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Acknowledgments: The JPEG support software is based in part on the work of the Independent JPEG Group.

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# Quick Start

## Welcome!

Just as many of your favorite creative software applications are compared to "real-world" activities - like painting, drawing and page layout - using Strata Design 3D CX™ is, in many ways, similar to studio photography. You create or place your objects of interest, arrange props, set up your lighting and environment, then snap your picture.

Along the way you make decisions like whether to use special backdrops, if you want to use lighting gels, set up reflection panels and more. In the "real world" equivalent, you also have to decide what camera to use, what film to use in that camera, what lens to use, which kind of film, the f-stop, etc. In Strata 3D CX there are some technical aspects to the process as well, but you will learn them very quickly.

With Strata 3D the creative process includes the following activities:

- Constructing models
- Texturing surfaces
- Lighting the scene
- Adjusting the environment
- Composing the shot
- Rendering the image
- Optionally add animation and special effects

This user manual is arranged according to this creative process, taking you through each step and showing you how to get the job done. For those who just can't wait to get their feet wet, we've included a Quick Start tutorial in the this chapter.

## Installation and Setup

Installing Strata Design 3D CX is very straight forward and similar to software installations you may have done in the past. The application installer will take care of everything for you and have you up and running in Strata Design 3D CX soon.

## System Requirements

Like any 3D program, this software is CPU, memory and graphics intensive. The following minimum configuration is provided; however complex models and textures may demand greater system capacity to run efficiently. If you experience sluggish response with larger models and textures, consider upgrading your system.

**Minimum System Configuration:**

Windows
• Windows XP with Service Pack 2 (Service Pack 3 recommended) or Windows Vista
• Processor: Pentium 4, Athlon or better.
• Memory: 512MB of RAM (1GB or more highly recommended).
• Hard drive: 1.2 GB of free disk space for full installation.
• Display: 1,024 x 768 resolution or better.
• DVD-ROM drive.

Mac OS X
• PowerPC (G4, G5) or Intel processor.
• Mac OS X 10.4.11 or later.
• Memory: 512MB of RAM (1GB or more recommended).
• Hard drive: 1.2 GB of free disk space for full installation.
• Display: 1,024 x 768 resolution or better.
• DVD-ROM drive.

## Installation

The Installer should be run within an account that has Administrator or Power User privileges. Simply run the Installer program and follow the instructions. The first time you run Design 3D you'll be asked to enter the Serial Number you received with your purchase. Remember to register your copy of Design 3D with us at Strata.com!

## Quick Start Tutorial: Build an Apple

With this tutorial you'll learn how to import Adobe Illustrator files, how to Lathe the 2D Illustrator file into a 3D object, how to link Adobe Photoshop files to surface textures and how to render an image of the scene. The files you need to complete this tutorial can be found in the **Tutorial** folder in your **Strata Design 3D CX** application folder.

### Step 1: Create a New Document

You can create a new document by selecting **New** from the **File** menu or you can click on the **New Document** icon on the Button Bar at the top of the interface, just below the Menus. The New Document button is the on the left end of the Button Bar.


### Step 2: Import the Illustrator File.

From the **File** menu, select the **Import** command. The Import dialog will open allowing you to find files you want to import into your project. **Import** the file called "Apple Template.eps" from the "Tutorial" folder.

Once you import the "Apple Template" file you will see the two-dimensional object within Design 3D's Modeling window.

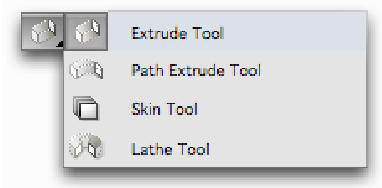
**The Adobe Illustrator file is a cross section of one-half of an apple.**

Press **Command** (Mac) or **Control** (Win) plus the "**=**" key to center the object in the Modeling window view. This is the shortcut for selecting **Fit Views to All** in the **Windows menu**.

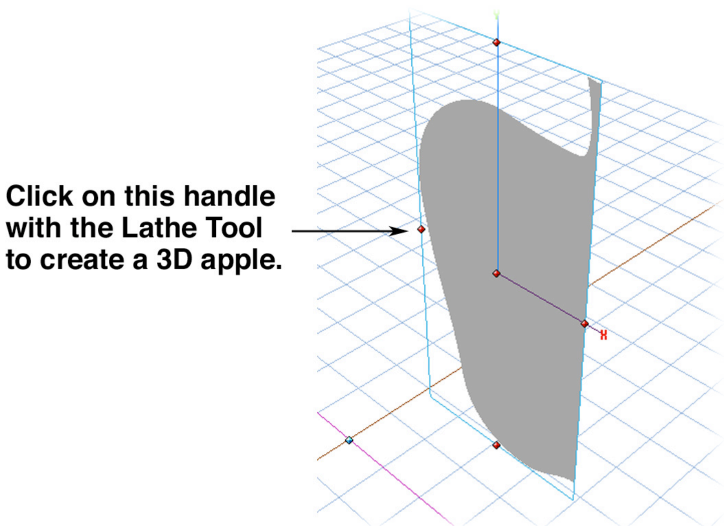
## Step 3: Lathe the Template

Now you can turn the 2D Apple Template into a 3D object by turning it 360° using the Lathe Tool.

First, select the **Lathe Tool** from the Tool palette. Use the hotkey "**U**". If the Lathe Tool is not selected immediately, you can press the hotkey again to cycle through the tools in the 2D to 3D Tools pop-up menu.

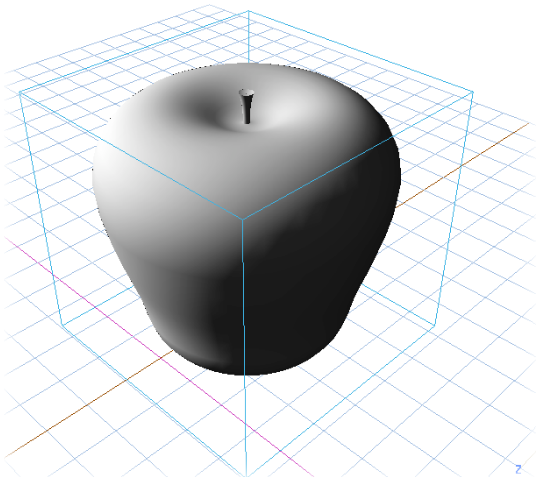



Next, click on the **red handle** that appears on the left-hand side of the Apple Template. Clicking on this handle rotates the template exactly 360º around the opposite axis. You can also drag the handle to Lathe more or less than 360º.




When you release the mouse button, the Lathe will be completed and you can see the results in the Modeling window. However, you can select the Lathe Tool again to adjust the axis location and direction, and the rotation. For more information see **Chapter 5 - Working with Bézier Objects.**

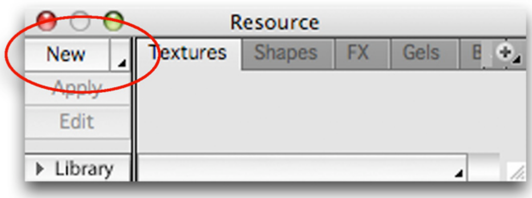
You may want to press **Command** (Mac) or **Control** (Win) plus the "**=**" key (Fit Views to All) again to center your newly created apple in the Modeling window view.



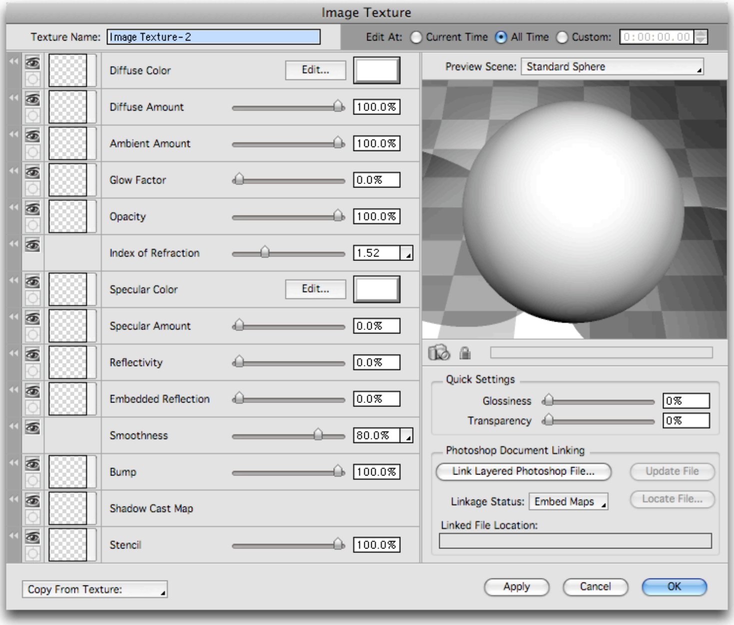
## Step 4: Link a Photoshop Layered File to a Texture.

Now that you have a 3D apple, it's time to create the surface coloring and other parameters that are known as "textures" in Design 3D. To create a texture you will be using the **Resource** palette. If it's not already open, go to the **Windows** menu and select **Show Resource Palette** or press the "**R**" hotkey.

The Resource palette has tabs across the top that let you manage different types of resources. For right now we'll be using only the **Textures** panel of the Resource palette. To create a new texture click on the **New** button on the upper left of the palette.



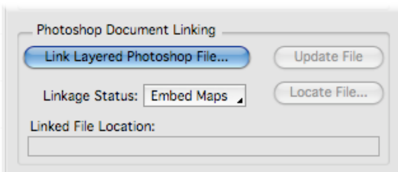

When you click on the New button a blank **Image Texture** dialog appears. Image Textures wrap images around the surface of your 3D objects. These images can be used to determine the color of the surface, how reflective it is and even how bumpy the surface appears.




You can load individual images into each channel of the dialog, or you can load a single layered Photoshop file to fill in these channels automatically. The texture can be **linked** to the Photoshop file so that future changes made to the Photoshop file will be updated in your Design 3D model. For this tutorial we have provided you with a pre-made Photoshop file to fill in these channels.

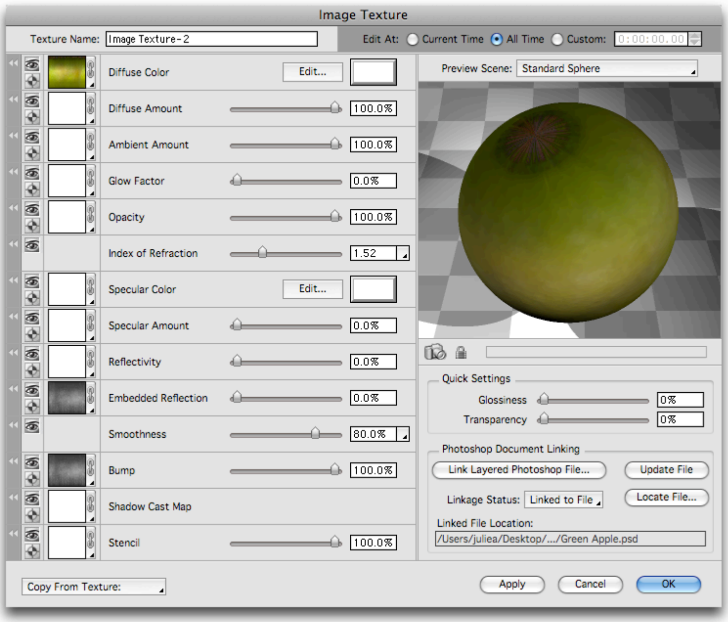
For more information, see **Chapter 8 - Texture Basics** and **Chapter 9 - Using Image Textures.**

To load and link the Photoshop file into the Image Texture click on the **Link Layered Photoshop File** button in the lower right of the dialog.

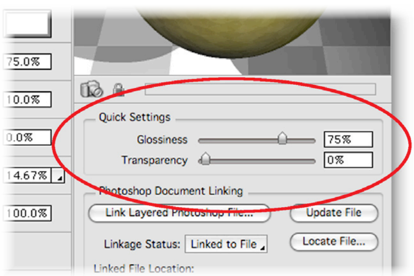


Find the Photoshop file named "Green Apple" and open it. The file is located in the Tutorial folder inside your Strata Design 3D CX application folder.

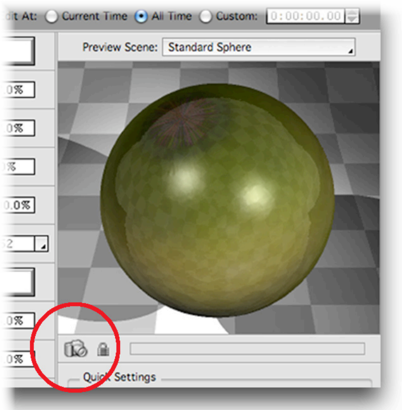
After a few seconds you will see some of the channels in the Image Texture dialog become filled with images. The top channel, titled **Diffuse Color**, supplies the color and pattern for the apple's texture. This channel determines the color of the light that reflects from diffuse light sources.




You can use the **Quick Settings** section to control the Glossiness and Transparency, or you can use the more complex settings in the rest of the dialog. For more information about the Image Texture dialog and the various texture channel settings, see **Chapter 9 - Using Image Textures.**



For this tutorial, we'll use the Quick Settings. Move the **Gloss** slider to the right until the percentage reads about **75%**. Click on the **Preview** "camera button" to see what your texture looks like at this point.




Once you're satisfied with your new texture click on the **OK** button. If the apple was selected when you created the texture, the texture will automatically be applied to the apple. You should be able to see the texture on the surface of the apple in the Modeling window.

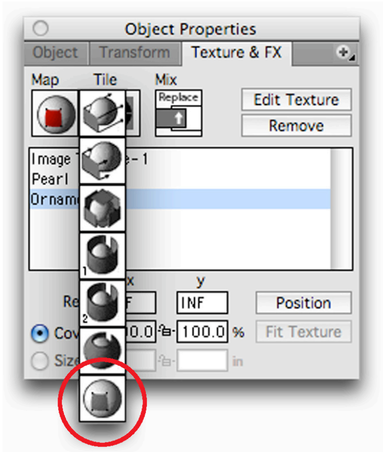
If the apple wasn't selected when you created the texture, select the texture and **drag** it from the Resource palette onto the apple object. The apple will highlight with a red box around it when the texture is on top. When you release the mouse button the texture will be applied.

## Step 5: Change the Texture Mapping

"Texture mapping" refers to the way an image texture is wrapped around the geometry of an object. Lathed objects default to cylindrical mapping, so you will want to change it another mapping type. For more information about texture mapping styles see **Chapter 8 - Texture Basics.**

To change the texture's mapping style, you will be using the **Object Properties** palette. If it is not already open, go to the **Windows** menu and select **Show Object Properties Palette** or press the hotkey "**O**".

The Object Properties palette has three panels: Object, Transform and Texture & FX. Click on the **Textures & FX** panel.

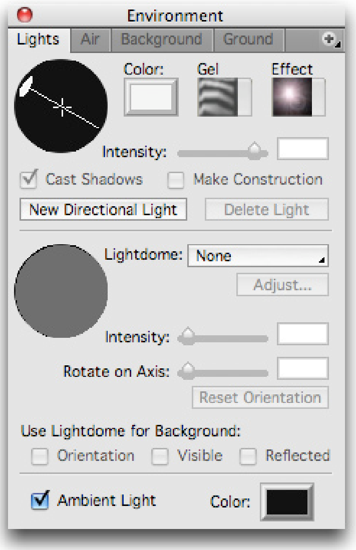



Now click on the icon at the top left of the palette to show the Texture Mapping pop-up menu. From the menu, select **UV** as your new mapping style.

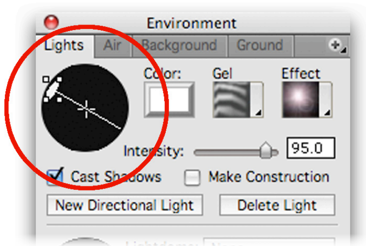
## Step 6: Set Up the Lighting

Now that you've created the apple and applied the texture, it's time to set up your lighting. There are many ways you can light your scene in Design 3D: Point Lights, Spotlights, Ambient light, Lightdomes, etc. For more information see **Chapter 14 - Lighting**.

For this tutorial we will only be using **Directional Lights**. Directional Lights are accessed and controlled through the **Lights** panel of the **Environment** palette. If the Environment palette isn't already open use the Windows menu or the hotkey "**E'** to open it. By default you already have one Directional Light in your scene.




The black disk on the top left of the palette contains your Directional Light Controller. By clicking on the smaller disk and line you can select the Directional light in your scene.



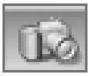

Once you have selected a Directional Light (there can be multiple Directional Lights in your scene - or none at all), you can use the controller to change the direction of the light, its intensity, or even the color of the light it casts. One effective method to light a scene is to use multiple colored lights. Using different colors of light will change the appearance of the apple.

To change the color of the Directional Light , **click** on it, and then click on the **Color** button. In the color picker dialog that appears, select a warm color such as a pale orange, and click **OK**.

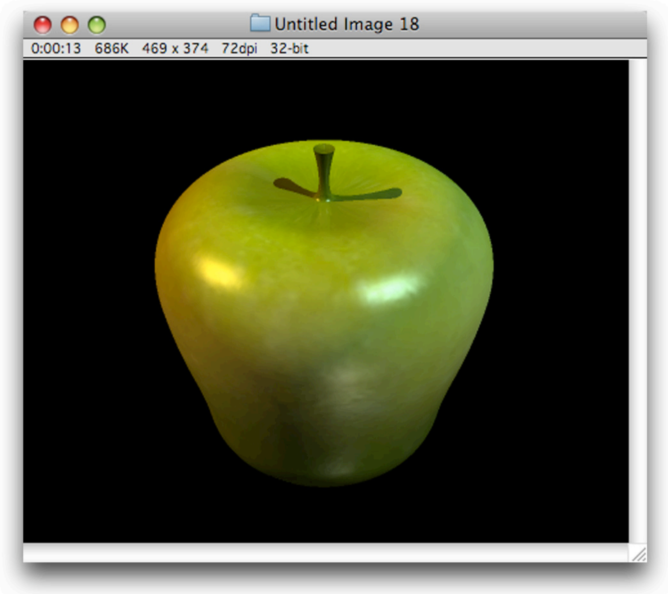
Now add a second light source by clicking the **New Directional Light** button on the left side of the Lights panel. Notice that creating a new Directional Light automatically enables the **Cast Shadows** checkbox directly below the Directional Light Controller. This checkbox determines whether or not a Directional Light casts any shadows.

Click on the new light to select it, and move it to an upper-right angle. While your new light is selected, select a cool color such as pale blue or blue-green.

## Step 7: Render the Image

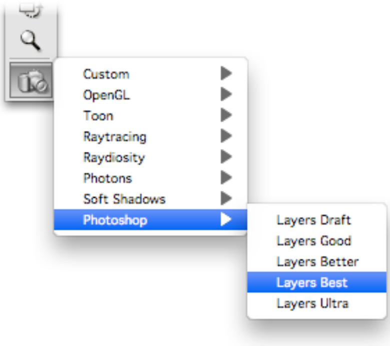


Select the Rendering Tool from the bottom of the Tool palette and click in the Modeling window to create a picture of your apple. The tool looks like a camera because that is exactly what it is used for - to "take a picture" of your 3D scene that you can save and print or view later.




There are many techniques you can use to generate the image of the apple. These techniques are referred to as **rendering methods**. Use the pop-up menu under the Rendering Tool to look at the available options.

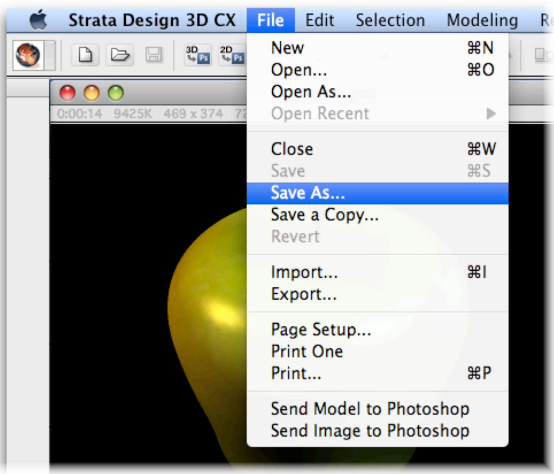
If you have an image-editing program that can read Photoshop® layered files, select the **Photoshop®** preset technique at the bottom of the drop down menu, and choose the **Layers Better** setting. This rendering method produces a layered Photoshop file as the output.




Click in the Modeling window again with the Photoshop® Layers Better "camera" to render the apple a second time.

## Step 8: Save the Image

Once your rendering has finished, save the image to your hard drive using the Save As... option in the File menu. Choose a descriptive name and save the image in the default Photoshop "PSD" format.




Congratulations! You now have a realistic rendering of a 3D apple made from some common 2D elements. When you open the resulting image file in Photoshop you will see many pre-made layers that you can adjust and blend to get the perfect image.

Design 3D can render and save many other types of images, from flattened files to animated QuickTime movies and even Strata Live 3D CX interactive 3D format!

## And There's More...

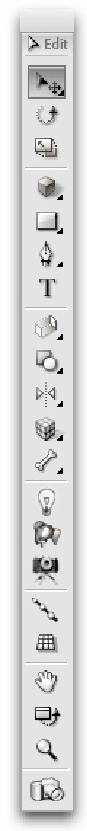
Strata 3D provides many, many more options to allow you to customize your camera angle, set up your lighting, add animation, and even special effects. For more information be sure to check out the available tutorials that come with this product. There are also many tutorials available on the web. Check the Strata web site at **www.strata.com** to learn more.

Chapter 1

# The Workspace

The Strata Design 3D CX™ workspace consists of standard elements you'll find in virtually all applications - a menu bar, tool palette, document window and palettes. In addition to these elements, Design 3D provides a Button Bar for quick access to commonly used functions, a Project window for animation and a Resource palette containing textures, shapes, background, etc.

## The Tool Palette




The **Tool palette** contains tools to create and manipulate the objects in your models, as well as tools to navigate and view your scene and manage your workspace. When you hover your mouse over each tool icon, a "tool-tip" of floating text will appear with the tool's name and hotkey.

When a tool is selected, its icon becomes highlighted and appears inverted on the Tool palette. Only one tool can be active, or selected, at a time.

Many tools have **hotkeys**, and can be selected with their associated keypress with the mouse never actually clicking on the icon. Pressing the hotkey will select the tool.

Pressing the hotkey for one of the tool pop-ups selects the first tool in the pop-up menu. Hitting a tool's hotkey again selects the next tool in the pop-up. Holding the hotkey down selects the associated tool temporarily.

The entire Tool palette is a floating palette. You can move it around the screen and position it wherever you want. To move the palette, drag it by its title bar. To hide or show the Tool palette, select the Hide/Show Tool Palette command in the Windows menu.

The tools are arranged on the Tool palette according to their function. Tools with a small triangle at the lower right of the tool icon have a pop-up menu containing additional similar tools.

Many of the tools in the Tool palette have an associated **Tool Settings** dialog that allows you to change the default behavior of the specific tool. To access this dialog, double-click the tool icon on the Tool palette.

**TIP:** At times you may need more visual precision as you create, edit, or position the objects in your model. You can change a tool's cursor to a cross-hair cursor at any time by turning **Caps Lock** on. This applies to all of the tools except the View Management tools (View Move, View Rotate and View Zoom).

For more information about the tools available in Design 3D, see **Chapter 2 - Design 3D Tools.**

### Edit Button


The **Edit** button at the top of the Tool palette allows you to quickly enter Edit mode for an object. Just select the object, then click the Edit button.

Once you've drawn or imported an object into Design 3D you can change its shape by **Editing** it. This is the same as selecting Edit Object from the Modeling menu. You can edit polygon objects, Bézier surfaces and some specialty objects. If the object you select cannot be edited, the command is dimmed.

Some object types need to be converted to another kind of geometry before they can be Edited. The Convert function allows you to change your object to a different type of geometry and can be easily accessed with the Convert pop-up menu at the far left of the Button Bar. You can also select Convert from the Modeling menu.

When you enter Edit mode, the Tool palette changes to provide only the tools appropriate for editing the object type you have selected. Selecting the Edit button again will end the Edit session and return you to the normal modeling mode.

For more information see **Chapter 5 - Working With Bézier Objects** and **Chapter 6 - Working With Polygonal Mesh Objects**.

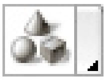
## The Button Bar

Design 3D's Button Bar is located directly below the menu bar, and provides easy access to the features and commands you use most often. You can quickly

Convert an object from one type to another, select common modeling features, access file handling and edit functions, and summon control palettes.

Clicking on any button is the same as using the corresponding menu command. Buttons may be active or dimmed. When dimmed, they are not available in your current situation. For example, Paste is not available if nothing has been cut or copied to the clipboard.

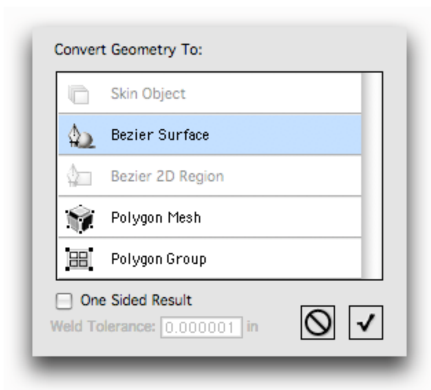
## Convert Menu



The Convert button is located at the far left of the Button Bar. It shows you what kind of object you have selected, and summons the Convert dialog.

When you select an object in your model, the icon changes to represent the object's geometry type. If the object can be converted, the Convert pop-up menu becomes available. If you select an object that cannot be converted, such as a Point Light, the Convert icon changes to reflect the object type, but is dimmed and the menu will not be available.

The Convert menu allows you to change an object from one type of geometry to another. Different types of geometry can be edited in different ways, and one may be more suitable than another in a particular situation. Convert can also be accessed through the Modeling menu.



**To Convert an object** from one type of geometry to another, select the object and then click on the Convert pop-up. In the menu which appears, select a new object type from the list, and then click the check mark to exit the dialog.

All of the allowable conversions appear in the menu. Those that don't apply to the selected object(s) are dimmed and unavailable.

The Convert pop-up dialog offers these options:
• **One sided result:** This checkbox allows you to specify whether the object becomes one-sided or two-sided. If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as Fog or Mist, it must be created as a solid, one-sided object.

• **Weld tolerance:** The Weld Tolerance field sets the maximum value for welding points together during the Convert operation. If two points on an object fall within the range set in this field, they will be welded together. This prevents holes in the object's geometry.

For more information about converting objects, see **Chapter 4 - Advanced Modeling.**

## File Handling

The next three icons in the Button Bar (from left to right) relate to file handling: **New, Open** and **Save**. These are quick ways to open and save models. These commands can also be accessed from the File menu.

## Photoshop Plug-In Access


These two buttons give you access to the Strata Design 3D CX plug-ins for Adobe Photoshop® CS4 Extended. If you have installed these plug-ins, the buttons are available and you can use them to send a model, texture or rendering to Photoshop. Using these buttons is the same as selecting **Send Model to Photoshop** ( 3D to PS) or **Send Image to Photoshop** (2D to PS) from the File menu.

For complete information about using these plug-ins, see the **3D[in] Quick Start PDF** located in the **Help** menu.

## Edit Functions

Next in the Button Bar are the **Cut, Copy, Paste**; and the **Undo** and **Redo** last action buttons. Using these buttons is exactly the same as selecting the same commands from the Edit menu. In addition to Undo and Redo, you can use the

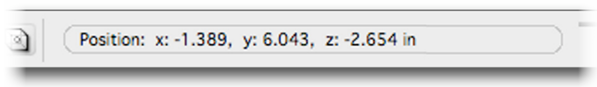
**History** panel in the Details palette to step back through recent reversible actions. For more information see **Chapter 21 - Menu Commands.**

## Modeling Functions

The next four buttons are frequently used modeling commands which are also available through the Modeling menu. **Group** and **UnGroup** are explained in **Chapter 4 - Advanced Modeling** and **Chapter 21 - Menu Commands.** For information about **Align** and **Recenter Origin,** also see **Chapter 21.**

## Numeric Feedback

Numeric feedback for many modeling functions is shown in the center part of the Button Bar. This includes degrees of rotation, percentage of scaling, and object or mouse position.




When the cursor is in the Modeling window, the feedback area displays the precise location of the cursor in the 3D space. The feedback area will also warn you if you are modeling in an edge-on orientation to the active grid.

## Palette Management Icons

At the far right of the Button Bar are the Palette Management icons. These buttons provide a quick, easy way to show and arrange the palettes in your workspace.

The first two icons are for stacking and collapsing the palettes. Clicking on the **Stack and Collapse** icon collapses all of the palettes down to just the tabs, and arranges them tightly in the upper right corner of your screen. Clicking the **Stack** icon opens all of the palettes in a "stack" on the right side of the screen.

To the right of Stack and Collapse are icons that show and hide each of the palettes in Design 3D: the **Project window**; and the **Environment**, **Object Properties**, **Details**, **Modeling Commands**, and **Resource** palettes.

# The Modeling Window

In Design 3D the document window is referred to as a **Modeling window**. The Modeling window provides a view of the 3D modeling space. This window is where you create and edit objects, set up your scenes and start your renderings.

The Modeling window contains many of the standard interface elements common to all document windows in each OS, as well as some specialized controls to adjust the way objects are displayed. You can open multiple windows for your model and you can even split a single Window into several different view panes.

You can keep multiple Modeling windows for a single scene open in Design 3D, as well as multiple windows for multiple files all open at once. Closing windows has no effect on your model until you attempt to close the last open Modeling window for that file. When you close that window, you will close the file, and there is typically a “Save” prompt before you do this.

When you select the **New** command from the **File** menu a Modeling window opens for the new model. The default configuration of new Modeling windows can be changed through the Preferences dialog. Previously saved models will open with Modeling windows in the same configuration as when the model was last saved.

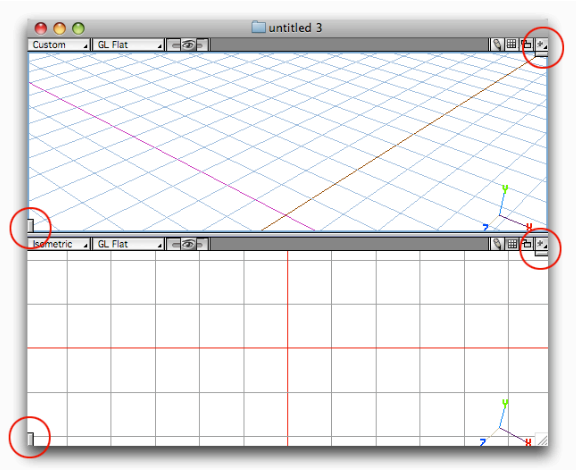
## Modeling Window Controls

The Modeling window provides many controls that allow you to customize the way you view your model. The size of a Modeling window on your screen is completely adjustable. Re-sizing the Modeling window simply enlarges, or magnifies, the view. It does not enlarge the modeling space.

Each Modeling window can be “split” into multiple view panes. Each view pane contains its own set of specialized controls. The settings within each view are independent of any other views.

### Splitting a View

You can split the window into multiple view panes by grabbing a Split View Control and dragging it to the desired size. The Split View Controls are represented as small rectangles located in the upper right and lower left of each view pane for splitting the view either horizontally or vertically.

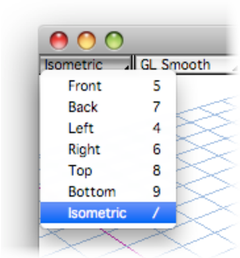



You can also split the active view in half by **double-clicking** on one of the Split View Controls. If the size of the active view is too small to split, the system beep sounds. Selecting the Split View command from the Plus menu also splits the active view into half. The Plus menu is the pop-out menu in the upper right of all palettes and windows, indicated by the "+" icon. To re-size an individual view pane, drag the Split View Bar to the desired position.

Each view pane has its own set of controls, allowing you to view your model from several different angles at once. You can also specify a different display method for each view. To delete a view pane, drag its split bar to the edge of the window, or select the **Delete View** command from the view **Plus menu**.

## View Orientation

The **View Orientation** pop-up menu, located in the upper left of each view pane, lets you choose the direction that you want to display your model from. You can choose from seven different preset positions.



Hotkeys are provided that allow you to easily switch the view orientation of the active view in the Modeling window. The position of the numbers on the numeric keypad correspond to the relative view orientation position.

**View Orientation Hotkeys:**
- **Left 4**
- **Front 5**
- **Right 6**
- **Back 7**
- **Top 8**
- **Bottom 9**
- **Isometric /**

You can press **Option/ Alt** and **Tab** keys to cycle through the various orientations within the active (outlined) view pane.

If you customize the view by rotating it with the View Move Tool, “Custom” appears in the view title area. To return again to a preset position, select one of the view orientation titles.

## Display Methods

A list of the available display methods appears in the **Display Method** pop-up menu. This menu is located next to the View Orientation pop-up menu. The available display methods include two basic types: OpenGL and Toon.

### OpenGL

OpenGL is an industry-standard interactive renderer for all platforms. OpenGL can work in software, running on the main processor, or it can utilize special 3D hardware for very fast calculation. In all cases, OpenGL creates a relatively low-resolution display of the 3D geometry in your scene, but it provides valuable “depth” to what you see on screen, as well as a very fast way to render images.

Design 3D provides hotkeys to allow you to quickly change from one OpenGL rendering technique to another. You will note that the hotkeys are in a line on your keyboard starting with “A” and ending with “H”.

**PointCloud**
Hotkey: **A**
PointCloud is the simplest and fastest rendering method used by Design 3D. Only the vertices are rendered. It is used primarily for displaying your model

in the Modeling window, but it may also be useful for rendering animation sequences for previewing purposes.

**Outline**
Hotkey: **S**
Outline displays only an outline of objects in the Modeling window. This display method gives you enough visual information to determine what the object is, while allowing you to model and animate quickly.
This is a good display option to use when speed is more important than detail.

**Wireframe**
Hotkey: **D**
Wireframe is generally used for displaying the model in the Modeling window, but you can also use it to render images quickly. It generates a line representation of objects in a model. In Wireframe, no surfaces are shown; surfaces are indistinguishable from hollow areas. No surfaces, lighting, or surface shading are calculated.

**Flat Shaded**
Hotkey: **F**
This rendering algorithm calculates a single color for each face on the surface. The orientation of a surface relative to the light source(s) illuminating it is also factored into the color as an intensity value. Flat shading is relatively fast, but it uses only one lighting calculation per polygon, so the final rendering is faceted in appearance. This renderer is most often used for quick previews and animation tests.

**Smooth Shaded**
Hotkey: **G**
The Smooth renderer calculates polygonal surface orientation and lighting intensity. The objects are rendered with a smooth, shaded surface.
The Smooth shaded rendering method is good for both accurate interactive displays in the Modeling window and as for images and animations, but it lacks some of the more advanced features of non-interactive renderers.

**Hidden Line**
Hotkey: **H**
Hidden Line display method removes the hidden lines from Wireframe representations before displaying them in the view or in rendered images, so objects appear solid, with implied surfaces, but without any illumination on the surface. The Hidden Line display method makes it much easier to determine the orientation of objects.

## Toon

Toon is second rendering method for both interactive and image and animation renderings. Based on OpenGL, it mimics a hand drawn, cell animation cartoon look. Each of the preset Toon rendering types below provide an outline for each object in the scene.

The same hotkeys for switching between various display methods are reused for Toon rendering, and progress through the display methods in a line on your keyboard starting with “A” and ending with “H.” The display method used depends on which mode you’re currently in - OpenGL or Toon.

**Flat**

Hotkey: **A**

Flat renders the surface of each object a flat, single color, based on a sample of the surface color of the object as it would appear at the brightest illuminated point on the surface.

**Gradient**

Hotkey: **D**

Gradient renders a shaded gradient based on the lighting of the scene and a sample of the surface color of each object.

**Average**

Hotkey: **F**

Average renders the surface of each object a flat, single color, based on a sample of the surface color of the object, and an average of the brightness that color would appear on the surface of the object.

**Bi-level**

Hotkey: **G**

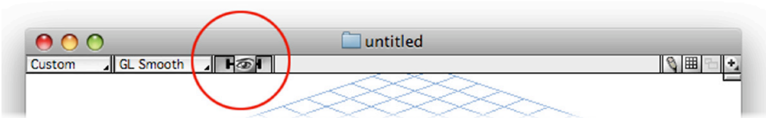
Bi-level renders the surface of each object based on the surface color of the object as it would appear at the brightest point on the object and at the darkest point. These two derived colors are then used to shade the object, based on the lighting of the scene.

**Tri-level**

Hotkey: **S**

Similar to Bi-level, Tri-level renders the surface of each object based on a sample of the surface color of the object, and as that sample color would appear at the brightest point, mid-point of the illumination and on the darkest point. These three derived colors are then used to shade the object, based on the lighting of the scene.

## Perspective Selector



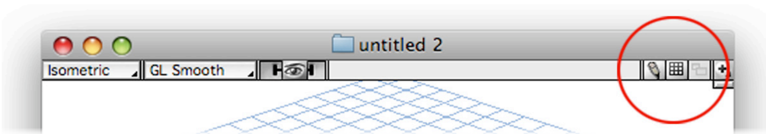

This control is located at the top of each view pane of your Modeling window. You can choose to display the view in orthographic (no perspective), normal perspective, or wide angle perspective.

Views without perspective display the model in an orthographic projection. Parallel lines of objects in the model appear parallel in the view. The objects always appear their true size relative to one another.

Perspective adds the element of depth to views. Objects closer to the view plane appear larger than those farther away. Views with perspective appear more natural, because this is the way your eye sees images in the real world.

To gain total control over the perspective, as well as many other features of view composition, you will want to use **Camera objects**. For more information see **Chapter 13 - Using Cameras.**

## Extra View Controls




**Redraw Button**
The Redraw button is located in the upper right of each view pane of your Modeling window. Clicking this button's pencil icon forces Design 3D to redraw the window. Screen redraws are typically automatic, but with more complex operations or large scenes, there are times that the interactive view must be "forced" to redraw the scene. When a small rectangle appears behind the pencil, then it is time for a manual refresh.

**View Grid Button**
Each view contains a **View Grid** button. When this button is depressed the View grid appears, which functions like any other grid for aligning and snapping, except that it is always oriented parallel to that view window. The distance of the grid from the view is equal to the distance of the View Set Center

from the view. The View Set Center is the central point that the views within a Modeling window all focus on. Clicking on the button again removes the View Grid and displays the default grids.

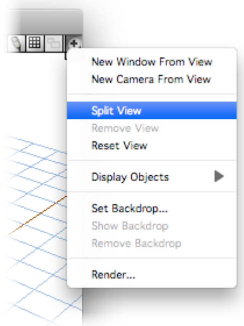
### Maximize View Button

If you have split your Modeling window into more than one view using either the Split Window Control or by setting the Modeling window to default to 2 or more panes, then this button toggles between the split views and a large (maximized) single view. To return to the window's previous state (back to split views), click the button again.

**NOTE:** Don't confuse this button with the Maximize button on the title bar (Windows only). This internal Maximize button does not change the size of the Modeling window; it just toggles between split views and single views.

### The Modeling Window Plus Menu

The "Plus" menu is located in the upper right corner of each view. It contains options for creating, deleting, and splitting views, creating new cameras from views, changing the display of complex objects, setting Backdrops as 2D reference while working, and even initiating a rendering from that window.




These options, and their submenus, are displayed based on the current settings of the active view. Every view window, even individual split view windows, has this type of "Plus" menu.

### Display Objects

You can select the level of detail displayed in the Modeling window from the Display Objects submenu in the Plus menu. The higher the level, the less detail displayed in the window. A check mark next to the menu entry indicates the current display detail.

If your model is so complex that the redraw times get too lengthy, you can choose to display the objects as **fast boxes**. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This greatly reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose 1 Level, objects in the model appear normal, but shapes in the model appear as fast boxes, etc. This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the Modeling windows, they will still render in full detail.

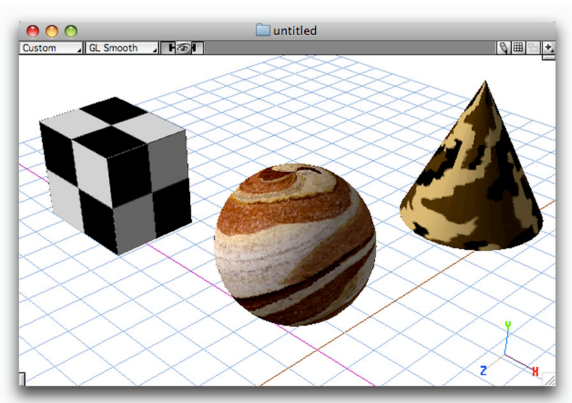
Holding down the **Option** (Mac) or **Alt** (Win) key while selecting one of the fast box options applies the setting to all views in a split window.
For more information about splitting a Modeling window view see the section **Modeling Window Controls** in this chapter.

## Depth Cueing

Depth cueing provides a visual indication of the distance of an object from the view plane. Objects farther away from the view plane appear less visible than objects closer to it. This effect can be seen in the Modeling, Camera, or Spotlight windows, but it doesn't appear in rendered images. You can enable Depth Cueing in the Windows panel of the Preferences dialog.

## Texture Display

When you have the Show Textures option enabled (in the Windows panel of the Preferences dialog), and the Display Method is set to Shaded or Flat, then bitmap versions of your textures will appear on the objects they are assigned to. In any other display mode, the texture is represented by a single color.



## View Management Tools

At the bottom of the Tool palette you will find tools to manage your views. This grouping consists of the **View Move Tool**, the **View Rotate Tool**, and the **View Zoom Tool**. These View Management tools allow you to navigate your scene and control how your model appears in the Modeling window.

**NOTE:** The View Management tools will function differently based on the "Natural Movement" option checkbox in the General panel of the Preferences dialog. This preference essentially reverses the direction that the View Move and View Rotate Tool will operate when the mouse is clicked-and-dragged. If the default operation is not intuitive for you, it can be reversed by checking this option.

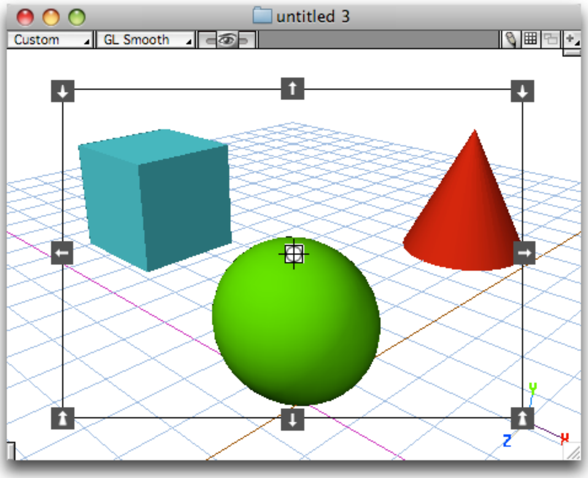
### View Move Tool

The View Move Tool lets you pan the view from side to side or up and down in the window. Only the view moves, not the objects themselves. Each view can be moved independently, but all views remain linked to the View Set Center at all times.

In addition to clicking on the tool icon, the View Move Tool can be selected with the **Shift-1** hotkey. The View Move Tool also can temporarily be selected at any time by holding down the **Space Bar**. Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of adjusting the view while working.

**View Move Tool Function**
When the View Move Tool is selected, an overlay appears in the Modeling window and the cursor changes to a "grabber" hand cursor. The overlay contains specialized handles which allow you to change the view plane, and the cursor allows clicking and dragging anywhere in the window to freely move the view.

Clicking and dragging on the arrow handles at the edges of the view constrain the View Move to either the horizontal or vertical axis. The corner arrow handles move the view plane on the depth axis, with an effect similar to a zoom. However, if the perspective selector at the top of the window is set at the Orthographic position, the effect of the move is not apparent.

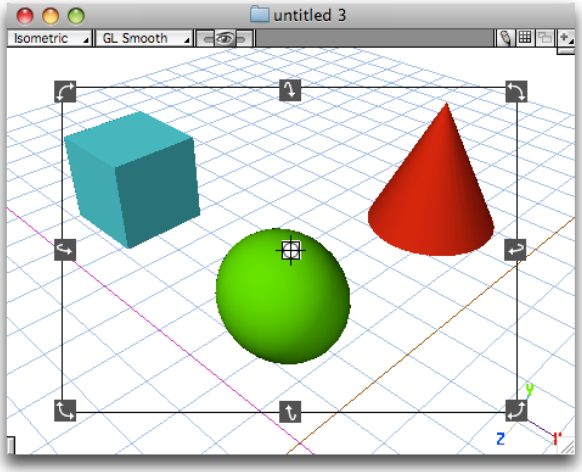



Modifier keys for the View Move Tool:
**Shift** = constrains the scrolling direction while using the "Grabber" method to either the vertical or horizontal axis, depending on mouse movement.
**Command** (Mac), **Control** (Win) = accelerates the view move operation, whether you're moving the view up, down, left, right, in or out.
**Option** (Mac), **Alt** (Win) = decelerates, or slows down, the view move operation, whether you're moving the view up, down, left, right, in or out.

## View Rotate Tool

The View Rotate Tool rotates the view around the View Set Center. Only the view rotates around the center point; the objects are not affected in any way. Any view can be rotated independently, but it always remains linked to the View Set Center.

In addition to clicking on the tool icon, the View Rotate Tool can be selected with the **Shift-2** hotkey. The View Rotate Tool also can temporarily be selected at any time by holding down the **Shift and Space Bar**. Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of rotating the view while working.




**View Rotate Tool Function**
When the View Rotate Tool is selected, an overlay appears in the Modeling window and the cursor changes to a "rotate grabber" hand cursor. The overlay contains specialized handles that constrain the rotation, and the cursor allows clicking and dragging anywhere in the window to freely move the view.

Clicking and dragging on the "curled arrow" handles at the edges of the view constrain the View Rotate to either the horizontal or vertical axis around the View Set Center. The corner arrow handles adjust the "roll" of the view.

Modifier keys for the View Rotate Tool:
**Command** (Mac), **Control** (Win) = accelerates the view move operation, whether you're moving the view up, down, left, right, in or out.
**Option** (Mac), **Alt** (Win) = decelerates, or slows down, the View Rotate operation to allow for finer adjustments to the view.

## View Zoom Tool

The View Zoom Tool is used to zoom in (or magnify) or zoom out (reduce the size) of the scene in a particular view. The magnification method can be adjusted to control how much of the model is visible at one time.

In addition to clicking on the tool icon, the View Zoom Tool can be selected with the **Shift-3** hotkey. The View Zoom Tool also can temporarily be selected at any time by holding down **Command-Space Bar** (Mac) or **Control-Space**

**Bar** (Win). Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of rotating the view while working.

You can **Zoom out** using the **Option** (Mac) or **Alt** (Win) key with the tool selected, or temporarily by adding Option or Alt to the **Command/Control-Space Bar** key combination.

**View Zoom Tool Function**
Magnifying (or reducing) an image does not change the actual size of the objects, it only changes the apparent size in the view. The View Zoom Tool operates in two ways:
**Click to zoom:** Each click in the active view magnifies or reduces the image by the percentage specified in the Tool Settings dialog. Double-click the Zoom Tool icon to change this setting.
To reduce, or zoom out in the view, use the **Option/Alt** key while clicking. The symbol in the cursor changes to a minus symbol to indicate this effect.
**Drag to zoom:** Position the cursor in the view and click-and-drag to define the area to be magnified. The area of the model you define with this method will enlarge to fill the entire active view. You can also click and drag to zoom **out** using the **Option/Alt** key. The smaller the area you specify, the further out the view will be zoomed.

### View Set Center

The View Set Center is the point that all view panes, within a single Modeling window, center on. This linking of views, within a single Modeling window, allows you to navigate the views while still staying focused on a single point. The View Set Center tends to keep you from becoming "lost" within the 3D world. However, entirely separate Modeling windows (even of the same scene) each have their own View Set Center.

In order to set exactly where the View Set Center is in the modeling view: First, position the **Front** view with the desired X and Y axis coordinates in the center, then change to the **Right** view and position the camera with the desired Z axis coordinates in the center. For a camera object, the View Set Center is always the look-at point.

## The Palettes

Like the Tool palette, the four palettes float above open documents. These palettes can be moved anywhere within the workspace by dragging on their title bar, and they "snap" together.

These palettes can appear in two ways; expanded to display all of the settings or library items, or collapsed to display the folder panels only.

To fully close a palette, select its **Hide** command from the **Windows menu**, or click the close box in the title bar. If a palette is open when you quit Design 3D, it will be open the next time you launch the application.

**NOTE:** When you enter text or numeric data into a palette from the keyboard, the changes will take effect when you press the Enter, Return, or Tab keys. Other changes to the contents of a palette (checkboxes, radio buttons, etc.) occur immediately.

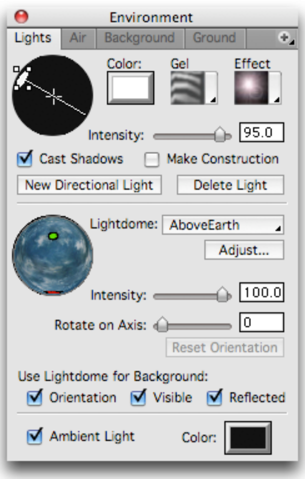
## Using Plus Menus

Design 3D provides a pop-up menu in the upper-right hand corner of most palettes and windows that provides commands that are appropriate for each palette or window. Commands may include things such as saving of shapes or textures, collapsing palettes, changing view details, and more.

## Environment Palette

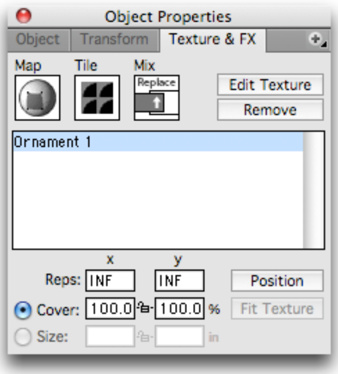
Use the Environment palette to set up the overall feel for the scene you're working on. The Environment palette contains controls that affect the entire model such as global lights (as opposed to local spot and point lights), global atmosphere, background images, reflections and ground planes.

The hotkey for displaying the Environment palette is "**E**."



## Object Properties Palette

The Object Properties palette contains all of the information about the currently selected object. You can edit the selected object or alter settings specific to the type of object selected at any time from this palette. You can move, rotate and scale the object numerically and adjust and position the textures applied to the object from this palette as well.



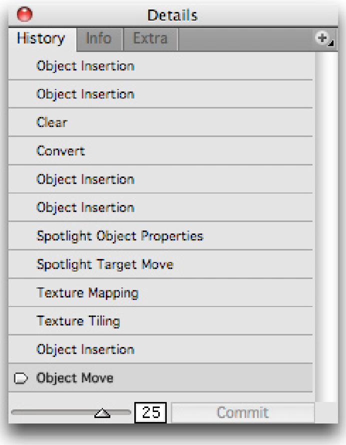

If multiple objects are selected, the palette grays out unless the objects are of the same type. In that case, some fields may be blank if some of the properties are different between the selected objects. You can, nonetheless, edit the properties of two or more selected objects using this palette.

The hotkey for displaying the Object Properties palette is "**O**."

## Details Palette

The Details palette is where information related to your scene is displayed and collected. The three panels in this palette hold and display very different types of information, but they all relate information about the entire scene or project.

The **History panel** visually shows the series of reversible actions that can be "undone" by pressing **Undo** [**Control-Z** (Win) or **Command-Z** (Mac)]. Each of these actions can also be "redone" if they have been reversed by using **Redo** [**Shift-Control-Z** (Win) or **Shift-Command-Z** (Mac)].




You can also click on each line in the History panel to jump directly to that state in the recent history. The History states will be sequentially overwritten from the beginning once you reach the limited number set at the bottom of the palette.

**NOTE:** Entering an Edit session will erase all previous History states (or possible undos) to allow for that session's own History states to be built up. Once you Exit the Edit session, all of that session's History states will then be cleared to allow for new History states outside of the session.

The **Info panel** provides access to statistical information about the open model - such as the number of objects and polygons. You can also generate a list of all the shape instances you have used in constructing your model.

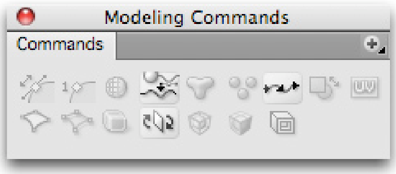
The **Extra panel** contains links to information about the full range of services and products available from Strata, including links to free tutorials, extra resources, and the Stratacafe online community site.

The hotkey for the Details palette is "**I**."

## Modeling Commands Palette

The Modeling Commands Palette provides quick access to all of the modeling commands, which are located in the lower section of the Modeling menu. Rather than selecting the menu command, you can just click on the icon in this palette.

Only those commands available in your current modeling situation are available in the palette. The unavailable commands are grayed out. To quickly find the command you are looking for, use the tooltips which appear when you hold your cursor over the palette.

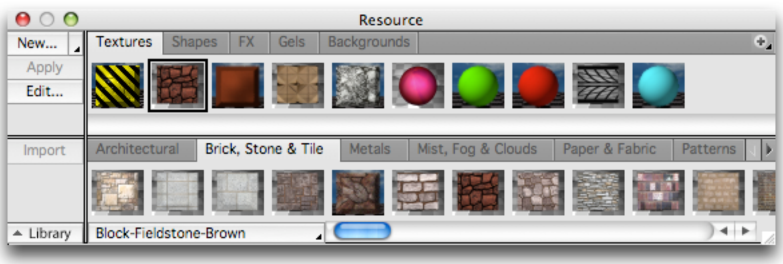



The hotkey for the Modeling Commands palette is "**T**".

For more information about the Modeling menu commands, see **Chapter 21 - Menu Commands**.

## Resource Palette

The **Resource palette** provides access to the various resources you may have used within your model, commands to create new resources, and access to a library of pre-made resources. Visual icons for your resources are created from the preview render for each resource, so you can quickly identify each one.




Resources may include **Textures** (surface color, reflectivity, etc.), **Shapes** (model components), **FX/special effects** (lens flares, smoke, particles, etc.), **lighting Gels** (to color lights, provide shadowing effects such as blinds, etc.) and **Backgrounds** (used for image based lighting, visible backgrounds and reflected backgrounds).

The palette is divided into three sections. On the left side is a small area with buttons and menus for the editing, creation, and application of resources. Across most of the rest of the palette is a large, tabbed, horizontal area to hold the active resources in your current scene, and a similar horizontal area just below it to hold the stored **Resource Libraries** available to all scenes.

The hotkey for the Resource palette is "**R**".

## Resource Panels

The panels on the top of the Resource palette are not only used to display the resources used within the current model, but also to change the mode of the palette to create, access and edit those types of resources from the buttons on the left, the Plus Menu in the upper right, and the Libraries. For example, pressing the "New" button while the Texture panel is frontmost will open the new Image Texture dialog, but pressing the same "New" button while the Gels panel is frontmost will open a new Image Gel dialog.

Texture, Shape and Effect library items can be imported into an open model by dragging and dropping. Shapes can be added to a model, and textures and effects can be applied to existing objects. Gels and backgrounds are applied in the model using the Environment palette and the Object Properties palette. All resources can be imported into a model (but not applied or used in the scene) using the Import button on the left side of the Resource palette.

## Libraries

The panels on the bottom (in the collapsible Library section) provide access to subfolders in the Resources libraries on your hard drive. The type of resources shown also reflects the mode that the palette is in from the upper panels. For example, if the Background panel is the frontmost panel in the palette, the items and panels in the lower section will all be Background resources and libraries.

You can create your own libraries of resources by saving out resources that you've made (by using the Save... command from the Plus menu) or downloading resources created by others and placing them into an appropriate folder within the application's Library folder. You can also create new folders to place the resources in. These new folders and resources will appear in your library the next time you run Design 3D.

For example, you might want to create a folder that contains only fabric textures. Create a folder named Fabric and place it inside the Textures folder within the Libraries folder. Then place the individual fabric textures into the folder. The next time you launch the software a panel labeled Fabric appears in the Textures library along with your other existing folders.

Left and right scroll arrows to the right of the panels allow you to scroll to all of the available resource panels.

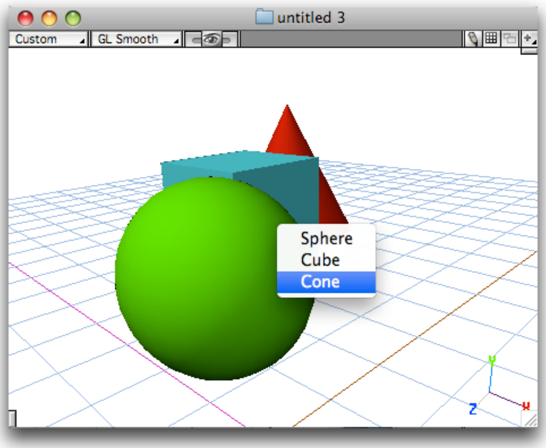
## Context Menus and Hotkeys

Design 3D provides many ways to speed up your modeling, rendering, animation and scene management without requiring a lot of visual clutter or searching in the interface. The icons and palettes are there to provide feedback when you need it, but in some cases it is just faster to get what you want without moving your eyes from the task at hand. Context menus and Hotkeys make this much easier to do.

### Using Context Menus

When you click within the Modeling window using the right mouse button (or **Control-click** on systems with only a single-button mouse) in some instances Design 3D will present a context menu directly underneath your mouse cursor.

In normal modeling mode the menu shows a list of the objects under the cursor that can be selected. Any objects that are selected will show with a check mark next to the object name.




When you are in Polygon Edit mode, the context menu lists a series of commands that assist you in creating the desired surface, some of which cannot be accessed in any other way than through the context menu.

## Using Hotkeys

You can access many tools and commands in Design 3D using "hotkeys". Some hotkeys require only a single strike of the key - such as using the "F" key to change the Modeling window display method to Flat Shaded. Other hotkeys require a modifier key be held down at the same time - such as the Command key on the Mac or the Control key on the PC.
The hotkeys and modifier keys are listed besides items in the menus, and also on tooltips.

## Customizing and Adding Hotkeys

Design 3D ships with a default set of keystrokes for many commands and tools, but with the **Customize Menus** command (in the **Edit** menu), you can define your own hotkeys to use for menu commands. It is important to note that this is applicable to items accessible through the drop-down menus at the top of the workspace, so you cannot assign a hotkey to a non-menu item or tool (such as the Spotlight Tool).

These user-defined hotkeys require a system-specific key held down: **Command - "key"** (for Macintosh) or **Control - "key"** (for Windows), but you can also add the **Option** (Mac) or **Alt** (Win) modifier to create a three-stroke hotkey. This requirement is because most of the single-key hotkeys are assigned to non-menu items in Design 3D. Many of these single-key hotkeys will also change based on the active state or context of the modeling environment. This makes it difficult to select and keep track of them.

After selecting the Customize Menus command, a dialog opens instructing you to choose the command to which you want to add or change the keystroke shortcut.

Select a menu command to change from the top drop-down menus just as you would normally select it. During this time the command won't perform its normal function; instead, a second dialog appears. Here you can type the letter or keyboard symbol that will be combined with the system-specific key to create your new hotkey combination.

The original dialog remains open, allowing for many more menu items to be selected and new hotkeys to be defined for all of them. When you are finished defining hotkeys, press the "Done" button in the original dialog and all of the menu items will return to their active state. Any new hotkeys you have defined or altered will now show up in the drop-down menus next to their associated menu items.

If you wish to "exchange" two existing hotkeys, you must assign one of them to a temporary hotkey and then reassign the second one and return to the first to assign it to the now available hotkey from the second.

## Setting Defaults

There are many methods you can use to configure your workspace and set-up the preferences for Design 3D. You can establish the palette configuration, use the Preferences dialog, set tool defaults, define the units of measure for dialogs and grids, and you can setup the mouse filter.

### Using The Preferences Dialog

You can access and modify the application preferences in different ways, depending on the operating system (OS) you are using. If you are using Design 3D in the Windows OS, choose the **Preferences** command from the **Edit** menu to display the Preferences dialog. If you are using Design 3D under the Macintosh OS (X), choose the **Preferences** command from the **Design 3D** application menu to display the same dialog.

The Preferences dialog allows access to many functions that determine how the application looks, behaves, and manages its system resources. This dialog contains three panels: General, Rendering, and Windows. For more information see **Preference Settings** in **Chapter 21 - Menu Commands**.

### Setting Defaults for Tools

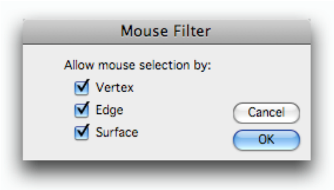
You can set the default behavior for individual tools by double-clicking the tool icon, which brings up a preferences dialog for that individual tool. Available settings vary according to the tool. For more information, see the specific tool.

### Setting Units

Design 3D allows you to customize the units you use to define and move objects. The Set Units dialog also gives you control over grid lines, snapping and nudging. To access the dialog choose the Set Units command from the Edit menu. For more information see **Chapter 21 - Menu Commands.**

### Setting the Mouse Filter

Sometimes it's difficult to select objects, either because they are inside another object or behind an object in the active view. In these situations it may be necessary to change the “mouse filter” for selecting objects interactively in the workspace.




The **Mouse Filter** command, found in the **Selection** menu, displays a dialog with options for selecting objects. These checkboxes allow you to select surfaces only, vertices only, or edges only; or you may use any combination of the three. The mouse filter settings are retained between sessions or until you change them.

Each time you click the mouse, Design 3D checks to see if this point matches any of the mouse filters you’ve selected. If the point matches, the object is selected. If no match is made, no selection is made.

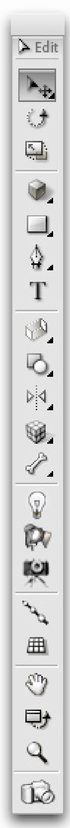
If you turn off **all three** selection filters, clicking on an object in the interactive views will never select it, since no condition exists to match the settings. However, you can still select objects in the Project window, or by dragging a selection marquee around them in the Modeling window.

## Chapter 2

# Design 3D Tools

This chapter describes all of the available tools in the Strata Design 3D CX Tool palette. While most of the tools are described elsewhere in the manual, **all** of the tools are described briefly here.

## The Tool Palette




The Design 3D **Tool palette** contains tools to create and manipulate the objects in your models, as well as tools to navigate and view your scene and manage your workspace. When you hover your mouse over each tool icon, a “tooltip” of floating text will appear with the tool's name and hotkey.

When a tool is selected, its icon becomes highlighted and appears inverted on the Tool palette. Only one tool can be active, or selected, at a time.

Many tools have **hotkeys**, and can be selected with their associated keypress with the mouse never actually clicking on the icon. Pressing the hotkey will select the tool.

Pressing the hotkey for one of the tool pop-ups selects the first tool in the pop-up menu. Hitting a tool's hotkey again selects the next tool in the pop-up. Holding the hotkey down selects the associated tool temporarily. When you release the hotkey the selected tool will revert to the previously selected tool.

The entire Tool palette is a floating palette. You can move it around the screen and position it wherever you want. To hide or show the Tool palette, select the Hide/Show Tool Palette command in the Windows menu.

The tools are arranged on the Tool palette according to their function. Tools with a small triangle at the lower right of the tool icon have a pop-up menu containing additional similar tools.

Many of the tools in the Tool palette have an associated **Tool Settings** dialog that allows you to change the default behavior of the specific tool. To access this dialog, double-click the tool icon on the Tool palette.

**TIP:** At times you may need more visual precision as you create, edit, or position the objects in your model. You can change a tool's cursor to a cross-hair cursor at any time by turning **Caps Lock** on. This applies to all of the tools except the View Management tools (View Move, View Rotate and View Zoom).

## Edit Button

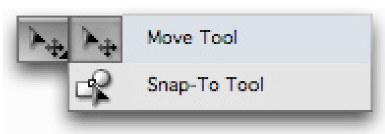

The **Edit** button at the top of the Tool palette allows you to quickly enter Edit mode for an object. Just select the object, then click the Edit button.

Once you've drawn or imported an object into Design 3D you can change its shape by **Editing** it. This is the same as selecting Edit Object from the Modeling menu. You can edit polygon objects, surfaces and some specialty objects. If the object you select cannot be edited, the command is dimmed.

Some object types need to be converted to another kind of geometry before they can be Edited. The Convert function allows you to change your object to a different type of geometry and can be easily accessed with the Convert pop-up menu at the far left of the Button Bar. You can also select Convert from the Modeling menu.

When you enter Edit mode, the Tool palette changes to provide only the tools appropriate for editing the object type you have selected. Selecting the Edit button again will end the Edit session and return you to the normal modeling mode.
For more information see **Chapter 5 - Working With Bézier Objects** and **Chapter 6 - Working With Polygonal Mesh Objects**.

## Move Tools




Hotkey: **1**
The Move Tools pop-up menu contains the Move Tool and the Snap-To Tool.

**Move Tool** - The Move tool moves selected objects in the active view. This tool functions as a selection tool and also allows you to click and drag to move your object freely along the active grid.

When the Move Tool is selected, handles appear at the center of each face of the selected object's bounding box. Using these handles constrains the object's movement along the X, Y or Z axis. If more than one object is selected, multiple bounding boxes appear and the objects move in unison.

To move the object freely, just click on the object's surface and drag. Using this method, the object can be moved anywhere parallel to the active grid. You can change grids by pressing the X, Y or Z key, or by pressing the Plus (+) or Minus (-) keys to cycle through all of the grids in the model.
For more information see **Chapter 3 - Modeling Basics.**

**Snap-To Tool** - This tool helps you position and align objects quickly and easily. Snap-To pulls one object to the selected point on another object, allowing you to easily position objects in relation to each other. You must select this tool from the Tool palette.

**To use Snap-To**, select a point on one object, then drag to select a point on another object. When you release the mouse button, the first object will "snap" to the second object.

**Snap-To** will also **Stretch** the geometry of the selected point on one object to the selected point on another object. Stretch works only on objects that allow stretching - those with points, such as Bézier and Polygon mesh; and on Bézier lines or regions. A point on a mesh object can be stretched to a point on an object that is not a mesh, but not vice versa.

You can constrain the Snap or Stretch along the grid or perpendicular to the grid. You can snap corner points, edge points or surface points.

Double-click on the Snap-To Tool icon to summon the tool settings dialog where you can select Stretch, and set constraints for either Snap or Stretch.

## Rotate Tool

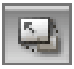
Hotkey: **2**
The Rotate Tool rotates objects in the active view. When you select the Rotate Tool, you can freely select items and rotate them by clicking and dragging on the object or on one of the handles.

When you select an object using the Rotate Tool, handles appear at the center of each edge of the bounding box. Objects can be rotated using two methods: by click-and-dragging directly on the surface of the object (free rotate), or; by using one of the edge handles. Using the edge handle constrains the rotation around the axis parallel to that edge. You can rotate the object on all three axes.

You can free rotate by clicking anywhere on the surface of the object and dragging. The object rotates around the object's origin point in an unconstrained manner.

For more information see **Chapter 3 - Modeling Basics**.

## Scale Tool



Hotkey: **3**
The Scale Tool is used to resize or stretch objects. You can also use this tool to select objects. When you select the Scale Tool, the cursor changes its appearance and you can freely select items with the Scale Tool ready to scale them on all axes as soon as you click-and-drag on the object, or on each axis by using one of the Scale selection handles.

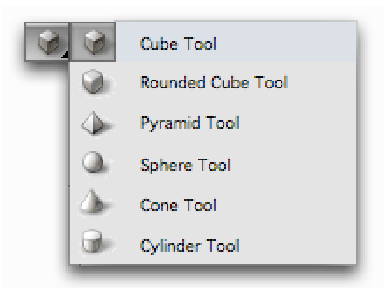
Scaling an object allows you to enlarge or reduce it in a single dimension (height, width, or depth), or in all three dimensions at once. Objects are scaled to the amount and in the direction the cursor is dragged once you click on the object with the tool.

When you select an object, handles appear on each face, and in each corner of the object's bounding box. The face handles constrain the scale in the direction of the face. Each handle can be pushed or pulled along one axis only. If a handle is pushed beyond the handle on the opposite side, the object inverts and continues to scale.

Corner handles scale the object in three dimensions. The handle opposite to the corner handle you're dragging stays put while you scale the object. As with using the face handles, if a corner handle is pushed through and past the opposite side, the object inverts and continues to scale.

For more information see **Chapter 3 - Modeling Basics.**

## 3D Drawing Tools



Hotkey: **C**

The 3D Drawing Tools pop-up menu contains tools for drawing "primitive" objects. These objects are a good way to quickly start building a model. These objects can be grouped together, Converted into other object types, and modified in many ways.

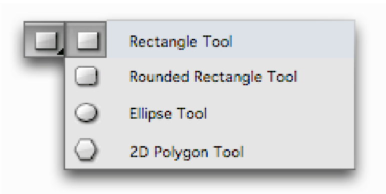
The 3D Drawing Tools include the **Cube Tool**, the **Rounded Cube Tool**, the **Pyramid Tool**, the **Sphere Tool**, the **Cone Tool** and the **Cylinder Tool**.

You can draw 3D primitive objects in two ways:
• **Click-and-drag:** With this method you simply click-and-drag the tool onto the active grid surface. Design 3D determines the height of the object by adding the width and depth, and then dividing the sum by two.
• **Three-click method**: The size of the primitive's bounding box is defined by three separate mouse clicks. The first two clicks are placed on the active grid, defining the size of the object in two dimensions. After the second click, a temporary grid line appears as an aid for positioning the third (perpendicular) dimension with a final click.

Modifier keys for drawing 3D objects:
**Shift** = constrains the tools to draw objects with the same dimensions on all axes (for perfect Cubes, Spheres, etc.).
**Option** (Mac), **Alt** (Win) = draws an object from its center, instead of the default method of drawing from one corner.
**Option-Shift** (Mac), **Alt-Shift** (Win) = draws objects from the center with equal proportions in all dimensions.

For more information see **Chapter 3 - Modeling Basics.**

## 2D Drawing Tools




Hotkey: **N**

The 2D Drawing Tools pop-up contains tools for creating 2D primitive objects. These include the **Rectangle Tool**, the **Rounded Rectangle Tool**, the **Ellipse Tool** and the **Polygon Tool**.

You can construct 3D objects by starting with 2D primitive objects. Two-dimensional objects can be Extruded, Lathed and even edited into three-dimensional objects. Most 2D objects can be defined as filled or unfilled using the Object Properties palette.

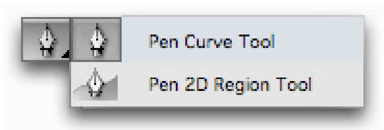
As with other objects, 2D objects are always drawn relative to the active grid. There are two methods you can use to draw 2D objects. First is the standard **click-and-drag** method. The second method uses **two single clicks** to establish the points needed to define the object.

Primitive 2D objects can be moved, rotated and scaled, but they can only be Edited after they've been converted into a Polygon Mesh or Bézier Surface. You can convert a 2D object by using the Convert command from the Modeling menu or by double-clicking on the object.

Modifier keys for drawing with the 2D primitive tools:
**Caps Lock** = changes the drawing cursor into cross-hairs, for precise drawing.
**Shift** = constrains the tool to draw evenly proportioned objects.
**Option** (Mac), **Alt** (Win) = draws the object from the center.

For more information see **Chapter 3 - Modeling Basics.**

## Pen Tools




Hotkey: **B**
The Pen Tools pop-up contains the **Pen Curve Tool** and the **Pen 2D Region Tool**. These tools can be used to draw Bézier lines or regions. Bézier lines are 3D objects - meaning they can be drawn and/or edited in more than just a flat, 2D plane. Bézier regions, in contrast, only exist in a 2D plane.

Both the Curve and Region tools work very much like your favorite drawing application, such as Adobe Illustrator.

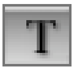
To begin drawing, simply click anywhere in the Modeling window. To draw the next point, click again. To make the line or region edge curve through the point where you click, just click-and-drag. A control handle is dragged out to determine the direction of the curve.

The length of each control handle determines the length of the curve. To complete the line, **double-click** or press the **Return** key. Clicking on the first point closes the curve or region.

If you make a mistake while drawing with the Pen Curve Tool, press the Delete key at any time during the drawing process to remove the last point (and segment) you drew. To remove more than one segment, continue to press the Delete key until as many line segments as you would like have been deleted.

For more information see **Chapter 5 - Working With Bézier Objects.**

## Text Tool



The Text Tool is a special, font-driven type of 3D Primitive. You can use the Text Tool to create three-dimensional text in your model, based on the installed fonts in your computer. This text can be easily customized to create the look you want.

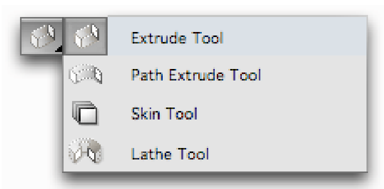
To create 3D text, select the Text Tool and click-and-drag in the Modeling window to define the left edge and height of the text you want to create (by default a capital "A" will guide you).

When you release the mouse button, the **Text dialog** appears where you can set the actual font and characters used, and extrude, bevel, and space the text elements.

Once created, the text can be edited from the Object panel of the Object Properties palette. This includes options for changing the name of the object, the text itself, the font, depth, width, and bevel settings.

For more information see **Chapter 3 - Modeling Basics.**

## 2D to 3D Tools




Hotkey: **U**

The 2D to 3D Tools are used to make 3D objects starting with a 2D object or template. Once you have created an object using one of these tools, you can Edit its properties by selecting Edit Object from the Modeling menu, clicking the Edit button at the top of the tool palette, or buy double-clicking on the object to open it in a separate Edit mode window.

When you enter Edit mode, the Tool palette will change to reflect the Editing tools available for your object type.

For more information about these tools, see **Chapter 5 - Working With Bézier Objects.**

**Extrude Tool** - To use the Extrude Tool, select any 2D object or 2D group to use as a template for the Extrude operation. Once selected, a 2D bounding box with a single red handle in the center appears around the object. If an object isn't suitable for extruding (such as a 3D curve or surface), no handle appears and it cannot be Extruded.

**To Extrude the object**, grab anywhere on the face and pull or push on the red extrude handle. The extrusion always occurs in a direction perpendicular to the face of the 2D object. If the face is pushed beyond the original position, it inverts and continues to extrude in the opposite direction.

Many of the features of an extruded object can be edited using the Object panel of the Object Properties palette.

**Path Extrude Tool** - The Path Extrude Tool allows you to extrude a 2D object along a pre-designated path to create a new 3D object. The 2D object, or profile, will be extruded perpendicular to path, and the final surface will be positioned in the same location as the path.

**To use Path Extrude**, start by drawing an open or closed curve with one of the 2D primitives or the Pen Curve Tool to use as a path for the extrusion. The direction the line is drawn determines the direction the 2D object you'll extrude will "move" along the path, from its beginning point to its ending point. (The 2D object is always extruded perpendicular to the path.)

Next, create or import a 2D object to extrude. You can use any single 2D object as a source for the extrusion. It can be filled or hollow, open or closed. To perform the extrusion, select the Path Extrude Tool and **click-and-drag** from the 2D object and to the path. Each object will be highlighted with a **red X**, and when you release the mouse button, the 2D object is repositioned to extrude along the path.

Always click on the object you want to extrude first, and then drag to the object you want to use as the path.

**Skin Tool** - The Skin Tool allows you to create a "skin" across two or more "ribs" (2D objects) to create a Skin object. This is similar to the way boats and aircraft are built with repeated profiles defining the shape of each segment, and a smooth covering is "stretched" across them to create flowing 3D surface.

There's no real limit to the number of ribs you can use with the Skin Tool, and any 2D object can be used as a rib. The ribs do not even have to contain the same number of edges or vertices or similar shapes. For example, one rib can be a rectangle and one a circle. The surface created between them will be based on "averaging" their profiles in the space between them.

**To create a Skin object**, first make sure you have two or more 2D objects in your scene that you wish to skin together. Next, select the Skin Tool and use the tool to click-and-drag from one 2D object to the next. Each pair of ribs will be highlighted with a red X when it is selected. The skin surface appears as soon as the mouse button is released, and the ribs are connected. You can add more ribs by repeating the click-and-drag action from an end rib to the next 2D object you wish to use.

If you make a mistake in Skinning, you can always undo the action, or use the UnSkin Tool as well. The UnSkin Tool is accessed by selecting the Skin Tool while holding down the Option/Alt key.

**Lathe Tool** - Use the Lathe Tool to rotate a 2D primitive around an axis to create a 3D object. The effect is similar to extruding a profile around in a circle where the axis perpendicular to the 2D object is constantly turning. You can use a 2D primitive, or create a Lathe template with the Pen Curve Tool. Either filled objects or unfilled paths can be used to Lathe an object.

**To use the Lathe Tool**, first create or import a 2D element. Then select the Lathe Tool and click on the 2D element to select it as the Lathe template. Once it is highlighted (selected), click on a red handle on the bounding box to revolve the object around the opposite handle. This is the same as defining which side of the template will be on the "outside" of the revolving profile.

Make a single click on any of the rotation handles to rotate the profile exactly 360 degrees, or grab the handle and rotate the profile to define a specific number of degrees by interactively clicking and dragging in the workspace.

When you release the mouse button, the Lathe will be completed and you can see the results in the Modeling window. However, you can select the Lathe tool again to adjust the axis location and direction, and the rotation.

When you select the Lathe Tool again, **green** wireframe lines will appear to show you the approximate revolution amount, while a **red** horizontal line provides a handle to adjust the rotation amount.

At the center of your Lathe object, a **blue** vertical line with **purple** top and bottom handles indicates the axis location and direction. While you are still in the active Lathe Tool, you can click and drag on these handles to reposition or tilt the axis. Pressing the **Shift** key while dragging up on the center axis will Sweep the Lathe axis off of the original plane to create a corkscrew effect.

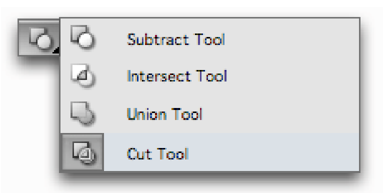
**TIP:** To quickly "preview" your Lathe object while you are adjusting the axis or revolution amount, press the Spacebar to toggle the View Move Tool on and off. This will show your Lathe object in whatever view mode you have set for the Modeling window without exiting the tool.

When you are through creating your Lathe, select any other non-temporary tool on the Tool palette (such as the Move Tool: "1") to complete the Lathe operation and examine the actual surface created.

If you choose the wrong initial 2D handle and lathe in a direction you had not desired, you can use the Undo command in the Edit menu, or you can simply step back using the History panel of the Details palette. You can still alter other aspects of the Lathe command from the Object Properties palette, and by clicking on the finished Lathe object with the Lathe Tool again.

Lathe Objects can also be altered in the Edit mode. To Edit a Lathe Object, click on the Edit button at the top of the Tool palette, select Edit from the Modeling menu, or double-click on the object to Edit in a separate window.

## Boolean Tools




Hotkey: **K**
The Boolean pop-up menu contains tools for Boolean modeling: the **Intersect Tool**, **Union Tool**, **Subtract Tool** and **Cut Tool**. Boolean modeling lets you use two 3D objects (of any shape or type) to produce a new object. The result is similar to gluing or carving with blocks of wood. Boolean operations can

even be “nested” inside each other to create very complex shapes with various Booleans.

To use the Boolean tools, the two objects you are using must overlap. Boolean operations can be reversed using the **UnBoolean** command from the Modeling menu.

**Intersect Tool** - The Intersect Tool creates an object that consists of only the over-lapping parts of two objects. This tool can be used for creating cross-sections of the internal structure of objects and for defining overlapping areas in a model.

**To use the Intersect Tool**, first position the objects so they intersect in the desired location, then select the Intersect Tool. Click-and-drag to select both objects. When you release the mouse button, the new object is created. For this tool it doesn’t matter which object you select first; the results will be the same.

**Union Tool** - The Union Tool performs a Boolean operation that physically joins two objects at their intersecting points, creating a single, more complex object.

**To use the Union Tool**, position the two objects so they overlap, then select the Union Tool, click-and-drag from one object to the next. It doesn’t matter which one you select first. When you release the mouse button, the two objects fuse together into one with no interior surfaces.

**Subtract Tool** - The Subtract Tool allows you to remove geometry from an object to create holes, indentations, or voids. This is done by removing some of the geometry of one object from another object. In the process, the first object completely disappears from your model.

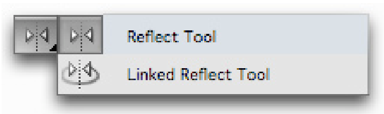
**To use the Subtract Tool**, first position the objects so they overlap. When using the Subtract Tool, the order of selection is very important. Next, select the Subtract Tool and **click-and-hold** on the object you want to use to subtract geometry (it will be highlighted in red). Then **Drag** to highlight the second object from which geometry will be subtracted.

The overlapping section of the first object is always subtracted from the second object.

**Cut Tool** - The Cut Tool creates a new shape by deleting all of both objects except the surface of the first object which is inside the second object. This makes the Cut Tool similar to the Intersect Tool, except that the final object consists of only the overlapping portion of the **first** object. And, unlike the Subtract Tool, the Cut Tool does not supply any additional surfaces. Therefore, a sphere cut by another sphere results in a bowl-shaped object.

**To use the Cut Tool**, position the objects so they intersect in the desired location. When using the Cut Tool, the order of selection will effect the outcome. First, position the objects so they overlap as desired, then select the Cut Tool and **click-and-drag** from the object that encloses your desired geometry (it will be highlighted in red) to the second object which will have a portion retained.

## Reflect Tools




Hotkey: **M**
The Reflect Tools create objects that are mirror images of the original.

**Reflect Tool** - The Reflect Tool lets you easily and quickly create objects that are mirror images of the original. Any animation information, textures or effects associated with the original object is also mirrored. You can Reflect any object, group or shape.

**To use the Reflect Tool**, select it from the Tool palette, and then select the object you want to mirror. With the mouse button depressed on your object, notice that you can select any of the six sides of the selection bounding box to use as the axis for creating the reflected object.

As you slide the cursor over the object, the selected face is indicated with a red selection border. When the face that you want is selected, release the mouse button. When you release the mouse button, the reflected object is created.

**Linked Reflect Tool** - This tool also creates a mirror image of the original object, but it also provides a “live” and constantly updating Reflect function so that you can Edit the original object and watch the symmetrical copy update.

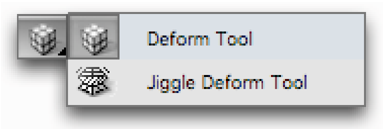
This is useful because in many cases it is easier to model only one half of a symmetrical object, however, it can be difficult to visualize the other half while working this way. If you intend to use one of the Object Edit modes, make sure you Convert your object to the desired object type before using Linked Reflect.

**To use the Linked Reflect Tool**, select it from the Tool palette, and then select the object you want to mirror. With the mouse button depressed on your object, you can select any of the six sides of the selection bounding box to use as the axis for creating the reflected object.

**NOTE:** The Linked Reflect Tool only updates any Edits you make to the original object surfaces, **not** any Transforms (Move, Rotate, or Scale) you apply to the entire object.

You can, however, Edit the object and select ALL of its elements (points, etc.) and Move, Rotate, or Scale all of them at the same time - which will be Linked to the Mirrored copy. This is useful because you can also Transform the linked copy freely and it will remain linked to the original for its Reflected shape.

## Deform Tools




Hotkey: **L**
The Deform Tools pop-up menu contains the Deform Tool and the Jiggle Deform Tool. These tools create a modifiable 3D box or lattice, called a Deform Object, to control the deformation of objects. An object can either be permanently changed, or it can change over time as it passes through the Deform Object.

**Deform Tool** - Deform Objects are three-dimensional objects used to deform other objects in your model. By manipulating points on the Deform Object, you can change the shape of objects within it. These Deform Objects are construction geometry only, which means they are used to help you create other objects in your model. They are visible only in the Modeling window, and are never visible in rendered images.

**To use the Deform Tool**, choose the object you want to Deform. Next create the Deform Object by selecting the Deform Tool and then clicking an object you want to Deform. You can also create a Deform Object independently and then use the Attach Tool to associate it to the object you want to Deform.

You can set the number of control points on the Deform Object by double-clicking on the tool icon to summon the Tool Settings dialog.

Once you have created a Deform Object, you will need to Edit it before it will have any effect. Select the Deform Object you want to edit, then select the Edit Object command from the Modeling menu or by using the Edit button at the top of the Tool palette. You can also double-click on the Deform Object to Edit it in a new window.

When you Edit a Deform Object, the Tool palette changes to include only tools that are appropriate to working with Deform Objects.

Additional controls are available in the Object panel of the Object Properties palette.

**Jiggle Deform Tool** - The Jiggle Deform Tool also deforms objects, and is most useful for animations. With the Jiggle Deform Tool, the user sets the initial position of the points, then lets it do its thing throughout the animation, following the laws of physics and the time-varying controls.

For information about creating an animation see **Chapter 15 - Adding Animation.**

This tool has many possibilities. Using a Jiggle Object, you can deform an object at time zero (see the Animation section). The entire object then rebounds repeatedly as it tries to return to its original shape, creating a motion that resembles a bowl of jelly. Jiggle can also be used to give an object a subtle, life-like jiggle. Jiggle Objects can be attached to objects, or you can pass an object through a free-standing Jiggle Object.

**To use the Jiggle Deform Tool**, first choose the object you want to Jiggle. Next create a Jiggle Object by selecting the tool and then clicking on your object. This creates the Jiggle Object directly on the object with the appropriate dimensions.

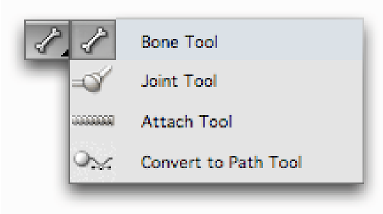
You can also click and drag to create a free-standing Jiggle Object. In this case, don't forget to use the Attach Tool to associate it with the geometry you want to Jiggle.

You can set the number of control points on the Jiggle Object by double-clicking on the tool icon to summon the Tool Settings dialog.

For Jiggle to have any effect, you must alter the Jiggle Object. This is done in Edit mode. To access Edit Object, use the Modeling menu command or click on the Edit icon on the Tool palette. The Tool palette will change to show only the tools available for Editing Jiggle Objects.

Additional controls are available in the Object panel of the Object Properties palette.

## Joint and Bone Tools




Hotkey: **J**
This pop-up tool menu includes the Bone Tool, the Joint Tool, the Attach Tool and the Convert to Path Tool.

**Bone Tool -** The Bone Tool is used to create the initial skeleton for an IK (inverse kinematics) structure. IK allows you to create complex structures that can then be animated to simulate realistic motion. With this feature you create a series of connected "bones" to form a hierarchical skeleton. This skeleton can then be used to manipulate, pose and animate an attached polygon mesh.

**To use the Bone Tool**, first select it from the Tool palette. Next, click on the position where you want the first bone to begin (the start point), and drag to where you want the bone to end (the end point), then release the mouse button. This defines the position of the "Root" bone. The start point of any bone is its rotation point.

To add a bone to the end point of the previous bone, click anywhere on the previous bone and drag. The new bone will begin at the end point of its "parent" bone.

Though the process of creating a skeleton is started using the Bone Tool, the majority of constructing and rigging a skeleton will be done using the **Object Properties** palette and the **Skeleton Edit mode** of the main Tool palette.

**Joint Tool -** The Joint Tool establishes a link or connection between two objects, primarily during animation sequences. The Joint Tool creates a hierarchy of a parent object and one or more child objects. The "children" can inherit characteristics of the parent object: scale, offset, rotation and movement.

**To use the Joint Tool**, click on the first object (the child) and drag to the second object (the parent). When both objects have highlighted, release the mouse to complete the Joint connection. Once the Joint is created, a line connecting the parent and child appears in the Modeling window.

The order of selection is very important. When you move a parent object, the child object also moves. However, you can move the child object without affecting the parent object. All child objects appear beneath the parent object in the hierarchical structure in the Project window. An object can only be joined to one parent.

You can change the default settings by double-clicking the Joint Tool icon. The Tool Settings dialog opens.
• **Scale**: If this box is checked, joints created with the tool will cause all child objects to scale together with the parent when the parent object is scaled.
• **Offset**: Check this box if you want the child to inherit the distance that the parent's object origin point is offset from its geometric center.
• **Rotate**: When a parent object is rotated, all child objects joined to that parent will rotate around the parent object's origin point if this box is checked.
• **Move**: When a parent object is moved, all child objects joined to that parent will move with it.

When none of the boxes are checked, moving, rotating, or scaling the parent object has no effect on the child. However, if the parent object is deleted, all child objects joined to the parent will also be deleted.

**Break Joint Tool -** Use the Break Joint Tool to undo connections made with the Joint Tool. The **Break Joint Tool** is accessed by selecting the Joint Tool while holding down the **Option/Alt** key.

**To use the Break Joint Tool**, select one object and then drag to the one it is joined to. The order of selection does not matter. You can break the joint to multiple objects by continuing to select objects with the Break Joint Tool.

**Attach Tool -** The Attach Tool is used to associate existing geometry with a Deform Object or a Jiggle Deform Object.

Select the Attach Tool, then click-and-drag from the Deform Object to the object you want to deform. You will notice that both the Deform Object and the object you are deforming will highlight in red boxes as you click on them.

Always select the Deform Object first, then the object. You can associate any number of objects, groups, or shapes to a single Deform Object. If you change your mind, you can use the Detach Tool to remove the association between the Deform Object and object it affects.

A Deform Object only affects associated geometry. Any unattached geometry is not affected by it, even if it comes in contact with the Deform Object.

**Detach Tool** - Use the Detach Tool to remove an existing association between two objects. The Detach Tool is accessed by holding down **Option/Alt** while you click on the Attach Tool.

Select the Detach Tool, then select the object. When the Deform Object highlights, drag the cursor to the object you want to disassociate from the Deform Object. The object will also highlight, indicating that it is no longer associated. When using the Detach Tool, always select the Deform Object first, then the object. Once the object is no longer associated with a Deform Object, that Deform Object has no affect on the object.

**Convert to Path Tool -** This tool converts any 2D object into an animation path which can be used for any other object in your model. The resulting animation path is a Bézier Curve type path, but you can change it to another path type on the Transform panel of the Object Properties palette, or in the Project window under the object's Position line.

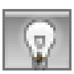
Select the Convert to Path Tool from the Tool palette, then select the object that you want to animate. When the object highlights, drag the cursor to the 2D line that you want to convert into an animation path. The path also highlights, indicating the selection is complete.

When you release the mouse button, the 2D object changes into a path for the first object you selected. If the Remove Curve checkbox is checked in the Tool Setting dialog, the 2D path object is removed from your model. If this box is unchecked, the 2D object converts to a path for the specified object, but it also remains as a 2D object in your model.

**NOTE:** When you convert a 2D object into a path, you move the object TO the path; therefore, you may want to position the path so that its beginning point is where you want the object to begin its travel before you convert the 2D object into a path.

You can change the default behavior of the Convert to Path Tool through the Tool Settings dialog. Double-click the tool icon to open the dialog. The options presented include the ability to Remove or Append a path, or set the timing of the path.

## Point Light Tool



Hotkey: **Q**
Point lights are local light sources that send illumination outward in all directions, much like a light bulb. Point lights can also cast shadows,

contain Gels and FX, and even have a negative intensity to “remove” light from a region.

**To insert a Point Light**, select the Point Light Tool and click in the Modeling window. A Point Light marker (in the shape of a light bulb) is placed on the active grid at the position the cursor is clicked. Light markers appear in the Modeling windows for reference, but they don’t show in the rendered image.

When you release the mouse button, a Point Light will be created at that location, and a small red circle appears around it to indicate the default radius of its Full Intensity. The circle remains facing your active view because it actually represents a sphere of Intensity. The four handles around this circle allow you to interactively resize the Full Intensity region when they are visible. The handles become visible when you select the Point Light.

Most of the controls for Point Lights are located in the Object panel of the Object Properties palette. Point Lights also have tool settings which can be accessed by double-clicking the tool's icon.

## Spotlight Tool

Hotkey: **W**
Spotlights work as you would expect - they project a cone of light that illuminates a specific area of your model.

**To insert a Spotlight into your model**, select the tool and then click in the Modeling window. A Spotlight is created at that location with a red line projecting from it to indicate the direction of the light. Two red circles represent the Full Intensity and Total Falloff Distances. The line passes through a small black “target” with red circles around it, which indicates the default Look At point.

The Look At point can be dragged to “aim” the Spotlight at an object, while the four handles around the circles allow you to interactively resize the Cone Angle (or Spread) and Penumbra regions when they are visible.

Most of the controls for Spotlights are located in the Object panel of the Object Properties palette. Spotlights also have tool settings which can be accessed by double-clicking the tool's icon.

For more information about using Spotlights see **Chapter 14 - Lighting the Scene**.

## Camera Object Tool

Hotkey: **V**
The Camera Object Tool is used to insert Camera objects into your model.
You can use a Camera object just like a real camera - to set up the perfect angle and position to best render or animate a model or scene.

**To add a Camera to a model**, click in the Modeling window. A camera marker is placed on the active grid and is initially aimed in a direction parallel to the grid. Camera markers are visible in modeling views, but they don't appear in renderings.

You can also clone an existing Modeling window view by using the New Camera from View command in the Modeling window's Plus menu.

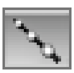
The direction the camera is aimed and its initial viewing angle are indicated by the rectangular cone projecting from the marker. You can grab and drag the Camera to point at a particular object.

Each camera has its own Camera window. To view the model through the Camera window, double-click on the camera object's icon in the Modeling window, or select the camera object by name from the Camera Window pop-up menu in the Windows menu.

The Camera controls are located in the Object panel of the Object Properties palette. Cameras also have Tool settings, which you can access by double-clicking on the Camera Tool icon.

For more information see **Chapter 13 - Using Cameras**.

## Guide Tool



Hotkey: **Shift - ;** (semicolon)
Use the Guide Tool to create a one-dimensional guide line to help you position objects in the main Modeling window or edit objects in **Object Edit mode**.

Any object or element you move while a guide is active will be constrained by the guide. This includes moving, scaling and rotating objects in the main Modeling window, and manipulating faces, edges and points while in Edit mode.

**To create a guide**, select the Guide Tool, then click on an object's surface, edge, or vertex (point). The orientation of the guide depends on where you click the mouse. The second and third clicks with the Guide Tool can be used to determine a guide's axis and origin, which affect movement around the guide. A guide's name, axis, origin, and length can also be controlled in the Project window. For more information about creating custom guides see **Chapter 4 - Advanced Modeling**.

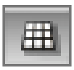
Once you create a guide, it remains visible even after you select another tool. You can toggle the guide on or off by pressing the "**;**" (semicolon) key. When the guide is visible, it becomes the constraining element of operations.

Guides are marked at specific intervals which appear in the same units or increments as grids. Grid and guide units and subdivisions can be changed by selecting **Set Units** from the Edit menu.

Once you draw a new guide, it becomes the current (active) guide, and is shown with a check mark by its name in the Current Guide submenu of the Windows menu. You can change the active guide in this menu. Only one guide can be active at a time.

**To delete a guide** -select the Guide Tool and then hit the **Delete** key.

## Grid Tool



Hotkey: **Shift - '** (apostrophe)

You can use the Grid Tool to create custom grids. This tool allows you to put a grid in exactly the position and orientation you need to accurately create or manipulate objects in your model. User-defined custom grids appear orange, and only one can be visible at any given time, although up to 99 can be defined in a single scene.

**To use the Grid Tool,** select the tool, then click on the desired surface, edge or point (vertex). Drag outward to define the size of the new grid. You can use the grid's handle to rotate it in 3D space.

You can also click again to more precisely define the grid. The second and third clicks determine the normal and origin of the grid. For more information about creating and using custom grids see **Chapter 4 - Advanced Modeling**.

Like all grids in Design 3D, custom grids are infinite in size, but you can resize the visible portion of the grid. You can also rotate, tilt, or move User-defined grids. Using the Project window, you can set various attributes of custom grids. You can specify the name and color, and set the location, orientation and other parameters.

Only one custom grid can be active at a time. You can select the active grid in the Active Grid submenu of the Edit menu.

You can cycle forward or backward through just the User-defined grids by using the **Option** or **Alt** key with the plus (**+**) or minus (**-**) keys. To cycle through both the User-defined grids AND World grids, use only the plus (+) or minus (-) keys (without the Option or Alt key).

For more information about using grids see **Chapter 3 - Modeling Basics**.

## View Move Tool

Hotkey: **Shift - 1**
The View Move Tool lets you pan the view from side to side or up and down in the window. Only the view moves, not the objects themselves. Each view can be moved independently, but all views remain linked to the View Set Center at all times.

In addition to clicking on the tool icon or using the hotkey, the View Move Tool can be temporarily be selected at any time by holding down the **Space Bar**. Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of adjusting the view while working.

## View Rotate Tool

Hotkey: **Shift - 2**
The View Rotate Tool rotates the view around the View Set Center. Only the view rotates around the center point; the objects are not affected in any way. Any view can be rotated independently, but it always remains linked to the View Set Center.

In addition to clicking on the tool icon or using the hotkey, the View Rotate Tool also can temporarily be selected at any time by holding down the **Shift and Space Bar**. Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of rotating the view while working.

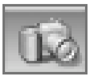
## View Zoom Tool

Hotkey: **Shift - 3**
The View Zoom Tool is used to zoom in (or magnify) or zoom out (reduce the size) of the scene in a particular view. The magnification method can be adjusted to control how much of the model is visible at one time.

The View Zoom Tool also can temporarily be selected at any time by holding down the **Command-Space Bar** (Mac) or **Control-Space Bar** (Win). Once the Space Bar is released the tool will return to the previously active tool, making this a very fast way of rotating the view while working.

Zoom **out** by adding **Option** (Mac) or **Alt** (Win) key, either with the View Zoom Tool selected, or while using Command/Ctrl-Space Bar to temporarily select the tool.

## Rendering Tool



You can use the Rendering Tool to render an image. A rendering can be made from many different windows: the Modeling window, a Camera or Spotlight window, or even started from the Project window.

You can start a rendering with the Rendering Tool in one of two ways:
• **Single click:** The entire window renders.
• **Cursor drag:** The size and proportion of the rendering is determined by the marquee drawn with the cursor.

Modifier keys that apply to initiating renderings with the Rendering Tool:
**Shift** - opens the Render Image dialog box. Without the Shift key, clicking or dragging the Rendering Tool immediately begins a rendering.

You can double-click on the Render Tool or use the Render Image command (hotkey: Command/Ctrl-R) from the Rendering menu to open up the Render Image dialog. This allows you to specify the complete set of rendering parameters, including image size, image quality, resolution, and animation frames, if applicable, before the rendering starts.

The pop-up **Preset menu** just below the Rendering Tool icon allows you to select the renderer and level of detail you want to use. These "presets" allow you to quickly switch from one rendering style to another, at varying quality levels, and even select special options for your renderings.

For more information about rendering your scene see **Chapters 17 - 20**.

*Chapter 3*

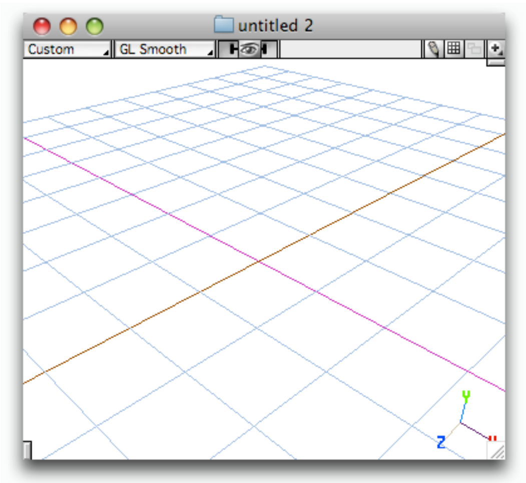
# Modeling Basics

Strata Design 3D CX has many tools and techniques to help you build your models. This section describes the basics of modeling - working with grids and the 3D modeling space, and creating and manipulating simple 2D, 3D and Text objects.

## Working with Grids

Building objects and constructing models in a 3D modeling program can take some getting used to because all of the work takes place in a "virtual workshop" inside the Modeling window of your scene. For objects to have dimension and spatial relationships with each other, the "Cartesian coordinate system" is used in almost all 3D computer modeling environments.

This coordinate system is based on the idea that there are three axes, labeled **X, Y,** and **Z**, which extend in the three dimensions we are used to in the physical world. There are consistent divisions along the axes with both positive and negative values. The key to navigating this system is to remember that there is a single "reference point" for all three axes. This is the center of the 3D world, at which each axis has a value of zero.




When you first create a new document in Design 3D, the visible grid you see will have two darker, intersecting lines in its center. This is the "zero point" for all three axes, with the grid itself laying along the zero point for one axis. This grid is named for the axis which is perpendicular to it.

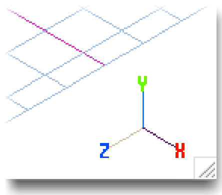
Grids allow you to accurately create and position the objects in your model. Design 3D has three different types of grids to use in your modeling: World grids, User-defined (custom) grids, and View grids. Each one provides a special purpose. It is essential to become familiar with how they work.

**NOTE:** All modeling takes place on the **active grid only.** However, you can change grids at any time, even in the middle of drawing or inserting an object in your model. Only one grid can be active in a view at a time, and the other, inactive grids are dimmed or hidden.

If you want to work on your model without any visible grids you can choose the **Hide Grids** command from the **Edit** menu. You might want to hide grids to get a clear view of your model, or if you prefer a "sheet of paper" approach to modeling. When Hide Grids is enabled, the View grid becomes the active grid, even though it is hidden. When all the grids are hidden, a check appears beside the Hide Grids command in the Edit menu.

## Tridents

Tridents provide a visual indication of the orientation of grids and objects in your model. You can display world tridents and/or object tridents by enabling these options on the **Windows panel** of the **Preferences** dialog.




Tridents make it much easier to keep track of an object's orientation in the Modeling window. This option is especially useful when using the Transform panel of the Object Properties palette to move, scale, or rotate objects. It is also much easier to change grids because you only need to glance at the world tridents in the lower right corner of the window to determine which grid you want to switch to.

## World Grids

There are three World grids to use for modeling in 3D space. Each is displayed in a different color; the **Y grid lines** are **blue**, the **Z grid lines** are **tan**, and the **X grid lines** are **purple**.

The **Y grid** is the flat, tabletop grid that most modeling typically gets done on. The **Z grid** is the grid that is parallel to the front view and the **X grid** is parallel to the side views.

World grids are displayed at a specific size, but they are actually infinite in size. The **Set Units** command in the **Edit** menu determines the units and subdivisions used for World grids.

You can resize World grids according to your modeling needs. To resize a World grid, select the Grid Tool from the Tool palette. You can increase or decrease the visible portion of the World grids, but they can't be rotated or moved.

To resize a World grid, grab a side handle and drag to resize it. You can only size the visible portion of the grid; it is actually infinite in size.

**NOTE:** With the Grid Tool selected, clicking on an object in your model instead of the grid's handle will create a custom grid. For more information about creating custom grids see the next section, **User-defined Grids**, and **Chapter 4 - Advanced Modeling.**

## Switching Grids

The following hotkeys are provided for selecting any of the three World grids:
**X** key selects the grid perpendicular to the X axis.
**Y** key selects the grid perpendicular to the Y axis.
**Z** key selects the grid perpendicular to the Z axis.

In addition to the X, Y, and Z hotkeys, you can also use the **plus** (**+**) or **minus** (**-**) keys to cycle forward or backward through all World and User-defined grids.

**NOTE**: Remember that ALL modeling occurs on the active grid. Therefore, if the active grid appears edge-on, or nearly edge-on, you may want to switch to a different grid. The feedback area in the center of the Button Bar provides a warning when you're modeling in an edge-on orientation to the active grid.

Also, be cautious when moving objects in a NEARLY edge-on orientation to the active grid. When moving objects in this orientation, what appears to be a very short distance may actually be an extremely long distance: 100 feet, for example, when it only appears you're moving inches. You may want to change the view orientation before moving objects to achieve more predictable results.

### Automatically Switching Grids

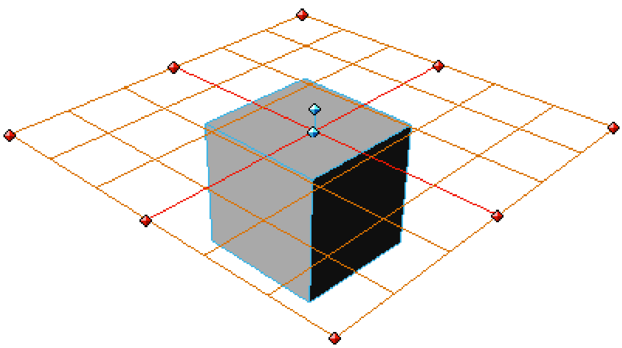
When the Auto Grid option (found in the Preferences dialog) is enabled, any time you switch views, the face-on grid automatically becomes the active grid. This option is **off** by default. Using this option greatly reduces the possibility of accidentally modeling edge-on to the active grid.

## User-defined Grids

You can create your own grids with the **Grid Tool**. User-defined (custom) grids allow you to put a grid in the position and orientation you need to accurately create your model. User-defined grids appear orange, and only one can be visible at any given time, although up to 99 can be defined in a single scene.

Like all grids in Design 3D, custom grids are infinite in size, but you can resize the visible portion of the grid. You can also rotate, tilt, or move User-defined grids.

You can cycle forward or backward through just the User-defined grids by using the **Option** or **Alt** key with the plus (**+**) or minus (**-**) keys. To cycle through both the User-defined grids AND World grids, use only the plus (+) or minus (-) keys (without the Option or Alt key).



Once you draw a new grid, it becomes the **Active Grid**. Only one grid can be active at a time. The Active Grid is indicated by a check mark in the Active Grid submenu, located in the Edit menu.

With the Grid Tool selected, and the new grid active, you can name the grid and select its color in the Project window. If the new grid is not named, it will be replaced the next time you draw a custom grid. In the Project window, you can also define other properties of a custom grid: its Origin, Normal, Width, Height, etc.

To **delete** a User-defined grid, cycle to the grid you want to delete using the plus (+) or minus (-) keys and, with the Grid Tool selected, press the **Delete** key.

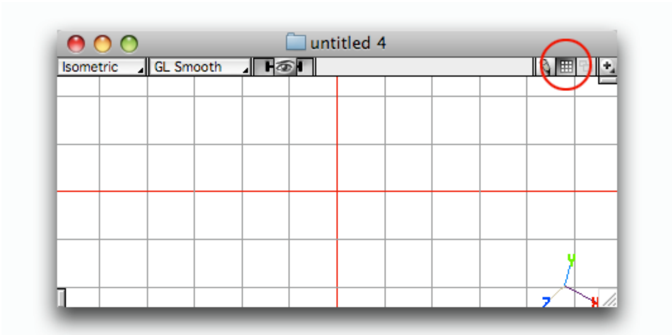
**Drawing a Custom Grid**
User-defined grids can be drawn on an object's surface, edge, or vertex (point). There are several ways to create a new grid. Clicking once on an object creates a new grid that lies along the surface of the object. Clicking more than once allows you to set a grid's normal and origin. When you are finished defining the grid, hit the Return key or select another tool.

For more information about creating custom grids, see **Using Custom Grids and Guides** in **Chapter 4 - Advanced Modeling**.

## View Grids

Unlike other grids in Design 3D, these grids are view-relative, so they track when you move in the window. View grids fill the entire modeling view and they cannot be resized, moved or rotated in any way. Imagine they are a grid that is linked to the camera you are using to see the scene. They appear gray in color.

Each view in the Modeling window contains a View Grid button in the upper right. Clicking the button inserts a grid in the active view, and clicking the button a second time returns to the grid that was last active.



When you select the Hide Grids command from the Edit menu, the View grid becomes the active grid, even though this grid is also hidden. Remember all modeling is done relative to the active grid.

### Snap to Grid

Snapping to Grids is the most common use for grids, besides relative reference for size and location. This option is very useful for precisely positioning objects in the scene, but it also can be applied to creating and moving objects in the Modeling window, and the vertices of a Polygon mesh in Edit mode. The Snap to Grid command, when activated, applies to any active, visible grid in your model. If a grid is hidden or inactive, the Snap will not apply to that grid.

The Edit menu provides several commands and submenus to assist you in managing grids. These include Snap to Grid, Active Grid, Visible Grids, and Set Units (for grid spacing).

Using the **Visible Grids** submenu, you can set one or more grids to remain visible at all times. A grid you designate as visible will be desaturated, or dim, but still visible even when it is not the active grid.

## Manipulating Objects

The Object Manipulation tools are located in the top of the Tool palette. Use these three tools to select and transform objects in your scene. The transformations possible are Move, Rotate, and Scale. Each one of these tools can also select or deselect objects without manipulating them at all. The Move Tool pop-up includes the Snap-To Tool.

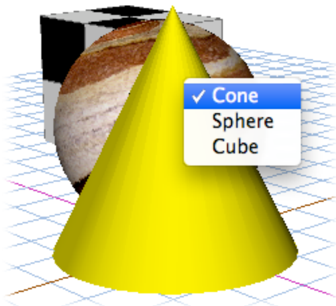
### Selecting Objects

You can select an object with any of the object manipulation tools (Move, Rotate and Scale). Simply use the tool to click on the surface of the object. There are also commands in the Selection menu to control what is selected or deselected, and even change the way that Design 3D selects objects.

Select multiple objects in your scene with these methods:
• Hold down the **Shift** key while clicking on additional objects. If an object is already selected, that object becomes deselected without affecting any of the other objects. If you click on overlapping objects, only the object in front is selected. You can also use a view from another direction to access hidden objects.
• **Click-and-drag** a selection **marquee** around the item or items to select them. Normally, an item is selected only when completely enclosed within the mar-

quee. However, by holding down the **Command** key (Mac) or the **Control** key (Win), all items touched by the selection marquee are also selected.
• Choose the **Select All** command from the Selection menu, or press the hot-key combination of **Control-A** (Win) or **Command-A** (Mac).

**Context Menu Selection**
If you have many objects in your scene that are very close together or overlapping, click and hold with the **Right Mouse Button** or **Control-click** to pop up a context menu beneath your mouse cursor that includes all of the objects that reside along the depth axis wherever you click. While the mouse button is still held down you can scroll and select an object from the list to select it.

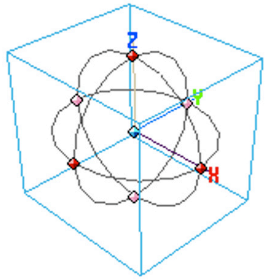



A check-mark appears beside the name of objects that are currently selected. If you hold down the Shift key you can select multiple items from the list. If you select an item from the list that is already selected, it becomes deselected.

Modifier Keys
Modifier keys for selecting objects with the Object Move, Rotate, or Scale tools:
**Shift** = add/ remove objects to the current selection.
**Command** (Mac) **Control** (Win) = select all objects a marquee-select touches.
**Control** (Mac) or **RMB** right mouse (Mac/Win) = pop-up context menu for all overlapping objects.

**Selection Handles**
Once an object is selected it will be surrounded by a bounding box - a box of light blue lines that represents the approximate bounds of the object. When one of the Manipulation tools is selected, red “handles” will appear around the bounding box in different configurations to aid in precise manipulation of the object. Selecting these handles will not deselect the object, and manipulations can still be made by clicking directly on the object.

Handles on the front surfaces of the bounding box are darker red. Handles that are on faces that are away from you (on the back sides of the bounding box) appear as a dimmed, light red color. (You will be unable to see the back-facing handles unless you are using the OpenGL PointCloud, Outline or Wireframe display methods.)

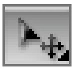



## Double-clicking on a Shape, Group or Object

Double-clicking an object will open that object in its own, new window. If the object is a group, the group opens in its own window. If the object is a shape instance, its shape window opens. If the shape contains other shape instances, double-clicking on a shape within a shape window opens that shape in its own window, and so on.

If you double-click on an object that can be Edited it will open in its own window and the Tool palette will change to the appropriate Edit mode. If the object cannot be Edited in its current form, the Convert dialog will open giving you the option to convert the object to a form that can be edited.

## Move Tool



Hotkey: **1**

The Move Tool moves selected objects in the active view. This tool also functions as a pointer or selection tool with the added feature that clicking and dragging will move your object freely along the active grid.

When the Move Tool is selected, handles appear at the center of each face of the selected object's bounding box. When the view orientation is set to Front, the face handles may appear to lie on the edges - however, if you change the view plane slightly, the location of the handles becomes apparent. These Move selection handles will only drag the object along the axis of the object that the handle lies upon. If more than one object is selected, multiple bounding boxes appear and the objects move in unison.

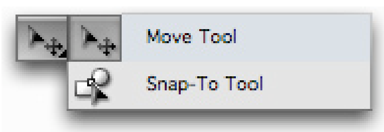
To move the object freely, just click on the object's surface and drag. Using this method, the object can be moved anywhere parallel to the active grid. You can easily change grids by pressing the X, Y or Z key, or by pressing the Plus (+) or Minus (-) keys to cycle through all of the World and User-defined grids in the active model.

The Move Tool can also be used to move camera objects and light sources; however, these objects do not have handles. Just grab the camera or light icon (not its target) to move it, using the same modifier keys as with other objects.

Move Tool Modifier keys:
**Shift** = constrains the motion of the selected object to 45 degree increments on the active grid or on a plane parallel to the active grid.
**Command** (Mac), **Control** (Win) = moves the object Origin point without moving the object itself; or, if you grab the object rather than the origin point, moves the object, but not the origin point. The Origin point is where animation, scale and rotation are centered.
**Option** (Mac), **Alt** (Win) = leaves a copy of the object being moved, including all its associated data (texture, animation, etc.) in its original position.
**Command-Shift** (Mac), **Control-Shift** (Win) = moves the object perpendicular to the active grid when using the free move method (grabbing the object anywhere on the surface, other than on a handle).

## Snap-To Tool

Snap-To is a very handy tool that allows you to select two points on two different objects, and then snap them together. **Snap-To** is located in the Move Tools pop-up menu on the Tool palette.




You can use Snap-To to position and align objects quickly and easily. And you can constrain an object's movement along the grid or perpendicular to the grid. You can snap corner points, edge points or surface points. Snap-To pulls one point of an object to the selected point on another object, allowing you to easily position objects in relation to each other.

**Stretch** is another great option for Snap-To. It stretches the actual geometry of the selected point on one object to the selected point on another object. Stretch works only on objects that allow stretching - those with points, such as Bézier and Polygon mesh; and on Bézier lines or regions. A point on a mesh object can be stretched to a point on an object that is not a mesh, but not vice versa.

#### Snap-To Tool Settings

Summon the Snap-To Tool settings dialog by first selecting the Snap-To Tool icon, and then double-clicking on it. The following options define exactly how the Snap-To Tool functions each time it is invoked. These settings also can change it from a Snap-To to a Stretch tool.

•**Snap or Stretch:** Select either Snap-To or Stretch using the radio buttons at the top of the dialog.
•**Constrain:** There are three ways to constrain the Snap-To or Stretch movement.
- Perpendicular to the grid. "Up" or "down."
- Along the grid. Side to side.
- No constraint. Free movement in any direction.

•**Snap On The:** There are two filters for snapping point selection.
- Edges: lets you select Snap points from the edges of objects.
- Surfaces: lets you select Snap points from the surfaces of objects.

#### Using Snap-To and Stretch

Snap-To and Stretch work by selecting two points on two different objects. When you select the Snap-To Tool, the mouse cursor becomes a locator for the Snap points by clicking-and-dragging. The first place you click on an object in the scene will be the starting point for the slave surface or curve (the one that moves or stretches). By holding down the mouse button after this initial click, you can slide the cursor to the target surface or curve. When you release the mouse button the two locations will meet in 3D space (with the first moving or stretching, and the second remaining stationary).

## Rotate Tool

Hotkey: **2**

The Rotate Tool rotates objects in the active view. When you select the Rotate Tool, the cursor changes its appearance and you can freely select items with the Rotate Tool ready to rotate them as soon as you click-and-drag on the object or one of the Rotate selection handles.

When you select an object using the Rotate Tool, handles appear at the center of each edge of the bounding box. Objects can be rotated using two methods: by click-and-dragging directly on the surface of the object (free rotate), or; by using one of the edge handles. By using the handles you have additional constraints and control not otherwise available when free rotating.

Using the edge handle constrains the rotation around the axis parallel to that edge. You can rotate the object on all three axes. You can free rotate by clicking anywhere on the surface of the object and dragging. The object rotates around the object's origin point in an unconstrained manner. Rotation can be in any direction. If multiple objects are selected, each object rotates around its own origin point.

The location of the origin point determines the object's axis of rotation. The object origin point is the blue diamond that appears along with the selection handles. Normally, this point is at the geometric center of the object, but you can move it, if needed. If multiple objects are selected, each object rotates around its own origin point.

You can also use a custom grid or guide to set the axis of rotation. See **Chapter 4 - Advanced Modeling** for more information.

**NOTE:** If you're rotating an object over time (animating), it is important that each rotation be in increments of less than 180 degrees. If you rotate more than this amount, Design 3D will rotate the object using the shortest path, and you may get unexpected results.

Rotate Tool Modifier keys:
**Shift** = constrains the rotation to 45˚ increments. The Shift key constrains only when rotating objects by dragging the handles. When rotating by grabbing the surface of the object, the Shift key does not constrain the motion.
**Command** (Mac), **Control** (Win) = moves the object Origin point without moving the object itself; or, if you grab the object rather than the origin point, moves the object, but not the origin point. The Origin point is where animation, scale and rotation are centered.
**Option** (Mac), **Alt** (Win) = leaves a copy of the object being rotated, including all its associated data (texture, animation, etc.) in its original position.

## Scale Tool

Hotkey: **3**

The Scale Tool is used to resize or stretch objects. You can also use this tool to select objects. When you select the Scale Tool, the cursor changes its appearance and you can freely select items with the Scale Tool ready to scale them on all axes as soon as you click-and-drag on the object, or on each axis by using one of the Scale selection handles.

Scaling an object allows you to enlarge or reduce it in a single dimension (height, width, or depth), or in all three dimensions at once. Objects are scaled to the amount and in the direction the cursor is dragged once you click on the object with the tool.

When you select an object, handles appear on each face, and in each corner of the object's bounding box. The face handles constrain the scale in the direction of the face. Each handle can be pushed or pulled along one axis only. If a handle is pushed beyond the handle on the opposite side, the object inverts and continues to scale.

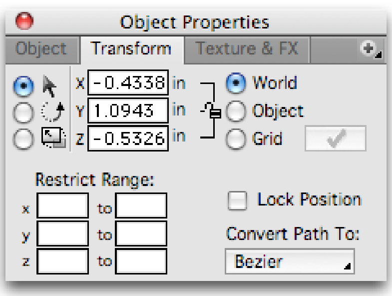
Corner handles scale the object in three dimensions. The handle opposite to the corner handle you're dragging stays put while you scale the object. As with using the face handles, if a corner handle is pushed through and past the opposite side, the object inverts and continues to scale.

You can free scale the object by clicking and dragging anywhere on the object's surface. In this case, the object scales proportionally in all three directions.

Scale Tool Modifier keys:
**Shift** = when scaling with selection handles, maintains the proportions of the object while enlarging or reducing its size. The object scales on all three axes.
**Option** (Mac)**, Alt** (Win) = scales an object about its geometric center.
**Option-Shift** (Mac), **Alt-Shift** (Win) = scales an object proportionally from the object's geometric center, regardless of which handle you may be using.

## Transforming with Object Properties

The **Transform panel** of the **Object Properties** palette allows you to easily and accurately position and size objects in your model. You can move, rotate and scale a selected object by using the controls in this panel.



These controls allow you to manipulate the object by entering numbers instead of clicking and dragging. You can also set constraints for the transformations, lock the settings altogether, and alter the type of animation path the object can use.
When working in the modes World or Grid (for position and rotation) or Size (for scale) you can enter a value into a field and press the **Tab** key to commit the change and advance to the next field. However, the modes Object (for position and rotation) and Percentage (for scale) are relative to the object itself. Therefore you must enter the data in each field and then press the **Apply** button (the check-mark button) or the **Enter/Return** key on your keyboard to commit the data.

To maintain the object's relative settings click on the **Lock icon** to the right of the X, Y and Z fields (not to be confused with the Lock Position checkbox in the lower right of the palette). When the Lock icon is in its "locked" position and you enter a value in one field, the other fields update with the same number for move and rotate. When locked in Scale mode the fields maintain the object's relative scale. Each time you click the Lock icon, it toggles between its locked and unlocked status.

**Move**
When the Move radio button is selected, the X, Y, and Z coordinates for the selected object appear in the appropriate fields. The Move radio button has the move cross-arrow icon to its right. You can change the position of the object on any or all axes. You can also specify the coordinates you want the move to be relative to.

You can move the selected object relative to the World, the Object itself, or the active Grid. When moving relative to the Object's coordinates, remember that an object is always at 0,0,0 relative to its own coordinates - wherever it is, that's the center of its own world. Each time you move the object using Object coordinates the move is relative to its position. The fields always return to 0,0,0 after each move.

**Rotate**
When the Rotate radio button is selected, you can rotate the selected object on any axis. The Rotate radio button has the rotate-arrow icon to its right. Enter the number of degrees in the appropriate fields. You can rotate the object relative to the World's X, Y and Z axis, the Object's axis or the active Grid.

Rotation always centers around the object's origin point, regardless of which coordinate system you use. When you use Object coordinates the object always rotates relative to its current orientation. Make a change and, as soon as the object rotates, the coordinates revert back to 0,0,0 immediately.

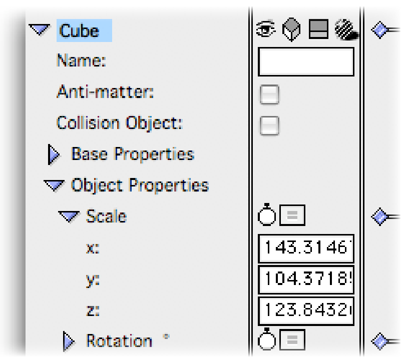
**IMPORTANT:** If you're rotating an object over time, it is important that each rotation be in increments of less than 180 degrees. If you rotate more than this amount, Design 3D will rotate the object using the shortest path, and the object may not rotate in the direction you intended.

**Scale**

When you select the Scale radio button, you can scale the selected object on any axis. You can also choose to scale the object by Percentage or by Size in the Scale by field. To scale the object proportionally, click the Lock icon. When the Lock icon is in its "locked" position and you enter a value in one field, the other fields update to maintain the object's proportions.

## Transforming with the Project Window

You can edit any of the Object Properties of an object from the Project window. These include items such as: Scale, Rotation, Position, Offset, Link nodes, Cycle attributes, Complexity, etc.




To edit the transformations of an object from the Project window, first turn down the arrow icon to the left of the name of the object in the Project window. Next, turn down the arrow to the left of Object Properties entry. You will see the available transformations here. If any of the settings haven't been changed then no field may be present for that transformation.

## Nudging Objects

You can nudge objects (move them a little at a time) with the **arrow** keys on your keyboard. The distance nudged is determined by the nudge subdivisions indicated in the **Set Units** dialog from the **Edit** menu.

Nudge works with any of the selection tools (Object Move, Rotate, or Scale tools), and many of the Editing tools as well. All nudge operations are relative to the active grid. The arrow keys nudge the selected object along the grid in the direction indicated by the arrow.

**NOTE:** Models do not save the units in which they were constructed. If you change the default units, and then open a model that uses another scale, the current units and scale are adopted by the opened model.

Nudge Modifier keys:
**Shift** = when used with the arrow keys, this nudges the object in larger increments, equal to 10 nudge units at a time.
**Option** (Mac) or **Alt** (Win) = when used with the arrow keys, this nudges the object in smaller increments, equal to 1/10 nudge units at a time.
**Command-Shift** (Mac), **Control-Shift** (Win) = when used with the arrow keys, this nudges the active objects perpendicular to the active axis.

## The Selection Menu

The Selection menu commands help you handle complex models and control how objects are selected. You can hide/show objects in your model to make it easier to work with other objects. You can designate Construction objects, to hold a place, anchor a fountain effect, or to use as a target for a camera. You can also hide or show your animation paths, deselect all objects, or select them all.

Common Selection Hotkeys:
- **Select All:** Select all objects in the scene that are not Hidden or Shy
  **Command-A** (Mac), **Control-A** (Win)
- **Select None:** Deselect all objects
  **Command-1** (Mac), **Control-1** (Win)
- **Hide Selected:** Turn off the visibility of all selected objects
  **Command-3** (Mac), **Control-3** (Win)
- **Show Hidden:** Turn on the visibility of all objects in the scene
  **Command-4** (Mac), **Control-4** (Win)

## Editing Objects

Once you've drawn or imported an object into Design 3D you can change its shape by using **Edit Object**. You can edit polygon objects, Bézier surfaces and some specialty objects with the Edit Object command. If the object you select cannot be edited, the command is dimmed. Some object types need to be converted to another type of geometry before they can be Edited.

You can begin an Edit session in several different ways:
• By double-clicking on an editable object.
• By pressing the hotkeys: **Command-L** (Mac) or **Control-L** (Win).
• By selecting the object and then choosing the **Edit Object** command found in the Modeling menu.
• By pressing the **Edit** button at the top of the main Tool palette.
• By selecting the **Edit Object** command from the **Plus menu** of the Object Properties palette for the selected object.

You can end an Edit Object session in these ways:
• By closing the Edit window.
• By pressing the hotkeys: **Command-E** (Mac) or **Control-E** (Win).
• By toggling the **Edit** button at the top of the Tool palette.
• By selecting the **End Edit** command from the Modeling menu.

### Edit Location and Windows
If you choose to use the Edit Object command from the Modeling menu the object will be edited directly in place in the Modeling window. If you double-click on the object (using any of the three Object Manipulation tools) it will open in a separate window where it can be edited by itself in isolation.

To edit an object that belongs to a group or shape, you can double-click on the group or shape. The group or shape opens in its own window, allowing you to select a single object. You can then edit the object in this window, or double-click to edit in a separate window.

### Edit Tool Palette
Different object types are edited in different ways. When in Edit mode the Tool palette changes to a special Edit Tool palette. The tools available on the Edit Tool palette depend on the type of object that you're reshaping.

### Editing Different Object Types
There are basically three types of objects that can be edited: polygon objects, Bézier objects and specialty objects. Polygon objects are defined by a series of flat sections (polygons) that can approximate a curved surface. Bézier objects are defined by curves which can be 3D or 2D. Specialty objects can come in many forms such as Deform Objects and IK Objects. Each type of object has its own Edit mode and tools.

If the object you are attempting to edit is a primitive (a sphere or cube, for example, created using the 3D drawing tools), you will need to Convert it first. Double-clicking on the object will summon the Convert dialog to allow you to change the object type to one that can be edited. The tools and techniques for Edit Object change with each object type.

For more information, see the specific type of object you wish to edit. For information about editing Bézier objects, see **Chapter 5 - Working With Bézier Objects** For information about polygonal mesh objects, see **Chapter 6 - Working With Polygon Meshes**.

### Importing Models

One way to start a project - or enhance a project - is to import existing geometric model data or other resources. These can be models you may have created yourself using Design 3D or a third party application. You can also find models on the web, both free and for purchase. The Strata.com website and community offers high quality resources for all aspects of your 3D needs. Because the community is so large and active, there are many options available.

Design 3D Shapes, Textures, and other resources can be individually imported into your scene through the Import command as well. This can be useful when a particular resource is not in your Libraries, or when you find that creating parts for a complex scene separately is easier than building everything in the same scene at the same time.

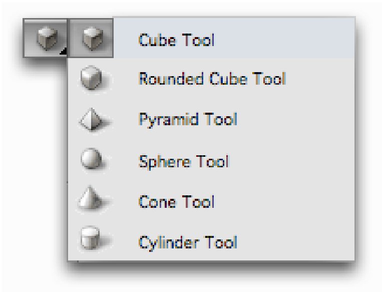
The Import command can also be used to import other external resources into your specific project, whether geometry, animations, 2D curves, or images. These resources can be in many different formats, and from many different sources. There are also some unique properties to Import options, including extracting 3D dimensional geometry from the tones of a 2D bitmap image.

For more information, see **Geometry Import and Export** in **Chapter 21 - Menu Commands**.

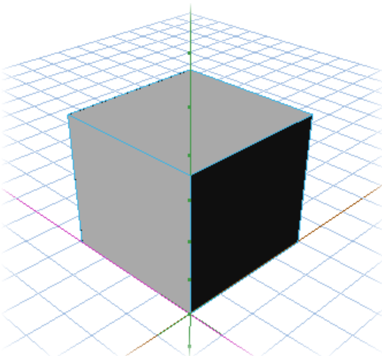
## Starting with 3D Primitives

3D primitives (simple, common objects) can be an excellent place to begin constructing your model. Primitives can be grouped, converted to Bézier surfaces, converted to polygon meshes or Melded together into a metasurface.

The 3D Primitive Tools are located in the 3D Drawing Tools pop-up menu on the Tool Palette. The hotkey for the 3D tools is "**C**."

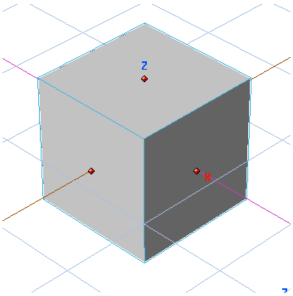



You can draw 3D primitive objects in two ways:
• **Click-and-drag:** With this method you simply click-and-drag the tool onto the active grid surface. Design 3D determines the height of the object by adding the width and depth, and then dividing the sum by two.
• **The three-click method**. The size of the primitive's bounding box is defined by three separate mouse clicks. The first two clicks are placed on the active grid, defining the size of the object in two dimensions. After the second click, a temporary guide line appears as an aid for positioning the third (perpendicular) dimension with a final click.



Click-and-drag Modifier keys for drawing 3D objects:
**Shift** = constrains the tools to draw objects with the same dimensions on all axes (for perfect Cubes, Spheres, etc.).
**Option** (Mac)**, Alt** (Win) = draws an object from its center, instead of the default method of drawing from one corner.
**Option-Shift** (Mac), **Alt-Shift** (Win) = draws objects from the center with equal proportions in all dimensions.

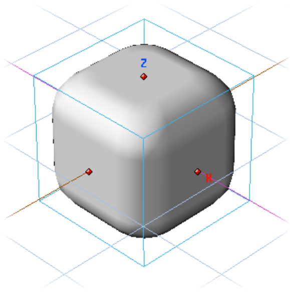
## Cube Tool



Use this tool to draw cube-type objects. They can either be perfect cubes with equal sides, or non-proportional boxes. Once you have selected the Cube Tool, how you draw it in your scene will determine its initial shape.

Once you've drawn a cube in your scene, you can modify it on the Object panel of the Object Properties palette. This includes naming the object, and whether the object is one-sided or not (to control refraction and volumetric effects). Double-clicking the Cube Tool icon will display the Tool Settings dialog to set some of these options before creating any cubes at all.

## Rounded Cube Tool

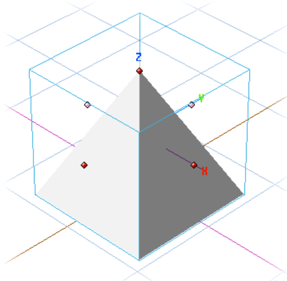


Use this tool to draw cube-type objects with rounded corners. They can either be perfect cubes with equal sides, or non-proportional boxes. Once you have selected the Rounded Cube Tool, how you draw it in your scene will determine its initial dimensions, while the radius of the rounded corners is initially determined by the value specified in the Tool Settings dialog.

Once you've drawn the rounded cube in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, the radius of the rounded corners, whether the object is one-sided or not (to control refraction and volumetric effects), and setting the complexity for rendering or converting.

Double-clicking the Rounded Cube Tool icon will display the Tool Settings dialog to set some of these options before creating any rounded cubes at all.

## Pyramid Tool

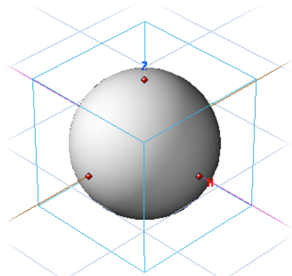


This tool allows you to draw pyramid-shaped objects with five flat sides, four of which are triangular. When you draw a pyramid using the click-and-drag method, you can specify the height or width interactively. If you change the proportions of the pyramid, the base is also distorted from a perfect square.

**NOTE:** Pyramids are always drawn with the base placed flat on the active grid, and the top of the pyramid pointing in a direction perpendicular to the active grid.

Once you've drawn the pyramid in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, and whether the object is one-sided or not (to control refraction and volumetric effects). Double-clicking the Pyramid Tool icon will display the Tool Settings dialog to set some of these options before creating any pyramids at all.

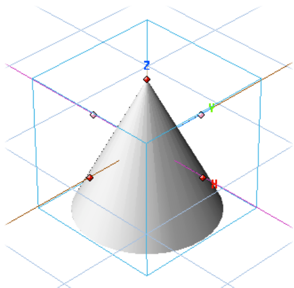
## Sphere Tool



Use this tool to draw spherical-shaped primitives. They can be either perfect spheres, or non-proportional ovoids. Once you have selected the tool, how you draw the sphere in your scene will determine its initial shape.

After you've inserted a sphere into your model, you can edit its parameters by modifying the values on the Object panel of the Object Properties palette. This includes naming the object, whether the object is one-sided or not (to control refraction and volumetric effects), and setting the complexity for rendering or converting. Double-clicking the Sphere Tool icon will display the Tool Settings dialog to set some of these options before creating any spheres at all.

## Cone Tool

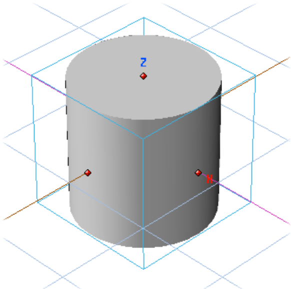


Use this tool to draw cone-shaped objects. One end is flat and round, and the opposite end progresses to a point. When you draw a cone using the click-and-drag method, you can specify the height or width of the cone. If you change the proportions of the cone, the base is also distorted from a perfect circle.

**NOTE:** Cones are always drawn with the base placed flat on the active grid, and the top of the cone pointing in a direction perpendicular to the active grid.

Once you've drawn the cone in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, whether the object is one-sided or not (to control refraction and volumetric effects), using an endcap on the bottom, and setting the complexity for rendering or converting. Double-clicking the Cone Tool icon will display the Tool Settings dialog to set some of these options before creating any cones at all.

## Cylinder Tool




Use this tool to draw cylindrical-shaped objects. They can either be closed cylinders or open "tubes." When you draw a cylinder using the click-and-drag method, you can specify the height or width of the cylinder. If you change the proportions of the cylinder, the ends can be distorted from a perfect circle.

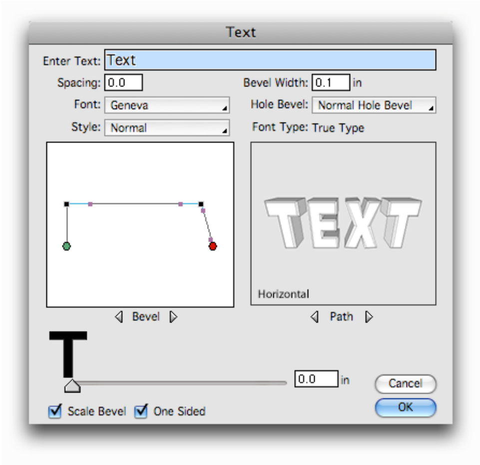
**NOTE:** Cylinders are always drawn with the base placed flat on the active grid, and the curved surface of the cylinder is smoothed when rendered.

Once you've drawn the cylinder in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, whether the object is one-sided or not (to control refraction and volumetric effects), using endcaps on the top and bottom, and setting the complexity for rendering or converting. Double-clicking the Cylinder Tool icon will display the Tool Settings dialog to set some of these options before creating any cylinders at all.

## The Text Tool

The Text Tool is a special, font-driven type of 3D primitive. You can use the Text Tool to create three-dimensional text in your model, based on the installed fonts in your computer. This text can be easily customized to create the look you want.

To create 3D text, select the Text Tool and click-and-drag in the Modeling window to define the left edge and height of the text you want to create (by default a capital "A" will guide you). When you release the mouse button, the **Text dialog** appears so you can set the actual font and characters used, as well as extruding, beveling, and spacing the text elements.




The Text dialog includes the following important settings:

• **Text:** Enter a single line of text in this field. This line can contain up to 255 characters. However, because you are limited to a single line, the Return character is not a valid character.
• **Spacing**: Set the default spacing amount between characters in this field.
• **Font**. Supported fonts appear in the pop-up list.
• **Style**: Choose a style for the text. You can choose Regular, Italics, or Bold.
• **Bevel Width**: The value in this field sets the width of any applied bevel.
• **Hole Bevel**: You can choose one of three ways to extrude any holes in the text: Normal, Inverted, and None.
• **Bevel**: Use the arrow buttons to scroll through the preset bevels available. The default bevel is a flat profile which produces squared off extrusions. If you don't find the exact extrusion settings you want, Design 3D allows you to modify one of the pre-defined bevels to meet your specifications.
• **Path**: Use the arrow buttons to select a path on which to align the text. Options include curves, circles and stair steps among others.
• **Extrude Depth**: Use the slider or enter a value in the numeric entry field to specify a depth, or thickness, for the extrusion. If you want to create 2D text, enter an extrusion depth of zero.

Once created, the text can be edited from the Object panel of the Object Properties palette. This includes options for changing the name, the Text displayed, the font, depth, width, and bevel settings. You can also Convert a text object into another object type, and then use Edit mode to change or reshape it.

### Editing 3d Primitives

Aside from moving, rotating, scaling, and editing Object Properties, you can only Edit 3D primitives freely by first converting them into another object type.

If your objective is to edit the resulting converted object into a more complex object you will want to convert it to either a polygon mesh or a Bézier surface. These objects can then be pushed and pulled in 3D space. If you convert the object into a Polygon mesh you can further refine the object using the Subdivide Surface command.

To convert a 3D primitive, choose the **Convert** command from the Modeling menu, or you can simply double-click the object, and rather than enter Edit, it will start a Convert. In either case the Convert dialog will display providing you with available options.

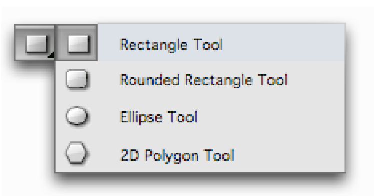
For more information see **Chapter 5 - Working With Bézier Objects** and **Chapter 6 - Working With Polygon Meshes.**

## Starting with 2D Objects

You can construct 3D objects by starting with 2D primitive objects. Two-dimensional objects can be Extruded, Lathed and even edited into three-dimensional objects. Most 2D objects can be defined as filled or unfilled objects.

You can also use 2D primitives to create animation paths. You can convert a 2D object to an animation path using the Convert to Path tool, locate in the Joint and Bones Tools pop-up menu (hotkey: **J**). For more information, see **Chapter 15 - Adding Animation.**

The 2D primitive tools are located in the 2D Drawing Tools pop-up menu on the Tool palette. The hotkey for these tools is "**N**".




**Reshaping 2d Primitives**

Besides moving, rotating and scaling, primitive 2D objects can only be edited after they've been converted into a another object type. You can convert a 2D object by using the Convert command from the Modeling menu or by double-clicking on the object. Once you convert a 2D primitive to another object type, you can reshape it with the special Edit mode tools.

For more information see **Chapter 5 - Working With Bézier Objects** and **Chapter 6 - Working With Polygon Meshes.**

**Drawing 2d Primitives**
As with other objects, 2D objects are always drawn relative to the active grid. There are two methods you can use to draw 2D objects. First is the standard click-and-drag method. The second method uses two single clicks to establish the points needed to define the object.

Modifier keys for 2D primitive tools:
**Caps Lock** = changes the drawing cursor into cross-hairs.
**Shift** = constrains the tool to draw evenly proportioned objects.
**Option/Alt** = draws the object from the center.

## Rectangle Tool

Using this tool you can draw 2D squares or rectangles of any proportions, either as filled regions or as unfilled paths. These objects always have square corners.

Once you've drawn the Rectangle in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, and whether the object is filled or not.

## Ellipse Tool

Use this tool to draw 2D oval-shaped objects. Ellipses can be filled, hollow or have a hole in the center that can be set in the Tool Setting dialog or the Object Properties palette.

Once you've drawn the ellipse in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, the inner hole radius, and whether the object is filled or not. Double-clicking the Ellipse Tool icon will display the Tool Settings dialog to set some of these options before using the tool at all.

## Rounded Rectangle Tool

As the name suggests, this tool is used to draw rectangles with rounded corners. Once you have selected the Rounded Rectangle Tool, how you draw it in your scene will determine its initial dimensions, while the radius of the rounded corners is initially determined by the value specified in the Tool Settings dialog.

Once you've drawn the rounded rectangle in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, the radius of the rounded corners, whether the object is filled or not. Double-clicking the Rounded Rectangle Tool icon will display the Tool Settings dialog to set some of these options before creating any rounded cubes at all.

### 2D Polygon Tool

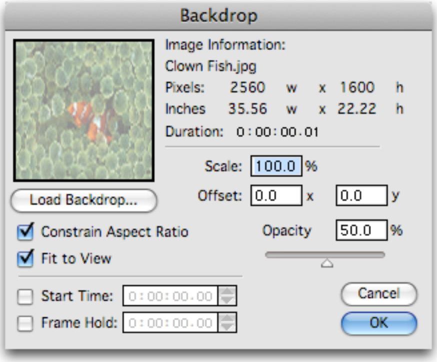
Use the 2D Polygon Tool to draw multi-sided 2D shapes with a pre-set number of equal length sides. How you draw the 2D polygon in your scene will determine its initial dimensions, while the number of sides is initially determined by the value specified in the Tool Settings dialog.

Once you've drawn the Polygon in your model, you can edit it by changing the values on the Object panel of the Object Properties palette. This includes naming the object, the number of sides, and whether the object is filled or not. Double-clicking the 2D Polygon Tool icon will display the Tool Settings dialog to set some of these options before creating any polygons.

## Using Backdrops for Modeling

Design 3D allows you to place a pixel-based image or animation in the Modeling window to assist you in the modeling process. (This feature is only available if the interactive renderer you're using is capable of displaying backdrops.)

Backdrops are accessed through the **Plus** menu in any view of the **Modeling window** you wish the Backdrop to appear in. Selecting the **Set Backdrop** command displays a dialog that lets you adjust the size, aspect ratio, opacity, and frame number (if the file is an animation).




**NOTE:** Backdrops are provided for modeling purposes only; they do not appear in rendered images. The image is placed at the back of the Modeling window, and remains in a fixed position relative to the view plane.

If both the **Constrain Aspect Ratio** and **Fit to View** options are enabled in the Backdrop dialog, the window resizes to fit the size of the image. The aspect ratio of the image is maintained, even if the window is later resized.

In most cases, using a backdrop in the Modeling window is the same as using one in a Camera window. There are a few exceptions, however:
•Camera windows can't be split, but Modeling windows can. If both the Constrain Aspect Ratio and Fit to View options are enabled, the size of the view doesn't change to fit the backdrop when views are split.
•Each view in the Modeling window can have its own backdrop.
•Commands are provided in the Plus menu that allow you to hide or remove the backdrop from any view.

*Chapter 4*

# Advanced Modeling

This section discusses some of the more advanced modeling tools and concepts: using default and custom grids and guides, Converting geometry from one type to another, and using Group and Ungroup. This chapter also explains how to take advantage of Shapes and Shape instances, and describes different methods of duplicating objects.

## About Grids and Guides

The ability to create custom grids and guides and use them while modeling is a very powerful feature of Strata Design 3D CX. Grids and guides allow you to constrain the movement of objects or object elements with great precision.

**Grids** in Design 3D help you recognize your location in the 3D modeling space, affect object movement and placement, and allow you to constrain the movement of any object.

In addition to the standard grids that are always present in your model, you can create **custom grids** in any location or orientation. Working with the default grids is discussed in **Chapter 3 - Modeling Basics**, and custom grids are described in this chapter.

Design 3D also provides default and custom **guides**. Guides are very similar to grids, however they are one-dimensional, while grids exist in two dimensions.

Like grids, guides constrain the movement of objects or the elements that make up objects: faces, edges and points (vertices). Default guides exist in every model, while custom guides are created as needed, using methods described below.

Custom grids and guides can be created and used in the main **Modeling window,** and in **Edit Object** mode. In the main Modeling window, grids and guides provide a way to precisely control the position and movement of objects and groups of objects. In Edit mode, you can set up a custom guide or grid exactly where you need it, and then move an object's surfaces, edges or vertices (points) with great precision.

For more information about using Edit mode to reshape objects, see **Chapter 5 - Working With Bézier Objects**, and **Chapter 6 - Working With Polygon Meshes**.

## Guides

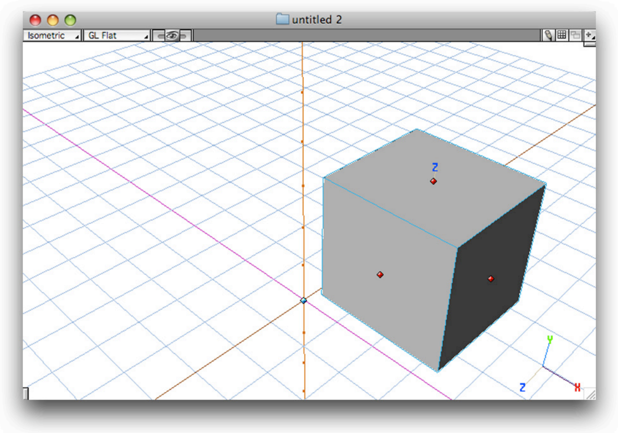
Design 3D allows you to create a one-dimensional guide line to help you position objects, and the elements that make up objects: surfaces, edges, and points (vertices). Guides are similar to construction objects - they are only used for modeling, and never appear in renderings. Any object or element you move while a guide is active will be constrained by the guide.

Guides have markers, or increments, that appear in the same units as grid lines. You can use the guide markers to constrain or measure the movement of objects or elements.

If you enable Snap to Grid from the Edit menu, movement will jump or "snap" to the Snap Subdivisions. A model's units and subdivisions can be changed by selecting the Set Units command in the Edit menu.

### Default Guides

Each time you open a new model, four guides are present in your model: the X, Y and Z guides, and the Perpendicular Guide. The X, Y and Z guides correspond to the X, Y and Z coordinates of the model. The Perpendicular Guide is always perpendicular to the active grid.




**With the Z guide active, movement of the cube is constrained along the Z axis.**

To make a default guide active (and visible), you can select it in the Current Guides submenu of the Edit menu, or you can use the hotkeys.

**Hotkeys for Default Guides:**

**Shift-X** makes the X guide active.
**Shift-C** makes the Y guide active.
**Shift-Z** makes the Z guide active.
**Command-Shift** makes the Perpendicular guide active.

## Custom Guides

Design 3D allows you to create custom guides in any position on an object, and then use that guide to constrain the movement of the object or part of the object (in Edit mode).

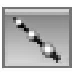
A custom guide can be temporary or permanent. Once you create a guide in the position that you need, you can save it for later use by giving it a name in the Project window (see below). Named guides are saved with the model file, and will be available anytime you open that particular model. If a custom guide is not named, it will be replaced the next time you draw a new guide.

Once you draw a custom guide, it appears in the Current Guide submenu of the Edit menu. You can select the current guide in this menu. After you make a guide active by selecting it in this menu, it becomes visible in the Modeling window, and it becomes the constraining element of operations.

You can **activate** the current guide at any time by selecting it in the Current Guide submenu of the Edit menu, or you can use the hotkey **";"** (semicolon). Click and release the hotkey to activate the guide. Press the hotkey again to turn the guide off.

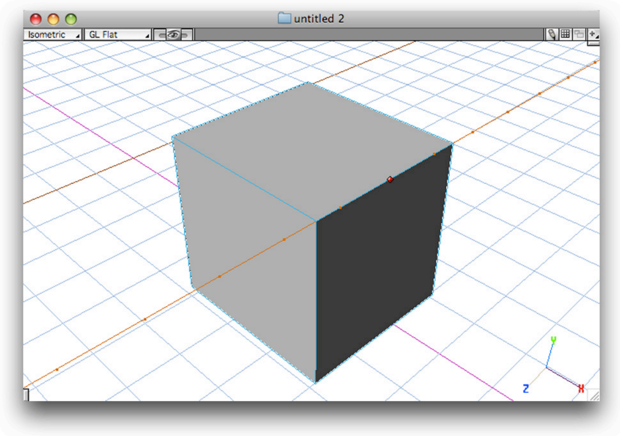
To **delete** a custom guide, select it in the Current Guide submenu of the Edit menu, then select the Guide Tool and press the Delete key. Make sure you do not have an object or element selected when you delete a guide.

### Creating Custom Guides



Hotkey: **Shift-;** (semicolon)
Use the Guide Tool to create a guide in the main Modeling window, or while in Edit mode.

To create a custom guide, select the Guide Tool, then click on an object or element. You can use one, two or three clicks of the mouse to define a guide. The axis and origin of the guide are determined by where and how many times you click, and by any modifier keys you use. This process is described below.




**This custom guide was created by clicking once on the edge of the primitive cube.**

Once the guide is properly positioned, you need to **commit** or finalize the creation process.

**To Commit a Guide:**
• Hit the Return key after the guide is in the desired position.
• Select another tool when you are finished defining the guide.
• Clicking and dragging to create the guide will define and commit it at the same time.
• If you are using the three-click method of defining a guide (see below), the third click will move you to origin mode. The next click will set the location of the origin and commit the guide.

If you commit the guide, and then click again with the Guide Tool selected, the first guide will be deleted and the process of creating a new guide will start again.

Once the guide is committed, you can name it in the Project window. Naming a guide makes it persistent - it can be summoned as needed, and is saved with your model.

**Guide Origins**
Guides have an origin, or center point. In many cases, the origin will not affect an object or element's movement.

However, the origin can be used as a center of rotation with certain tools such as Rotate and Scale Element in Polygon Mesh edit mode. The center of the rotation for these tools is normally the center of the object or selection.

The origin of the guide can be Active or inactive. In the active state, it becomes the center of rotation. If the origin is active, it will appear red. If the origin is not active, it will appear blue.

You can toggle the Active state on or off using the Project window controls (see below). However, you can also toggle this setting on or off for **all** grids and guides at any time by using the **Shift- "."** (period) modifier keys.

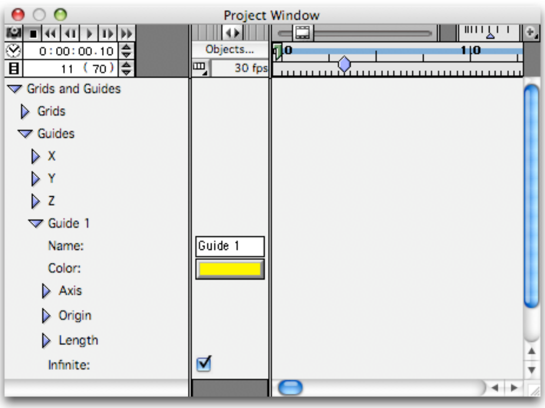
The placement of a guide's origin can be set through the creation methods described below. The origin can also be changed **after** the guide is created, using the Project window. Or, with the Guide Tool selected, you can click and drag the origin to a different location on the guide.

**Options for Defining a Guide's Axis and Origin:**
• **Click and drag** on an object to define a guide. The origin is placed at the point where you first click. The guide is committed when you release the mouse button.
• **Click one face:** The axis is placed along the (surface) normal of the face. The **normal** is perpendicular to the surface of the object. The origin is placed at the point on the face where you clicked.
• **Click one edge:** The axis is placed along the normal of the edge. The origin is placed at the point on the edge where you clicked.
• **Click two edges:** The axis is placed perpendicular to the two edges. The origin is placed at an average of the first two clicks.
• **Click two vertices:** The axis runs through the two points. The origin is placed at an average of the first two clicks.
• **Click three vertices:** The axis will be perpendicular to the plane defined by the three points. The origin is placed at an average of the three clicks.

**Modifier Keys for Creating Guides**
You can use these modifier keys while creating a guide to control the placement of the guide's origin.
**Shift** places a guide at the center of an edge.
**Shift-Option or Shift-Alt** (Win) places the origin at the vertex of the edge closest to the intersection point.
**Command** or **Control** (Win) while selecting a vertex, edge or face snaps the origin to the object’s pivot point.
**Press the “.” (period)** key and click on the guide to set the location of the origin.

## Project Window Settings

The Project window allows you to set the different attributes of a custom guide. The Guide settings are located in the Grids and Guides folder at the top of the Project window's object list. The Guides folder will always contain the default X, Y, Z and Perpendicular guides, as well as any custom guides you have created. You can assign custom guides a name and color, and you can set other parameters numerically. **Naming** a guide makes it persistent - it will stay in the same location and be stored with the model file.




• **Axis:** Sets the axis of the guide using the x, y and z coordinates.
• **Origin**: Sets the origin of the guide using the x, y and z coordinates.
- Active: This checkbox determines if the guide origin is active while using edit tools that utilize an origin point, such as Rotate and Scale in Polygon Mesh editing. This checkbox is enabled by default for custom guides.
**NOTE:** You can toggle this setting on or off while modeling by using the **Shift - "."** (period) modifier keys. If the guide's origin is active, it will appear red. If the origin is not active, it will appear blue. The **Shift - "."** (period) modifier keys change the Active origin status of **ALL** grids and guides in the model.
• **Length:** Sets the visible length of the guide in the positive and negative directions.
• **Infinite:** This checkbox determines whether movement along the guide is constrained to the dimensions set in the Length fields.

## Custom Grids

In Design 3D there are three types of grids: World grids, View grids and Custom grids. For more information about World and View grids see **Chapter 3 - Modeling Basics**.

Custom (User-defined) grids are similar to custom guides. They allow you to put a grid in exactly the position and orientation you need to accurately create and arrange objects in your model. Any object or element you move while a grid is active will be constrained by the grid.

Custom grids can be created and used in the main Modeling window, and in Edit Object mode. In the Modeling window, they can help you position, move, rotate or scale objects.

In Edit mode a custom grid can help you edit geometry by constraining the movement of an object's surfaces, edges or vertices (points) with great precision.

Custom grids appear orange, and only one can be visible at any given time, although up to 99 can be defined in a single scene. You can cycle forward or backward through just the Custom grids by using the **Option** or **Alt** key with the plus (**+**) or minus (**-**) keys. To cycle through both the Custom grids AND World grids, use only the plus (**+**) or minus (**-**) keys.

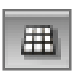
Once you draw a new grid, it becomes the **Active Grid**. Only one grid can be active at a time. The Active Grid is indicated by a check mark in the Active Grid submenu of the Edit menu.

If the new grid is not named, it will be replaced the next time you draw a custom grid. You can name the grid in the Project window. Named grids are saved with the model file, and will be available anytime you open that particular model.

To **delete** a custom grid, cycle to the grid you want to delete using the plus (+) or minus (-) keys and, with the Grid Tool selected, press the **Delete** key. Make sure you do not have any object or element selected when you press Delete.

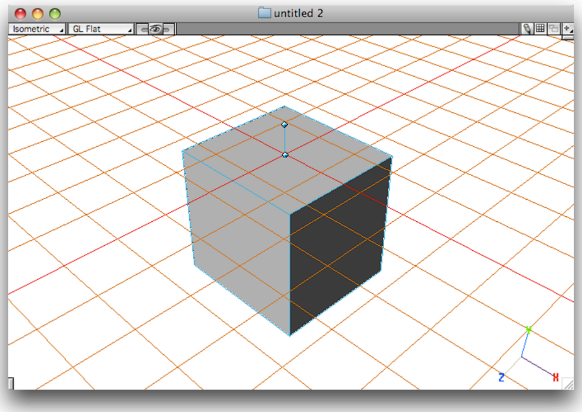
With the Grid Tool active, you can **move** a custom grid by clicking and dragging it in the window, or you can **rotate** it by dragging the handle. A custom grid can also be resized by clicking and dragging on the edge markers. You can also use the Project window to set the size, orientation and other parameters. The Grid controls are located in the Grids and Guides folder at the top of the Project window object list.

## Creating a Custom Grid



Hotkey: **Shift-'** (apostrophe)
Custom grids are created using the Grid Tool. They can be drawn on an object's surface, edge, or vertex (point).

Select the Grid Tool, then click on an object or element. You can use one, two or three clicks of the mouse to define a grid. The normal and origin of the grid are determined by where and how many times you click. This process is described below.




**This custom grid was created by clicking once on the cube's top face.**

Once the grid is properly positioned, you need to **commit** or finalize the creation process.

**To Commit a Custom Grid:**

• Hit the Return key when the grid is in the desired position.
• Select another tool after you have defined the grid.
• If you are using the three-click method of defining a grid (see below), the third click will move you to origin mode. The next click will set the location of the origin and commit the grid.
• Clicking and dragging to create the guide will define and commit it at the same time.

If you commit the grid but don't name it, clicking again with the Grid Tool will delete the first grid and start the grid creation process again.

**Grid Origins**

Grids have an origin, or center point. In many cases, the origin will not affect an object or element's movement.

However, the origin can be used as a center of rotation with certain tools such as Rotate and Scale Element in Polygon Mesh edit mode. The center of the rotation for these tools is normally the center of the object or selection.

The origin of the grid can be active or inactive. In the active state, it becomes the center of rotation. If the origin is active, it will appear red. If the origin is not active, it will appear blue.

You can toggle the Active state on or off using the Project window controls (see below). However, you can also toggle this setting on or off for **all** grids and guides at any time by using the **Shift - "."** (period) modifier keys.

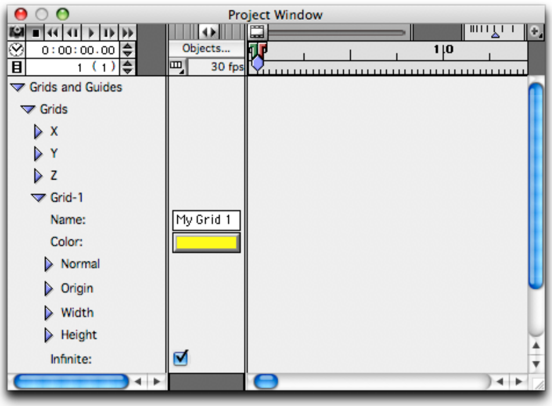
The placement of a grid's origin can be set through the creation methods described below. It can also be changed using the Project window controls after a grid is created.

**Options for Defining a Grid's Normal and Origin:**
• **Click and drag** on an object to define a grid. The origin is placed at the point where you first click. The grid is committed when you release the mouse button.
• **Shift-click one face:** The grid is placed at the center of the polygon face, parallel to and centered on the face.
• **Click one face:** The normal of the grid is aligned with the normal of the surface you click on. The origin is placed at the point on the face where you clicked.
• **Click one edge:** The normal of the grid is placed along the normal of the edge. The origin is placed at the point on the edge where you clicked.
• **Click two edges:** The normal of the grid is placed perpendicular to the two edges. The origin is placed at an average of the first two clicks.
• **Click two vertices:** The normal of the grid runs through the two points. The origin is placed at an average of the first two clicks.
• **Click three vertices:** The grid's normal will be perpendicular to the plane defined by the three points. The origin is placed at an average of the three clicks.

**Modifier Keys for Creating Custom Grids**
**Shift** places the origin at the center of an edge.
**Shift-Option or Shift-Alt** (Win). The origin is placed at the vertex of the edge closest to the intersection point
**Command** or **Control** (Win) while selecting a vertex, edge or face snaps the origin to the object’s pivot point.

**Press the "." (period)** key and click on the grid to set the location of the origin.

**Project Window Controls**
Using the Project window, you can set all of the parameters of a custom grid, including name and color. Naming a grid makes it persistent - it will stay in the same location and be stored with the model file.




• **Normal:** Set the x, y and z coordinates of the surface normal. The surface normal can be thought of as a line that extends perpendicular from the face of the object, pointing directly away.
• **Origin**: Set the x, y and z coordinates of the origin point of the grid. Use the Active checkbox to determine if the origin of the grids remains active, or is disabled. You will want to disable the checkbox if you are using tools that also work with an origin.
- Active. This checkbox determines if the grid origin is active while using tools that utilize an origin point, such as Rotate and Scale in Polygon Mesh editing. You can toggle this setting on or off while modeling by using the **Shift+ "."** (period) modifier keys. If the grid's origin is Active, it will appear red. If the origin is not active, it will appear blue. The **Shift - "."** (period) modifier keys change the Active origin status of **ALL** grids and guides in the model.
• **Width**: Set the width of the grid, in the positive and negative directions.
• **Height**: Set the height of the custom grid, in the positive and negative directions.
• **Infinite:** This checkbox determines whether movement along the grid is constrained to the dimensions set in the Width and Height fields.

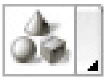
## Converting Objects

The Convert command allows you to change an object from one type of geometry to another. There are different reasons for converting an object from one type to another. For example, you may want to edit the object in a way that is not allowed with the current object type.

Once you convert an object from one type to another, the link to its native modeler or tool is broken, and you may not be able to convert it back to its original object type again.

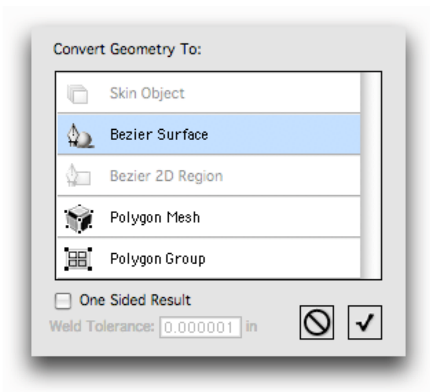
For example, if you convert an object created with the Extrude Tool into a polygonal mesh, you will not be able to edit the Extrude parameters again. The Edit Object command will allow you to push and pull individual vertices, but you can no longer edit the template or the bevel of the object because the object is no longer linked to the Extrude Tool.

### Using Convert



The Convert command can be accessed using the **Convert** button and its associated **pop-up menu** on the **Button Bar**. Select the object(s) you want to convert; then select the button or use the Convert command from the Modeling menu to summon the dialog.

All of the allowable conversions appear in the Convert dialog. Those that don't apply to the selected object(s) are dimmed and unavailable.




You can also double-click some objects (such as 3D primitives) with one of the object manipulation tools: Move, Rotate or Scale. This automatically summons the Convert dialog and enters Edit mode in one operation. When you make your selection in the Convert dialog and click OK, the object opens in its own Edit mode window. This lets you Edit the object without any other objects around it. When you are through editing the object, just close the window to exit Edit mode.

The Convert dialog offers these options:
• **One sided result:** This checkbox allows you to specify whether the object becomes one-sided or two-sided. If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as Fog or Mist, it must be created as a solid, one-sided object.

• **Weld tolerance:**
The Weld Tolerance field sets the maximum value for welding points together during the Convert operation. If two points on an object fall within the range set in this field, they will be welded together. This prevents holes in the object's geometry.

**Object Types**
The conversions available depend on the type of object(s) selected:
• **Skin:** Objects created with the Lathe, Extrude, or Path Extrude tools can be converted to Skin objects.
• **Bézier Surface:** The types of objects that can be converted to a Bézier surface are: 3D primitives (spheres, cones, cubes, rounded cubes, cylinders); Skin objects (may convert into a group containing both a Bézier Surface and 2D Bézier region endcaps); filled or unfilled 2D rectangles, rounded rectangles, and discs created with the Ellipse tool.
• **Bézier 2D Region:** Filled, two-dimensional objects created with the Rectangle, Rounded Rectangle, or Ellipse tools. Objects created with the 2D Polygon tool must be converted to Polygon Group first, and then converted to Bézier Region.
• **Polygon Mesh:** Almost any object can be converted into a polygonal mesh. This includes all of the 3D primitives, any filled 2D primitive, Bézier surfaces, and Bézier regions. If the object being converted has a complexity slider in its Object Properties, this slider can affect the polygon count in the polygon mesh created.
• **Polygon Group:** Anything that can be converted to a Polygon Mesh can be converted to a Polygon Group. Polygon Groups can be UnGrouped to get access to the individual polygons (be sure the Project window is closed if you do this as it can make for lengthy redraws of the Project window). Polygons can be re-grouped and converted into a Polygon Mesh.

**Conversion Changes**
All conversions occur on a one-to-one basis. That is, if five objects are selected and converted to Bézier Surface, the result will be five Bézier surfaces. If the five objects are grouped together first, the result will be one group with five Bézier surfaces.

However, if five objects are grouped together and converted to Polygon Mesh, the result is **one** mesh. When converting to Polygon Group, the result is one group with all of the polygons. This allows you to combine multiple meshes together.

When objects are converted, all of the properties listed under their Base Properties in the Project window are lost during the conversion process. All of the properties listed under Object Properties in the Project window (which includes textures) are maintained. However, once you group an object, the object and **all** of its properties - both Base Properties **and** Object Properties appear under the Group's Base Properties.

So, if you group an object **before** converting it to another object type, **all** of its properties are lost. This is a way of eliminating any information that may become unnecessary later.

## Group and UnGroup

Grouping does just what the name suggests - it allows you to group objects together so that they can be selected, moved, rotated, scaled, textured, animated, (etc.) as a group.

### Grouping Objects

The **Group** command can be accessed through the Modeling menu or by clicking on the **Group button** on the **Button Bar**. This command is available whenever any objects, groups and/or shapes are selected. You can group any combination of any type of objects you have in your model, and even group together multiple groups to create "sub-groups." If you wish, you can even group a single object to itself - an operation which can be handy in some circumstances.

### UnGroup

Use the UnGroup command in the Modeling menu to split grouped objects into separate objects again. You can access this command anytime one or more grouped objects are selected. You can also select the **UnGroup button** on the

**Button Bar.** When a group contains other groups, only the outermost group is affected by the UnGroup command, but each time you use this command, the next level is ungrouped.

## Editing Groups

You can access the individual objects within a group in two ways:
• **Double-clicking** on the group in the Modeling window. It may be easier to work with a group in its own window. You can open a group in its own window by double-clicking on the group.
For example, you may want to change the relative position of the individual objects within the group. If the model is complex, it may be difficult to access parts of the group without affecting other objects. You can double-click on the group so it opens in its own window, then change the position, scale, etc. of the individual components within the group. You don't need to ungroup the group first.
• Open the Group in the **Project window**, then open (turn down) the Base Properties triangle. Any time the Base Properties field of a group (or shape) is in its "open" position in the Project window, the individual objects that make up the group can be edited and otherwise manipulated in the Modeling window.

## Nested Nodes

A "nested node" can happen when an attribute is applied to a group, and then the group is ungrouped. Nested nodes are more likely if multiple transformations have been applied.

During the UnGroup operation, the software applies each attribute that was applied to the group to each individual object. This information is then stored under a nested node entry in the Object list in the Project window.

Nested nodes may not always cause problems, but in general it is best to avoid them. The information in the nested node may override other changes and interfere with what you are trying to do. There are two ways to avoid nested nodes:
•Use group windows to apply attributes to individual objects. Double-click on the group to open the group in its own window.
•Have the Base Properties for the group open in the Project window. This is the same as editing in a Group window: when the Base Properties arrow is turned down, all the objects can be edited individually, either in the Project window or in the Modeling window.

## Shapes

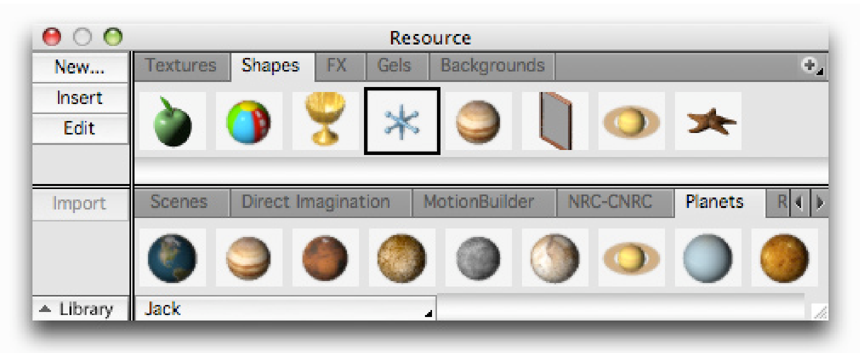
Shapes do everything that standard objects can do, plus a lot more. Shapes are objects (and groups of objects) that are named, referenced and stored in memory. When used in a model, the information is referenced to the named shape much like an alias or a shortcut to a folder on your computer.

Therefore, no matter how many times you use the shape in your model, the information only needs to be stored once and recalled many times. Plus, when you change any property of the original (parent) shape, all of the referenced (child) shapes are automatically changed as well. The parent-child relationship between the original shape and all copies of it is called a "hierarchal" relationship.

Using shapes makes your modeling more efficient. It requires much less memory to insert multiple instances of a shape than to create the objects each time or copy-and-paste them over and over again. Inserting a shape instance requires approximately 20K of memory. This is much less than the memory required to duplicate the object, especially if the object is a complex polygonal mesh. Using shapes also saves time during rendering because the renderer has to process the shape's information only once, rather than many times.

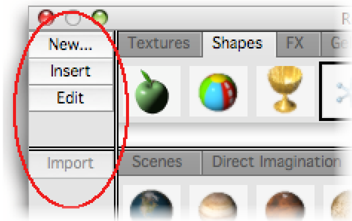
### Shapes and the Resource Palette

Shapes are created and managed using the **Shapes panel** of the **Resources palette**. You can create new shapes, edit existing shapes, insert shapes into the active model, or load shapes from the Library into the active model.



## Loading Shapes from the Library

You can select shapes from the Shapes library to add to your model. If the Shapes library is not visible, click the Library button on the bottom left to expand the palette to display all of the shapes available to you. Use the scroll bar, if necessary, to scroll through the entire collection of shapes. The shapes in the library may be sub-divided into categories, with each category represented by a separate folder in the library. To view the contents of a library folder, click on the folder panel. Only shapes included in the active model appear in the upper portion of the Shapes panel.




Shapes can be loaded from the Library in the following ways:

• **Insert:** Click once on the shape to select it, then click the **Insert** button. This loads the shape, if necessary, and then inserts an instance of the shape into the Modeling window. See **Inserting Shapes** below for information on command key shape insertion.

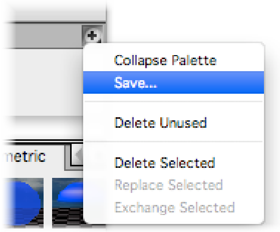
• **Edit:** Select a shape from the palette and click the **Edit** button. This loads the shape and opens the shape's workspace. This can also be accomplished by double-clicking the shape preview. **Double-clicking** a shape is the same as selecting the shape and clicking the Edit button.

• **Import:** Click the **Import** button to import the selected shape from the library into the active model.

• **Drag-and-drop**: You can drag any shape from your library directly into your model.

## Plus Menu Commands

When the Shapes panel is active, the Plus menu in the upper right corner of the Resources palette contains entries that apply to handling shapes. These specific options are detailed below.



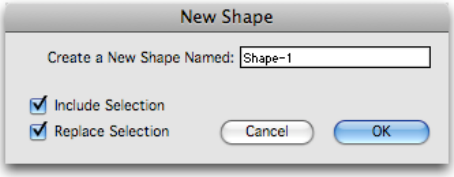

• **Save:** When you create a new shape, it automatically becomes part of the current model and is saved with it. You may, however, want to access a shape to use later in other models.

To save a shape to your Shapes library, choose the **Save** command from the **Plus menu** on the Resource palette. A dialog appears allowing you to specify a name and the location for the save function.

To have your saved shape appear in the Library, you must save the shape to the Shapes folder in the Resource Libraries folder of your Strata Design 3D CX installation on your system. You will also find folders that correspond to each panel in your Shapes Library. To create a new panel, simply create a new folder in the Shapes folder.
• **Delete Unused:** You can also delete all of the shapes from the model that are not being used, because removing unnecessary shapes decreases the amount of memory required for the model. If the shape has already been saved using the Save command from the Plus menu, this command doesn't delete the shapes from your disk, just from the model itself.
• **Delete Selected:** This command deletes the selected shape from your model, but not the Shapes library.
• **Replace Selected:** This command is available when the Shapes panel is active. It allows you to replace the object that is selected in the Modeling window with the shape selected on the Resource palette. The new shape takes on the size, scale, position, texture and animation information of the original object.
• **Exchange Selected:** Use this command to replace the shape selected in the Shapes panel with the object or shape selected in the Modeling window. The new shape takes on ONLY the position and animation information of the original shape or object.

## Creating Shapes

Click the **New** button on the left side of the **Resources palette** while the **Shapes panel** is active to create a new shape. A **New Shape** dialog appears allowing you to name the object and add it to the list of shapes. The dialog also contains two checkboxes. If an object (or group of objects) is selected in the Modeling window when you click the New button, two checkboxes will be available.



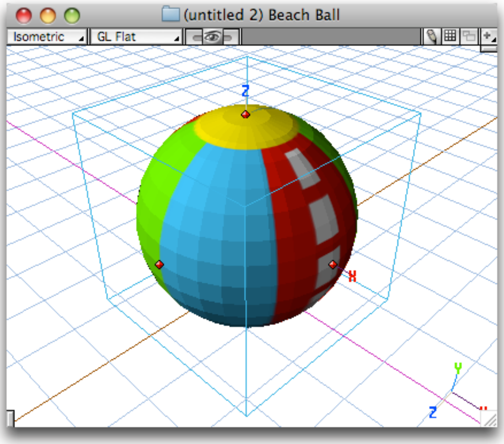

• **Include selection:** Any selected objects are included in the new shape and appear in the new Shape window. If you don't want the selected object(s) to be included, be sure this checkbox is unchecked.
• **Replace selection:** When an object is converted to a shape, the selected object becomes an instance of the shape. If you don't want the original object to be replaced by an instance of the shape, be sure this box is unchecked. The selected object remains a completely independent object.

Leaving both boxes unchecked simply opens a new, empty Shape window. Clicking the OK button opens a new **Shape Window**. Shapes are created in their own workspace and inserted into the model when they're needed. You can also insert a shape instance into other Shape Windows. You can create one or more objects in this window. If the shape is based on a selected object, the new shape retains all of the properties of the selected object. This includes the geometry, proportions, surface maps, etc.

Each time you insert a shape in your model, it is treated as an instance of the shape, not as a separate object. If your shape contains more than one object, the objects are grouped together and inserted into your model as a single grouped object. **UnGrouping** a Shape instance at a different level will break its link to the Shape, and it will be treated as a separate, regular unnamed object.

## Editing Shapes

To edit a Shape that is not in the Modeling window yet, click the **Edit** button the left side of the **Resources palette** while the **Shapes panel** is active. It will automatically load first, and then its Shape window opens for editing. Clicking this button opens the Shape window of the selected instance. This button is accessible only when an instance of a shape is selected. If the selected object is not linked to any shape, the button is dimmed.




**Double-Click Editing**

If you double-click on a shape instance in the Modeling window, the Shape window for that object opens. Any changes that you make in the Shape window are reflected in all instances of the shape. The preview on the Resource palette also reflects any changes you made to the shape.

**Editing Shapes in the Project Window**

You can also access the individual parts of a shape in the Project window. Any time the Base Properties field of a shape is in its "open" position in the Project window, the individual objects that make up the shape can be edited and otherwise manipulated in the Modeling window.

## Inserting Shapes

Click the **Insert** button to insert the selected shape into the active model. The shape is placed on the active grid, oriented to and near the center of the active view.
The shape is loaded into the model, if necessary, and an instance of the shape is inserted into the model.

You can also insert a shape with the **drag-and-drop method**. Select the shape from the Resource palette, then drag-and-drop it in the Modeling window. When you release the mouse button, the shape is placed on the active grid, and is oriented to the active view.

**Note**: This default behavior can be switched to the command key options described below by **disabling** the "Orient inserted shapes to view" General Preference item.

**Command Key Shape Insertion**

**Drag-n-drop**
**Command** (Mac), **Control** (Win) = at mouse release position, on active grid (not oriented to the view).
**Option** (Mac), **Alt** (Win) = at mouse release position, shape's origin point retained.
**Command+Option** (Mac), **Control+Alt** (Win) = origin point re-centered, shape placed at the "view set center" (not oriented to the view).
**Shift+modifier keys** (and no selected objects) = works like the Insert button options below.

**Insert Button**
**Command** (Mac), **Control** (Win) = on active grid, near the center of the active view (not oriented to the view).
**Option** (Mac), **Alt** (Win) = origin point re-centered, shape placed at the "view set center" (not oriented to the view).
**Command+Option** (Mac), **Control+Alt** (Win) = shape's origin point retained, set at World coordinates of 0,0,0.

**Insert or Drag-n-Drop**
With a single object selected:
**Shift** = the Origin point is re-centered and placed at the selected object's origin point.
**Shift+Command+Option** (Mac), **Shift+Control+Alt** (Win) = shape's origin point retained and placed at the selected object's origin point.

With multiple objects selected:
**Shift** = origin point re-centered and placed at center of the selected objects.
**Shift+Command+Option** (Mac), **Shift+Control+Alt** (Win) = shape's origin point retained and placed at the center of the selected objects.

**NOTE:** When duplicating or replicating a shape instance, new geometry is not created. Additional shape instances are created.

## Saving Shapes

When you create new shapes, they become part of the active model and will be saved with the model. However, unless you save the shapes to disk, they cannot be accessed for use in other models. A Save command is provided in the Plus menu for saving the shapes you create so you can access them later for use in other models.

### Importing Shapes

To import shapes from other sources, use the **Import** command in the **File** menu. When you import a file from another source, it is placed in the center of the active view. All imported files are treated as shapes and will appear in the upper portion of the Resource palette, along with all of the other shapes that are loaded in your model. To import shapes from the Shapes Library into the active model, select the shape in the Library, then press the **Import** button on the left side of the Resource palette.

For more information about importing and exporting geometry see **Chapter 21 - Modeling Commands.**

## Duplicating Objects

Duplicating existing objects can be an effective way to build a model. When you duplicate an object the new copy includes all the attributes of the original - this includes textures, animation, scale and orientation. Replicate lets you modify the transformations as copies are made. If you are duplicating a Shape the copy is actually an “instance” of the original - this allows you to later make changes to the original which will then be reflected in the copy. There are multiple ways to duplicate objects in Design 3D.

### Copy

Select the Copy command (from the **Edit** menu) to place a copy of the selected items on the clipboard. Copy does not remove anything from the document, but it does replace the previous contents of the clipboard with the copied items. You can also Copy with the system-wide hotkey of **Control-C** (Win) or **Command-C** (Mac) or by clicking the Copy button on the Button Bar.

You can Copy anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, rendered images, etc. Objects that are copied, then **Pasted** back into the same Modeling window will be placed in the exact same location - you won’t be able to tell by looking that you have two or more objects in the same location.

### Paste

The Paste command (in the **Edit** menu) places the contents of the clipboard into the active document, keeping all of the data intact. You can also access this command by selecting the **Paste button** on the **Button Bar**, or by using the system-wide hotkey of **Control-V** (Win) or **Command-V** (Mac). This command is available as long as the clipboard contains an appropriate item.

Items that you Paste must be in the same format and context as the place from which you copied them. For example, you can't paste a 3D object into a text field in a dialog, or text from a dialog into the Modeling window.

## Drag-copy

You can create an instant copy of any object by using the drag-copy method. To copy an object using this technique choose the **Move Tool** from the Tool palette, hold down the **Option** key (Mac) or **Alt** key (Win) and drag the object to where you want the copy to be. You will note that the first object is left in its original position.

This method can also be used with the Rotate Tool with the exception that the copy is rotated to a new position leaving the first object un-rotated.
Holding down the Option or Alt key while using the Scale Tool scales the object about its center point and does not create a copy of the object.

## Duplicate

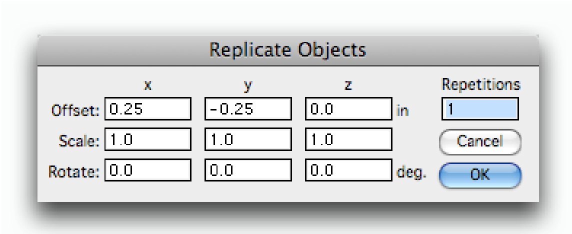
Use the Duplicate command (in the **Edit** menu) to create a copy of the selected object, slightly offset (0.25 inches or equivalent unit) from the original. The copy becomes the new selected object. The hotkey for Duplicate is **Command-D** (Mac) or **Control-D** (Win).

You can control the amount of offset used by this command. To change the default offset, first select an object and choose Duplicate from the Edit menu. Then drag the newly duplicated object the desired distance from the original. The distance you drag the duplicate from the original becomes the new offset each time you use the Duplicate command. This is a quick way of creating quick copies of an object at regular intervals.

If more than one model is open, each model can have its own offset value which remains in effect until the model is closed. However, each time you open a model, the original default offset of 0.25 inches (or equivalent unit) is restored.

## Replicate

The Replicate command can create multiple copies of a selected object, group or shape, all at the same time with pre-set conditions. The dialog box lets you input numeric values for each replication setting. The values are in the same units as defined in the Preferences settings. The Replicate command is located in the **Edit** menu.

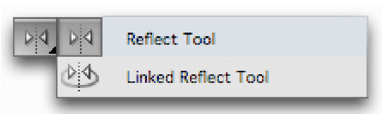



The fields in this dialog perform the following functions:
• **Offset:** These fields allow you to specify the offset distances along one or more of the three axes for each successive copy. If the units are set to inches, the default value of the offset is 0.25 inches on all three axes.
• **Scale:** These fields let you specify the size of each copy relative to the original. A value of two will double the size of the object(s) with each repetition. A value of one, which is the default value, will make all copies the same size as the original. A value of 0.5 will result in half the size with each repetition.
• **Rotate:** These fields allow you to specify the amount (in degrees) on all three axes by which each repetition should be rotated from its predecessor. The default value for rotation is zero degrees on all axes.
• **Repetitions:** This field specifies how many times the Replicate command should copy the object(s). The default setting for this field is one.

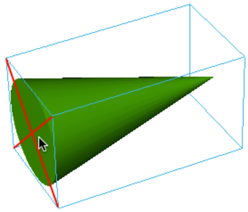
Any settings you enter in the Replicate dialog are retained until you change them or until you close the model. The settings in the Replicate dialog apply to the current model only. If more than one model is open, the replicate settings in each model can be different. However, the original default settings are restored each time you open a model.

## Reflect Tools

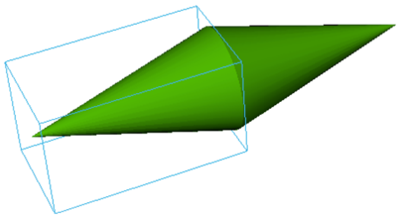
Hotkey: **M**
The Reflect Tools allows you to easily and quickly create objects that are mirror images of the original. Any animation information, textures or effects associated with the original object is also mirrored. You can Reflect any object, group or shape.




To use the **Reflect Tool**, select it from the Reflect Tools pop-up menu on the Tool palette, and then select the object you want to mirror. With the mouse button depressed on your object, notice that you can select any of the six sides of the selection bounding box to use as the axis for creating the reflected object.



As you slide the cursor over the object, the selected face is indicated with a red selection border. When the face that you want is selected, release the mouse button. When you release the mouse button, the reflected object is created.



## Linked Reflect

In many cases it is easier to model only one half of a symmetrical object, however, it can be difficult to visualize the other half while working this way. The Linked Reflect Tool provides a "live" and constantly updating Reflect function so that you can Edit the original object and watch the symmetrical copy update.

If you intend to use Edit Object mode, make sure you Convert your object to a **Polygon Mesh** before using Linked Reflect.

**NOTE:** The Linked Reflect Tool only updates any Edits you make to the original object surfaces, **not** any Transforms (Move, Rotate, or Scale) you apply to the entire object. You can, however, Edit the object and select **all** of its elements (points, etc.) and Move, Rotate, or Scale all of them at the same time - which will be Linked to the Mirrored copy.

Select the **Linked Reflect Tool** from the Reflect Tools pop-up menu on the Tool palette, then select the object you want to reflect. With the mouse button depressed, notice that you can select any of the six sides of the selection bounding box to use as the axis for creating the mirrored object.

As you slide the cursor over the object, the selected face is indicated with a red selection border. This is easiest when the face is visible in the active view. When the face that you want is selected, release the mouse button. When you release the mouse button, the mirrored object is created.

You can also use the Linked Reflect Tool on **Groups** and **Shapes**. In this case any Transforms you apply to individual objects **inside** the Group or Shape will also be reflected in the Linked Reflect copy. This is similar to editing an original Shape object and having all of its instances update (but mirrored).

# Working With Bézier Objects

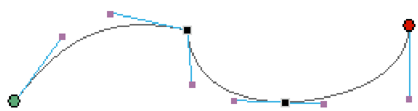
Bézier splines are a class of 3D objects and powerful modeling tools that combine the best of vector drawing programs (like Illustrator or Freehand) with a 3D modeling environment. Just like their 2D counterparts, Bézier splines are defined by complex math with convenient handles. This means you have complete control over the shape and curvature of each section of the curve, and they will render completely smooth no matter how close you zoom in on them. Many complex shapes beyond the simple primitives can be drawn and created using the tools in Strata Design 3D CX for Bézier splines.

## Working with Bézier Splines

Design 3D splines are very similar to splines you may be familiar with from using your favorite drawing applications, such as Adobe Illustrator. The following review discusses the basics of Bézier spline editing.

### Using Control Points and Handles

The control point determines the absolute position of the line path or object edge as it passes through that point. Each point has two direction handles (if visible) that control or influence the curve of the line segment between it and the next point on either side. The further a direction handle is pulled out by clicking-and-dragging from its control point, the more force it applies to its line segment to bend or curve it.



If the handles of a point are not visible, this means that they are "collapsed" and the point functions as a cusp, or hard break in the curve. To pull a point out, click and drag on the handle with the **Command** key (Mac) or **Control** key (Win) held down. To collapse the handles again, drag the handle to overlap the control point, then release the mouse button.

### Hinging Direction Handles

You can hinge the control points so that its direction handles can be moved independently to adjust the curve of the line segments separately on either side of the point. To hinge a control point, hold down the **Option** key (Mac) or **Alt** key

(Win) while dragging one of the direction handles. Once you break the alignment between direction handles for a particular point, either handle can be later moved freely without using the Option or Alt key again.

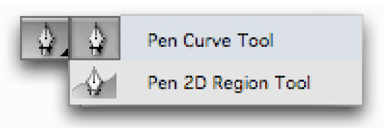
**Aligning Direction Handles**
Control points usually have direction handles that pass through that point in a straight line, creating a smooth curve through the point. When the direction handles are aligned, they are hooked together. Adjusting one handle also moves the one on the other side.

To re-align previously hinged direction handles, grab one of the handles and move it until it is visually aligned with the one on the other side of the point and it locks into position. When you release the mouse button, the direction handles become linked together. If you move one of the direction handles again, the other follows. You can also select the **Align Handles** command from the Modeling Commands palette.

## Bézier Curves and Regions

Bézier curves and 2D regions can be imported from other software, or created in Strata Design 3D CX. These curves and regions have many uses; for example they can become complex animation paths, or form the template for Lathe or Extrude operations.

### Drawing Bézier Curves and Regions




Hotkey: **B**
The **Pen Curve Tool** and the **Pen 2D Region Tool** are used to draw Bézier lines or regions. Bézier curves are **3D objects** - meaning they can be drawn and/or edited in more than just a flat, 2D plane. Bézier 2D regions, in contrast, only exist in a **2D plane**.

Bézier curves and 2D regions are drawn in the main Modeling window. To change their shape, adjust the control handles or otherwise alter them, you will need to enter **Edit** mode.

To switch from the Pen Curve Tool to the Pen 2D Region Tool, hold down the tool's icon, then make your selection from the tool's pop-out.
Both the Curve and Region tools work very much like they do in your favorite drawing application. To begin drawing, select the tool and click anywhere in the Modeling window. To draw the next point, click again.

To make the line or region edge curve through the point where you click, just click-and-drag. A control handle is dragged out to determine the direction of the curve. The length of each control handle determines the length of the curve. To complete the line, **double-click** or press the **Return** key. Clicking on the first point closes the Curve or Region.

If you make a mistake while drawing with either tool, press the Delete key at any time during the drawing process to remove the last point (and segment) you drew. To remove more than one segment, continue to press the Delete key until as many line segments as you would like have been deleted.

Curve and Region Tool Modifier keys:
**Shift** = constrains drawing or dragging to 45 degree increments.
**Option** (Mac), **Alt** (Win) = breaks continuity on Bézier handles, creating a sharp corner or hinged joint.

## Editing Bézier Curves and 2D Regions


To edit Bézier curves and 2D regions, click the **Edit** button at the top of the Tool palette, or choose the **Edit Object** command from the Modeling menu.
When you enter Edit mode, the Tool palette will change to display the tools that can be used to edit the object. In the lower section of the tool palette you will find the Guide Tool, the Grid Tool; and View Move, Rotate and Zoom. These tools work the same way as they do elsewhere in the software.

### Move Element Tool

Use the Move Element Tool to select points, move points or manipulate handles. You can select and move more than one control point at one time. To select multiple points, you can either drag a marquee around them, or click on the points one at a time while holding down the Shift key. When you drag one of the selected points, all of the selected points move in unison. If all points are selected, moving one point moves the entire object. To deselect a single point, Shift-click on it, and to deselect all points, click anywhere in the window away from the object.

### Add Point Tool

To add a point select the Add Point Tool and click anywhere on the spline. Each click will produce a new point on that spline while retaining the shape of the overall object. To delete control points, select the points you wish to remove (using the Move Point Tool) and press the **Delete** key. The object will redraw to show its new form.

**Make First Point**
All Bézier splines have a beginning and ending point. The beginning point can be changed, if needed, by selecting the point and then choosing the **Make First Point** command from the Modeling Commands palette.

The green handle of a Bézier spline indicates the beginning point; the red handle is the ending point. All other points are represented by black squares. The beginning and ending point on closed 2D regions are the same point and are represented by a green point. All other points are represented by black squares.

The location of the beginning point is usually set with the first click of the mouse, and in most situations it doesn't matter which point is which. However, there are times when you may want to shift the beginning point to align it with the beginning points on other curves or regions. For example, when you create ribs for Skin objects, the beginning point is very important to the end result.

If you use a Bézier curve or region as an animation path, the beginning and ending point also make a difference. You can use the **Convert to Path Tool** to transform a Bézier curve or region into an animation path.

**To make a different point the first point**, select the desired point, then choose **Make First Point** from the Modeling Commands palette. The selected point will become the first point.

## Editing Bézier Surface Objects

Bézier surface objects can be created in Design 3D in different ways. You can create a Bézier surface by Converting another object type or by using one of the Bézier modeling tools such as Lathe, Extrude, Path Extrude, Skin and Hull.

Once you've created or imported a Bézier surface into Design 3D you can change its shape by using **Edit Object**. If the object you select cannot be edited, the command is dimmed, and you will need to **Convert** it to a Bézier Surface.

**To Convert** an object to a Bézier Surface, select the object and then choose Convert from the Modeling menu or from the Button Bar icon. You can also double-click on the object with any of the Object Manipulation tools to open the Convert dialog. In the Convert dialog, select Bézier Surface.

You can begin an Edit Object session in several different ways:
• By double-clicking on an editable object.
• By using the hotkeys: **Command-L** (Mac) or **Control-L** (Win).

• By selecting the object and then choosing the **Edit Object** command from the Modeling menu.
• By pressing the **Edit** button at the top of the main Tool palette.
• By selecting the **Edit Object** command from the **Plus menu** of the Object Properties palette for the selected object.

You can end an Edit Object session in these ways:
• By closing the Edit window.
• By using the hotkeys: **Command-E** (Mac) or **Control-E** (Win).
• By toggling the **Edit** button at the top of the Tool palette.
• By selecting End Edit from the Modeling menu.

**Edit Location And Windows**
If you choose to use the Edit Object command from the Modeling menu the object will be edited directly in place in the Modeling window. If you double-click on the object (using any of the three Object Manipulation tools) it will open in a separate window where it can be edited by itself in isolation.

To edit an object that belongs to a group or shape, you can double-click on the group or shape. The group or shape opens in its own window, allowing you to select a single object. You can then edit the object in this window, or double-click to edit in a separate window.

## Bézier Edit Tools


When you enter Edit mode, you will notice the Tool palette changes. The tools specific to the type of object you are editing are located at the top of the Edit tool palette. In the lower section of the tool palette you will find the Guide Tool, the Grid Tool and the View Move, Rotate and Zoom tools. These tools work the same way as they do elsewhere in the software.

**Constraining Movement**
When you use the Move Element Tool, you can click and drag freely, use a custom grid or guide, or you can use the modifier keys to constrain the movement.

**NOTE:** You can create a custom grid or guide in the precise location and orientation that you need, and then use it to constrain the movement of elements while in Edit mode. See **Chapter 4 - Advanced Modeling** for more information.

**Perpendicular to the Active Grid**
Modifier = **Command-Shift** (Mac), **Control-Shift** (Win)

You can manipulate selected elements perpendicular to the active grid by first holding down two modifier keys - Command-Shift (Mac) or Control-Shift (Win). A temporary guide line appears to assist you in the proper placement of the selected elements.
To change grids, and therefore change the axis to which movement is constrained, use the "**+**" or "**-**" keys on the keypad. Pressing either of these keys toggles you through all available grids, including any User-defined (custom) grids.

**Move Element Tool**
Use the Move Point Tool to select points, move points or manipulate handles. You can select and move more than one control point at one time. To select multiple points, you can either drag a marquee around them, or click on the points one at a time while holding down the Shift key. When you drag one of the selected points, all of the selected points move in unison. If all points are selected, moving one point moves the entire object. To deselect a single point, Shift-click on it, and to deselect all points, click anywhere in the window away from the object.

**Move Normal Tool**
Use the Move Normal Tool to move selected points in the direction the surface normal faces.
An alternative behavior to grid relative manipulation is "**normal**" relative. A normal can be thought of as a line that extends perpendicular from the face or faces associated with the element, pointing directly away from the element.

**Add Point Tool**
To add a point select the Add Point Tool and click anywhere on the Bézier surface. Each click will produce a new point while retaining the shape of the overall object.
To delete control points, select the points you wish to remove (using the Move Point Tool) and press the **Delete** key (Windows users may also use the **Backspace** key.) The object will redraw to show its new form.

## Bézier Modeling Tools

### Lathe Tool

Hotkey: **U**
The Lathe Tool is located in the 2D to 3D Tools popup on the Tool Palette. You can use the Lathe Tool to rotate a 2D primitive or spline object around an axis to create a 3D object.

The effect is similar to extruding a profile around in a circle where the axis perpendicular to the 2D object is constantly turning. With the Lathe Tool, this axis can be "tilted" to create a rotating Sweep surface as well. The object that is rotated is called the Lathe Template, and can be edited after it has been swept.

Either filled objects or unfilled paths can be used in the Lathe operation. However, if a filled 2D object is lathed less than 360 degrees, it appears as a solid object with endcaps, but the same lathe operation performed with an unfilled 2D object appears hollow with no endcaps.

**NOTE:** If you're going to apply a transparent texture to a lathed object that is rotated 360 degrees (or more), you'll want to use an unfilled template. Otherwise, when the image is rendered, the endcaps will appear as seams in the surface of the object.

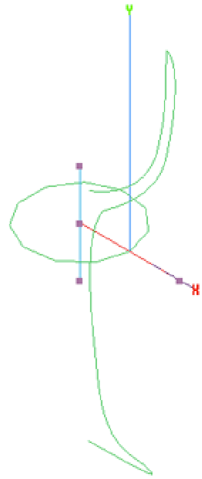
**How to Lathe**

Select the Lathe Tool and click on a 2D element to select it as the Lathe Template. Once it is highlighted as selected, click on a red handle on the bounding box to revolve around the object around the opposite handle. This is the same as defining which side of the Template will be on the "outside" of the revolving profile.

Make a single click on any of the rotation handles to rotate the profile exactly 360 degrees, or grab the handle and rotate the profile to define a specific number of degrees by interactively clicking and dragging in the workspace. The lathe angle and number of rotations are shown in the **Numeric Feedback** area of the Button Bar while you are dragging the Lathe profile.

When you release the mouse button, the Lathe will be completed and you can see the results in the Modeling window. However, you can select the Lathe tool again to adjust the axis location and direction, and the rotation.

When you select the Lathe Tool again, **green** wireframe lines will appear to show you the approximate revolution amount, while a **red** horizontal line provides a handle to adjust the rotation amount.

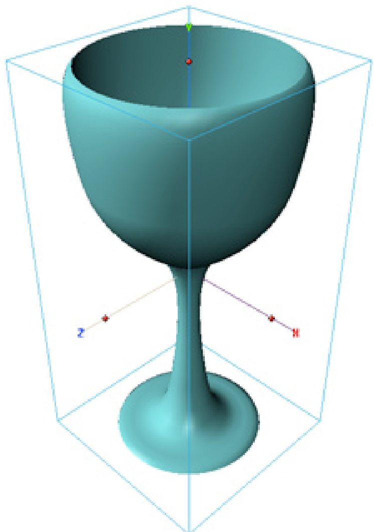


At the center of your Lathe object, a **blue** vertical line with **purple** top and bottom handles indicates the axis location and direction. While you are still in the active Lathe Tool, you can click and drag on these handles to reposition or tilt the axis. Pressing the **Shift** key while dragging up on the center axis will Sweep the Lathe axis off of the original plane to create a corkscrew effect.

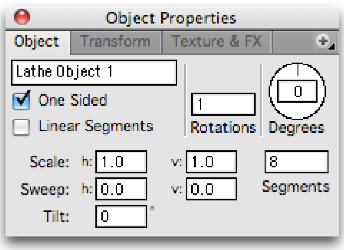
**TIP:** To quickly "preview" your Lathe object while you are adjusting the axis or revolution amount, press the Spacebar to toggle the View Move Tool on and off. This will show your Lathe object in whatever view mode you have set for the Modeling window without exiting the tool.

When you are through creating your Lathe, select any other non-temporary tool on the Tool palette (such as the Move Tool: "1") to complete the Lathe operation and examine the actual surface created.

If you choose the wrong initial 2D handle and lathe in the wrong direction, you can use the Undo command in the Edit menu, or you can simply step back using the History panel of the Details palette. You can still alter other aspects of the Lathe command from the Object Properties palette, and by clicking on the finished Lathe object with the Lathe Tool again.



**Lathe Object Properties**
Once created, the Lathe settings can be edited from the Object panel of the Object Properties palette. This includes options for changing the name, the Lathe rotation amount, segment information, and whether the object is one-sided or not. Other options include the Sweep settings which are not available in the initial Lathe creation and are outlined below.




Segment Settings:
• **Linear segments:** This checkbox controls whether the Lathe is smoothly revolved or uses separate, linear segments.
• **Segments:** This field indicates the number of segments the lathed object has. The higher the value in this field, the smoother the surface of the object appears (and the longer it will take to render!).

Rotation Settings:
• **Rotations:** This field keeps track of the total number of rotations. Each time the axis is rotated more than 360 degrees, the number in this field increases by one. You can increase or decrease the number of rotations using this numeric field.
• **Degrees:** This value indicates the degrees of rotation used to create the lathed object. Enter any number in the numeric field. If you use a value greater than 360 degrees, the effect is not visible unless you move the horizontal or vertical axis to any value other than one. This is equivalent to a sweep operation.

Sweep Settings:
• **Scale:** This value indicates the percentage of the height and width of the template that EACH segment is scaled, relative to the previous segment. Each segment will get progressively larger or smaller.
• **Sweep:** The value in the horizontal field controls the perpendicular distance from the axis that each segment moves, relative to the previous segment. The value in the vertical field determines the distance each segment moves ALONG the axis, relative to the previous segment.
• **Tilt:** This value represents the number of degrees that the axis of rotation is tilted relative to its original orientation.

**Editing Lathe Objects**
You can alter Lathe objects in two additional ways:
**In the main Modeling window**, you can alter the axis distance from the center of the lathe operation by selecting the lathe object again with the Lathe Tool. You can then edit the axis just as when you created the Lathe object. To perform a sweep, hold down the Shift key, then grab the center handle on the axis and move it up or down.

**In Edit mode** you can change the original 2D Template of a lathed object. To enter Edit mode, double-click the Lathe object, press the Tool palette Edit button while it is selected, or use the Edit hotkeys. The Tool palette will change to provide appropriate tools, and double-clicking will open the object in a separate window to isolate it from other objects in your scene.

The tools available in Edit mode for Lathe objects are the **Add Point Tool** and the **Move Element Tool**. These tools function in the same way as they do in Bézier Surface editing, described above.

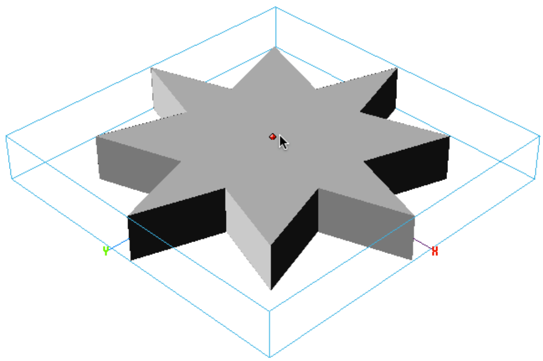
## Extrude Tool

Hotkey: **U**

The Extrude Tool is located in the 2D to 3D Tools popup menu on the Tool Palette.

The Extrude Tool allows you to create 3D objects from 2D objects. The **Extrude Tool** is located in the 2D to 3D Tools pop-up menu of the Tool palette.

To use the Extrude Tool, select any 2D object or 2D group to use as a template for the Extrude operation. Once selected, a 2D bounding box with a single red handle in the center appears around the object. If an object isn't suitable for extruding (such as a 3D curve or surface), no handle appears and it cannot be Extruded.

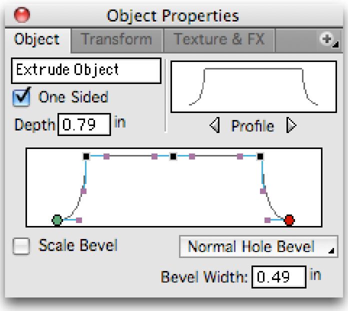


Extruded objects are interactively created with straight sides perpendicular to the 2D object, but these settings can be modified later.

To extrude the object, grab anywhere on the face and pull or push on the red extrude handle. The extrusion always occurs in a direction perpendicular to the face of the 2D object. If the face is pushed beyond the original position, it inverts and continues to extrude in the opposite direction.

### Extrude Object Properties

Many of the features of an extruded object can be edited using the Object panel of the Object Properties palette. This includes options for changing the name, the extrusion depth, and preset Bevel profiles.




• **Profile:** This area contains a preview of the current bevel. You can change the bevel by using the arrows to scroll through the pre-defined profiles.
An edit window is provided to edit the profile that appears in the preview area. When you click in the edit window, you can reposition the control points and their handles.
To add a point, hold down the Option key (Mac) or Alt key (Win) and click at the position on the line where you want to add a point.
• **Scale Bevel** checkbox: When a check appears in this box, the Scale Bevel option is enabled. If the box is not checked, the Router Bevel is used instead.
• **Hole** extrusion method: This field contains the current hole bevel option: None, Normal, or Inverted.
• **Bevel Width:** This setting indicates the current width of the bevel.
To change the width, enter a different value in this field, then tab out of the field or press the Return key.

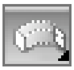
**Editing Extruded Objects**
You can alter Extrude objects in two additional ways:
**In the Modeling window**, you can interactively change the depth of the extrusion, by selecting the extruded object with the Extrude Tool and dragging the center handle.

**In Edit mode** you can edit the extrude face (the original 2D object) and the bevel of an Extrude object. To enter Edit mode, double-click on the object. The extruded object will open in a separate window and the Tool palette will change to provide appropriate tools. You can also select the Edit Object command from the Modeling menu to edit the 2D object and the bevel directly in the Modeling window.

The tools available in Extrude Edit mode are the **Add Point Tool** and the **Move Element Tool**. These tools function the same way as they do in Bézier Surface editing, described above.

**NOTE:** If you Convert a Extrude object to a Bézier Surface, the result will be a Group of Bézier objects. If you UnGroup the objects, you can then edit the components of the group individually. You can also double-click on the converted object (group) to open the group window, where you can edit the individual Bézier objects.
This happens because Extrude creates an object with endcaps. When you Convert a Path Extrude object to a Bézier Surface, Strata 3D converts all of the pieces of the object, and then Groups them together.

## Path Extrude Tool

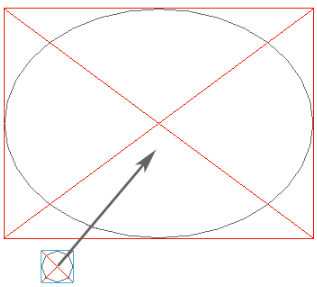


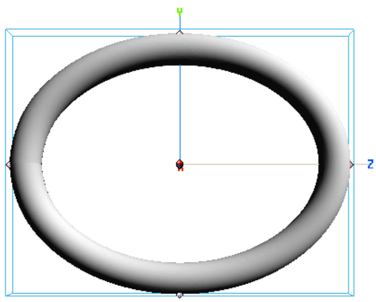
Hotkey: **U**
The Path Extrude Tool, found in the 2D to 3D Tools pop-up of the Tool palette, allows you to extrude a 2D object along a pre-designated path to create a new 3D object. The 2D object, or profile, will be extruded perpendicular to path, and the final surface will be positioned in the same location as the path.

### Using the Path Extrude Tool

Start by drawing an open or closed curve with one of the 2D primitives or the Pen Curve Tool (or you can import a spline path from your favorite drawing program such as Adobe Illustrator) to use as a path for the extrusion. The direction the line is drawn determines the direction the 2D object you'll extrude will "move" along the path, from its beginning point to its ending point. (The 2D object is always extruded perpendicular to the path.)

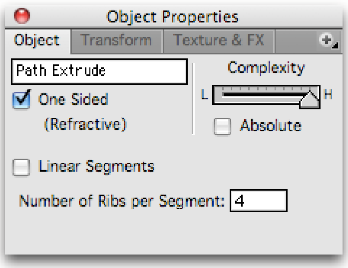
Next, create or import a 2D object to extrude. You can use any single 2D object as a source for the extrusion. It can be filled or hollow, open or closed. To perform the extrusion, select the Path Extrude Tool and **click-and-drag** from the 2D object to the path. Each object will be highlighted with a **red X**, and when you release the mouse button, the 2D object is repositioned to extrude along the path.





**TIP:** Always click on the object you want to extrude first (the profile), and then drag to the object you want to use as the path. If both objects are 2D then either can serve as the path or profile - so the order is extremely important.

**Path Extrude Object Properties**
You can edit some of the features of a selected Path Extrude object using the Object panel of the Object Properties palette. This includes options for changing the name, the complexity when rendered, and whether the object is one-sided or not. Other choices include the Segment and Rib options which are outlined below.




• **Linear segments:** When this box is checked, the areas between segments contain flat surfaces, creating a ridge-like appearance. When this box is unchecked, the areas between segments create a smoothly curved surface.
• **Number of ribs per segment:** This field indicates the number of ribs placed between each segment, which controls the precision of the final Path Extrude. (Segments are defined by the position of Bézier points on the original Path curve - so if you have 4 points on the Path, a number of 2 will produce 8 ribs.)

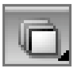
**Editing A Path Extrude Object**
You can also edit Path Extrude objects in **Edit mode**. To edit either the path or the original 2D object, double-click the Path Extrude object or select the Edit Object command in the Modeling menu.
When you enter Edit mode, the Tool palette will change to provide appropriate tools. When you double-click the path extruded object it will open in a separate Edit window. When editing a Path Extrude object, direction handles appear on the control points of both the original 2D object and the path, and you can edit either object as desired.

The tools available in Edit mode for Path Extrude objects include the **Add Point Tool** and the **Move Element Tool**. These tools function the same way as they do in Bézier Surface editing, described above.

**NOTE:** If you Convert a Path Extrude object to a Bézier Surface, the result will be a Group of Bézier objects. If you UnGroup the objects, you can then edit the components of the group individually. You can also double-click on the converted object (group) to open the group window, where you can edit the individual Bézier objects.

This happens because Path Extrude creates an object with endcaps. When you Convert a Path Extrude object to a Bézier Surface, Strata 3D converts all of the pieces of the object, and then Groups them together.

## Skin Tool



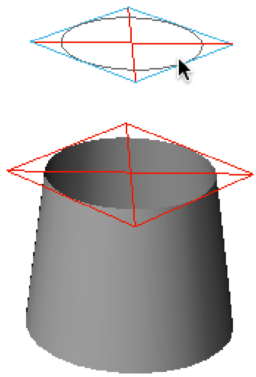
Hotkey: **U**
The Skin Tool, found in the 2D to 3D Tools pop-up menu on the Tool palette, allows you to create a "skin" across two or more "ribs" (2D objects) to create a Skin object. This is similar to the way boats and aircraft are built with repeated profiles defining the shape of each segment, and a smooth covering is "stretched" across them to create flowing 3D surface.

There's no real limit to the number of ribs you can use with the Skin Tool, and any 2D object can be used as a rib, whether filled or unfilled. The ribs do not even have to contain the same number of edges or vertices or similar shapes. For example, one rib can be a rectangle and one a circle. The surface created between them will be based on "averaging" their profiles in the space between them.

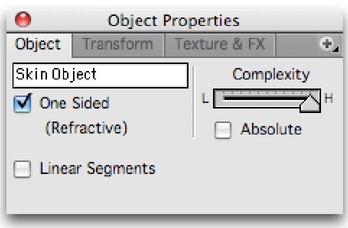
### Using the Skin Tool

To create a Skin object, first make sure you have two or more 2D objects in your scene that you wish to skin together. Next, select the Skin Tool and use the tool to **click-and-drag** from one 2D object to the next. Each pair of ribs will be highlighted with a **red X** when it is selected. The skin surface appears as soon as the mouse button is released, and the ribs are connected. You can add more ribs by repeating the click-and-drag action from an end rib to the next 2D object you wish to use.

**NOTE:** The order in which you connect the ribs will determine the final shape of the Skin object, so select rib objects when you can clearly tell which is which. If you make a mistake in skinning, you can always undo the action, or use the UnSkin Tool as well. The UnSkin Tool is accessed by selecting the Skin Tool while holding down the Option/Alt key.



**Skin Object Properties**
You can edit some of the parameters of a Skin object using the Object panel of the Object Properties palette. This includes options for changing the name, the complexity when rendered, and whether the object is one-sided or not.




• **Linear segments:** When this box is checked, the areas between segments are flat surfaces, creating sharp angles between ribs. When this box is unchecked, the areas between segments create a smoothly curved surface.

**Editing Skin Objects**
To push or pull individual points on the surface of the final Skin object, you must first **Convert** it to a Bézier surface or polygonal mesh. Once you convert a Skin object to another type, you can then use the Edit Object command to edit the surface. However, once you convert a Skin object to another type, you can't convert it back into a Skin object again.

You can edit Skin objects in these additional ways:
**In the Modeling window.** To edit the shape of individual 2D ribs of a Skin object, you must first UnSkin the object. See UnSkin, below. You can then edit the

individual rib(s) just as you would any 2D object. When you're finished editing the ribs you can re-skin them back to the original Skin object.

**In Edit mode** you can move, rotate and scale the ribs of your Skin object. The skin of the object will adjust to the changes you make.
To enter Edit mode, either double-click the Skin object, press the Edit button at the top of the Tool palette or choose the Edit Object command from the Modeling menu. Double-clicking will open a separate Edit window. When you enter Edit mode, the Tool palette will change to provide appropriate tools.

**NOTE:** If you Convert a Skin object to a Bézier Surface, the result will be a Group of Bézier objects. If you UnGroup the objects, you can then edit the components of the group individually. You can also double-click on the converted object (group) to open the group window, where you can edit the individual Bézier objects.
This happens because Skin creates an object with endcaps. When you Convert a Skin object to a Bézier Surface, Strata 3D converts all of the pieces of the object, and then Groups them together.

**Move Element Tool**
Hotkey: **1**
This tool allows you to select and move the individual ribs of the Skin object. The "skin" of the object will adjust to the new location of the rib. You can use the handles to constrain movement to a particular axis.

**Rotate Element Tool**
Hotkey: **2**
Use this tool to select and rotate the ribs of the Skin object. The skinned surface of the object will adjust, creating a twisted effect. You can rotate the ribs on any axis using the handles, and you can constrain movement using the modifier keys.

Rotate Element Tool Modifier keys:
**Shift** = constrains the rotation to 45˚ increments.
**Command** (Mac), **Control** (Win) = moves the object Origin point without moving the object itself. Rotation occurs around the Origin point, so moving it and then using the Rotate Element Tool allows you to create an "off-center" rotation.

**Scale Element Tool**
Hotkey: **3**
This tool allows you to scale the ribs of a Skin object. Scaling a rib enlarges or reduces it. You can scale by clicking and dragging on the handles, or you can constrain the scale operation using the modifier keys.

Scale Element modifier keys
**Shift** = maintains the proportions of the rib while enlarging or reducing its size.
**Option** (Mac)**, Alt** (Win) = scales an object about its geometric center.
**Option-Shift** (Mac), **Alt-Shift** (Win) = scales an object proportionally from the object's geometric center, regardless of which handle you may be using.

## UnSkin Tool

The UnSkin Tool lets you remove the skin between any two ribs of a Skin object. You can access the **UnSkin Tool** by selecting the Skin Tool while holding down the **Option/Alt** key. Then drag between the ribs from which you want to remove the skin. When you select the segment to UnSkin, it appears highlighted in a red box. When you release the mouse button, the skin surface disappears, leaving only the ribs.

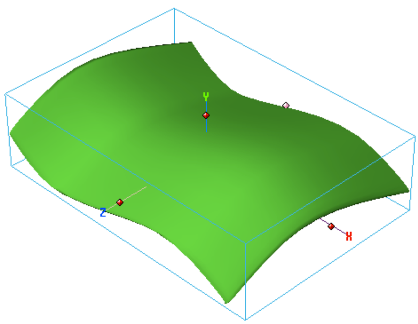
## Hull Tool

The **Hull Tool** forms a surface between four Bézier curves as if they were the four sides of a cloth. Using Hull you can create complex Bézier surfaces that may be difficult to define otherwise. The Hull command can be found in the Modeling menu, or in the Modeling Commands palette.

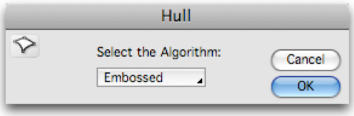
### Creating a Hull Surface

To create a Hull surface you need to start with four open (unclosed) Bézier curves. You can create these curves using the Pen Curve Tool or you can import the lines from Adobe Illustrator or similar software.

Once you have your four curves drawn and positioned the way you want them, you're ready to create the surface. First, select all four curves. You will note that the Hull command only becomes active when you have four - and **only four** - Bézier curves selected.



Select the Hull command from the Modeling menu or the Modeling Commands palette. The Hull surface dialog will appear. The dialog provides a pop-up menu allowing you choose the algorithm used to create the surface. The options are Flat and Embossed.

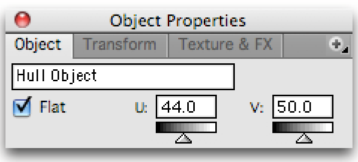



• **Flat:** This algorithm creates a linear interpolation between the Bézier lines. In other words, it makes the new surface as flat as possible.
• **Embossed:** This algorithm exaggerates the changes in the surface. It results in a surface with more curves.

**Editing a Hull Surface**
There are two ways to edit a Hull surface - you can use the **UnHull** command from the Modeling menu to get access to the original Bézier curves to edit them individually, or you can convert the Hull surface to a 3D Bézier surface which can be edited.

To edit the original Bézier curves, first **UnHull** your surface by selecting it from the Modeling menu. This removes the Hull surfaces, leaving the four original curves. You can then select the individual curves and use Edit Object command or double-click them to quickly Edit them. You can use the Hull Tool again to rebuild the surface from these edited curves.

**Hull Object Properties**
After you've created the Hull object you can edit some of the options of the surface, which includes naming the object and two unique properties outlined below. To get access to these options first select the Hull object and then bring up the Object panel of the Object Properties palette.




• **Flat** checkbox: The Flat checkbox lets you change from Embossed to Flat - and visa versa - after the Hull object is formed. You can use this to change from

one type of interpolation to another at any point, but this feature is not time varying.
• **U and V**: The U and V settings on the Object Properties palette change the interpretation of the Hull surface. In other words, you can make the surface lean or flow from one side to the other. This weighting towards one side or the other can change over time.

At the default settings of **u=50** and **v=50**, all four sides are weighted equally. Use the sliders or enter a value from 1 to 100, with the extreme ends of the scale pulling the surface toward one side or the other.

# Working With Polygon Mesh

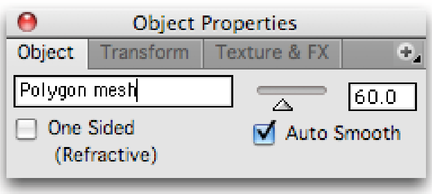
## About Polygonal Mesh Objects

Polygon mesh objects are made up of a series of individual flat faces. These faces can produce an object that appears to have flat surfaces such as a cube, or the polygons can approximate a curved surface like facets on a very fine diamond.

In Strata Design 3D CX, polygonal objects can either be a **Polygon Group**, which is just like a group of many individual polygons; or a **Polygon Mesh**, where individual polygons are linked together at their edges and corners to form a mesh. Many non-polygon objects, such as 3D primitives and Bézier surfaces, can be converted into Polygon Groups or Polygon Meshes with the Convert command. This can be a good way to begin to build a more complex polygon object. You can also import polygonal objects which can be used as a starting point for further editing.

Polygon objects can be modified with the Object Properties palette, subdivided into a subdivision surface object, and edited with a broad variety of tools for explicit surface control. It is the ease of editing and simplicity that gives polygonal objects their greatest strengths.

**Polygon Mesh Object Properties**
Once you have a polygon mesh object in your model - whether you've converted an object or imported an object, you can make some overall modifications to its appearance using the Object panel of the Object Properties palette. This includes options for changing the name, whether the object is one-sided or not (for refraction and volumetric effects), and the Smoothing Angle.




**Smooth Angle**
The Smooth Angle slider sets the maximum angle between adjacent polygons that will produce a smooth rendered look. If the angle of incidence between any

two polygons is greater than this value, no smoothing occurs at that boundary, and the surface appears creased in the Smooth Shaded or rendered views.

The Smooth angle slider goes from 0 to 180 degrees. Generally, the higher the value, the smoother all facets of an object appear, but this is based on the shape of your mesh. Lower values result in a more angular, or faceted appearance at smaller angles. You can toggle this option on or off by checking the **Auto Smooth** checkbox. When unchecked, no smoothing is applied by Design 3D, but if the object is an imported mesh it may already contain smoothing data that can be used instead.

It's important to note that the Smooth angle does not add polygons to create a smoother curved look - it is simply a rendering technique of smoothing out the shading of adjacent polygons. To actually smooth an object with more polygons to approximate the surface you'll want to use the **Subdivide** command.

## Subdividing a Polygon Mesh

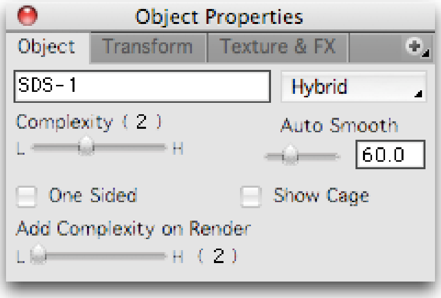
The Subdivide command is one of Design 3D's most powerful and frequently used modeling features.

Subdividing a polygon surface approximates a curved surface by breaking the polygons into smaller and smaller faces, using a spline-like curve to fit the new mesh within the points that made up the original polygons. This original polygon mesh is retained as a "cage" which still controls the shape of the subdivided surface "inside" it, and is used when reshaping the Polygon surface.

Any Polygon mesh object can be either permanently or temporarily subdivided into a subdivision surface by selecting the mesh and then selecting the **Subdivide** command from the Modeling menu.
To reverse the subdivision of the Polymesh object, select the **UnSubdivide** command from the Modeling menu.

### Subdivision Surface Object Properties

Once you apply the Subdivide command to a Polygon Mesh object, the Object panel of the Object Properties palette changes to reflect the object type. This includes the typical options for changing the name and whether the object is one-sided or not (for refraction and volumetric effects). There are several other specific properties which are outlined below.




• **Subdivision type:** The Subdivision Type drop-down menu allows you to choose from Triangle, Quad, and Hybrid subdivision types. This controls the way that the base mesh (“cage”) is subdivided with each level of complexity. This can greatly effect the final shape of your object!
- The **Triangle** method will subdivide your polygon mesh object using all triangular (3-sided) sub-polygons. This method can lead to unpredictable results when the base mesh is not also triangulated.
- The **Quad** method will subdivide your polygon mesh object using all quadrangular (4-sided) sub-polygons. This results in flexible and predictable shapes, especially from quadrilateral meshes. Many external subdivision-surface modelers use this type, so if you import files from other modelers for subdivision this may be the best option. (This type is also known as Catmull-Clark subdivision, named for its inventors.)
- The **Hybrid** method is a combination of both Triangle and Quad subdivisions, using either 3 or 4-sided sub-polygons whenever they are needed. This makes it both efficient and predictable when a single type of polygon is not needed in the subdivided mesh.

• **Complexity:** The Complexity field and slider sets the degree to which the object will be subdivided. The higher the number, the greater the number of subdivisions. This type of Complexity slider is different from the object sliders because it is always an absolute value. The range for this field is from **0 to 5**. A value of zero does not subdivide the original polygon mesh, while 5 subdivides each polygon section five times.

• **Auto Smooth:** The Auto Smooth slider sets the maximum angle between adjacent polygons that will produce a smooth rendered look. This is similar to the Smooth Angle in all other polygon mesh objects.

• **Add Complexity On Render:** This second Complexity slider will add subdivisions to your object only when you render it with one of the pixel-based renderers (such as Raytracing or Raydiosity). This extra level of subdivision is “added on” to whatever level you choose in the main Complexity attribute. This is extremely useful for working with a low-resolution object and having it appear high-resolution only when it is necessary.

• **Show cage:** Checking this option will show the "cage" (the original polygon mesh) in the modeling view, even though the surface may be subdivided to a finer level. The cage will always show as a wireframe around your object, regardless of the display mode of the Modeling window. The cage wireframe lines are displayed in different colors based on the attributes of the mesh underneath.

## Editing Polygon Mesh Objects


In **Polygon Edit mode** you can edit either polygon mesh objects or the cage of a subdivision surface object. Polygon Edit allows you to modify the shape of a polygonal object in many ways.

You can work with points (vertices), edges or faces. You can move, rotate, scale, extrude, inset and bevel these elements, either individually or in group. You can also add and delete elements.

To begin editing a polygon-based object you can choose one of three ways; **double-click** the object, select the **Edit object** command in the Modeling menu, or toggle the **Edit button** at the top of the Tool palette. If you use the Edit object command or Tool palette button, the object will be edited directly in the Modeling window. If you double-click on the object (using any of the three Object Manipulation tools) the object will open in a separate window where it can be edited without the clutter of any other objects.

In the lower section of the tool palette you will find the Guide Tool, the Grid Tool; and View Move, Rotate and Zoom. These tools work the same way as they do elsewhere in the software.

## Element Editing Modes

Polygon surfaces and cages are made up of **vertices** (also known as points), **edges** (lines connecting points) and **faces** (“whole” polygons, which are defined by three or more edges and a surface between them). The polygon editor operates in three different modes that allow you to work on each of these elements.

To change from one mode to another, click on one of the three element mode buttons at the top of the polygon editing tool section of the Tool palette. These mode buttons are, from top to bottom, **Vertex**, **Edge** and **Face**. You can also switch between them very quickly by using the following hotkeys:

Hotkey: **1** to work in Vertex Mode.
Hotkey: **2** to work in Edge Mode.
Hotkey: **3** to work in Face Mode.

**NOTE:** Active selections are transferred when switching modes. When you switch from one mode to another while an element is selected, the associated elements in the next mode you switch to will also be selected. For example, if you select a four-sided polygon face, then switch to Edge Mode, you will have the four edges of that face selected. If you switch to Vertex mode, the four corner points will be selected.

#### Hide Selections

You can use the Hide Selection slider at any point in the editing process. This feature temporarily hides any selected elements, giving you a normal view of your object. Hide Selection allows you to check the progress of your model without the selection indicators interfering. It is particularly useful if you are working with many selected points or edges in a small area.

You can access Hide Selections in two ways. You can use the Hide Selections control in the Polygon Edit Tool palette, or you can use **Shift-Y** to toggle back and forth between views.

#### Tool Selection Hotkeys

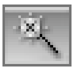
All of the Polygon Mesh editing tools have **hotkeys**, and can be selected with one keypress. Pressing the hotkey for one of the tool group pop-ups selects the first tool in the menu. Hitting a tool’s hotkey a second time selects the next tool in the pop-up. Holding the hotkey down selects the associated tool temporarily, and when you release the hotkey, the selected tool will revert to the previously selected tool.

## Selecting Elements

Selecting the appropriate elements is critical to editing a polygonal object. You can select elements (vertices, edges and faces) using any of the tools, and there are several ways to fine-tune your selection.

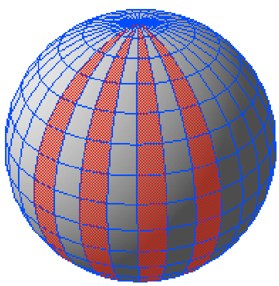
The **Magic Wand Tool** is specifically designed to make the selection process quick and easy, and can select patterns of elements. The selection pattern is determined by the options in the Tool Settings dialog, which is accessed by double-clicking on the Magic Wand icon.

### The Magic Wand Tool



Hotkey: **W**

This tool is a rules-based pattern selection tool. It does not change or transform the geometry at all, but can be used to quickly select patterns in a polygon mesh that would be otherwise difficult to select. The pattern selected is controlled by Horizontal and Vertical angle tolerances, a Modifier for the direction of the selection, and a Skip number to ignore certain numbers of interior elements.



The Magic Wand can have different settings for each modeling mode, allowing for one pattern to be selected in Vertex mode, and a different one for Edge and Face mode. Double-click on the Magic Wand Tool icon in the Edit tool palette to open up the Tool Settings dialog box.

**Magic Wand Tool Settings:**

• **Horizontal** and **Vertical Tolerance:** These settings range from 0-180 degrees, and reflect how much curvature difference across the surface of the object the selection will spread. A zero value in either range will constrain the pattern to the other direction only.

• **Modifier:** In some Modeling modes, a pattern can already be selected, such as Ring and Loop in Edge mode. Use the Context menu to access Ring or Loop select. This allows the Horizontal and Vertical tolerances to be overridden by these patterns, but still includes the Skip option.

• **Skip every other:** This number is the whole number of pattern-matching elements that will be skipped when selecting the pattern. The element that is initially clicked on will be the start point, and elements after it that match the pattern will be skipped over based on this setting.

**Fine-Tuning Selections**

There are several methods you can use to fine-tune your selection:

**Using the "+" and "-" keys** - You can expand or contract a selection by pressing the "**+**" and "**-**" keys on the **main keyboard** (not the numeric keypad). The selection will expand or contract in all directions each time you press the key. The exception to the hotkey method of expanding or contracting a selection is if you have **Gravity** turned on and you are in Vertex mode. When Gravity is on, and the modeler is in Vertex mode, the "+" and "-" keys expand and contract the influence of the gravity.

**Modifiers for Making Selections:**

**Shift key** = To add to a selection. You can also hold down the Shift key and drag to **"paint select"** elements.

**Alt/Option key** = To deselect an element.

**Command/Control-A** = To select all of the object's vertices, edges or faces.

**Command/Control-1** = To deselect all of an object's elements.

**Command/Control-Shift-I** = To select the inverse of the current selection.

**Context Menu**

There are also several selection options in the Context menu, which is accessed by right-clicking on your object while in Poly Edit mode. See the **Context Menus** section below for more information.

**Changing Modes with Selections**

If you change modes while one or more elements are selected, the selected elements will change to reflect the new mode. For example, if you are in Vertex mode with one point selected, and you change the mode to Edge, the edges that connect to that point will become selected. If you then change to Face mode, the faces that are connected to the selected edges will become selected.

**Selecting Hidden Elements**
You can only mouse-select elements that are visible in the active view, which means the points, edges or polygons on the "back" of your object (facing away from the view or hidden by other elements) cannot be selected, even with a marquee, until you adjust the view. However, if you use Wireframe, Outline, or PointCloud display mode, these "backfacing" elements are visible and can be selected.

## Manipulating Elements

The polygon manipulation tools (all the tools except Magic Wand and Add Point) all work on the same basic principles. First you must select one or more elements, and then you can move the selected element(s). With elements selected, you can use the current tool or switch to another tool.
In all cases, you must either **click-and-drag** on a selected element or press the arrow keys to "**nudge**" the action of the tool. For multiple selected elements, the standard behavior is for the action to move the selected elements as a group about an average central point, or axis, relative to the active grid.

The movement of elements can be constrained or affected by modifier keys, Point gravity, the active grid, or the current guide.

You can use the standard grids and guides, or you can create custom grids or guides to constrain movement precisely while modeling. See **Chapter 4 - Advanced Modeling** for more information about creating and using standard and custom grids and guides.

**Perpendicular to the Active Grid**
Modifier = **Command-Shift** (Mac), **Control-Shift** (Win)
You can manipulate selected elements perpendicular to the active grid by first holding down two modifier keys - Command-Shift (Mac) or Control-Shift (Win). A temporary guide line appears to assist you in the proper placement of the selected elements.
To change grids, and therefore change the axis to which movement is constrained, use the "**+**" or "**-**" keys on the keypad. Pressing either of these keys toggles you through all available grids, including any User-defined (custom) grids.
**Normal Relative**
Modifier = **Command** (Mac) or **Control** (Win)

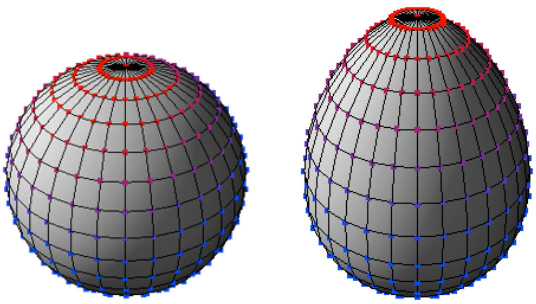
An alternative behavior to grid relative manipulation is "**normal**" relative. A normal can be thought of as a line that extends perpendicular from the face or faces associated with the element, pointing directly away from the element.

With normal-relative modeling, each action happens around the selected element's own normal-relative point or axis - unless there are two or more adjoining selected elements. In this case the adjoining elements move as a group about an average point or axis based on the normals of those adjoining elements.

The Move, Rotate, Scale and Extrude element tool pop-up menus all contain corresponding normal relative tools. Pressing Command or Control temporarily activates the Normal tool for the tool group you are using. When you release the Command or Control key, the tool selection reverts back to the main tool.

You can either select the Normal tool by clicking on it, or you can use the Command/Control modifier key to switch to normal relative movement.

**Gravity**
Hotkey: **V**
Gravity works only when you are in Vertex mode. With Gravity enabled, points close to the selected one will move along with the selected point, but to a lesser degree. This allows you to make smooth, organic alterations to polygon meshes.



To turn Gravity on and off hit the "**V**" hot key. When Gravity is on, the points adjacent to the selected point (or points) become tinted with the red selection color.
You can increase or decrease the amount of the gravity for the selected points by using the "**+**" and "**-**" keys on your keyboard. Point Gravity increases gradually, so you may need to press the keys several times to get the effect you want. As you increase the gravity you will notice that the red tint will increase in the points closest to the selected point. You will also notice that the tint extends to more and more points. The closer the tint gets to full red, the higher the level of gravity. Gravity is also available as a Context Menu command when you are in Vertex mode.

**Nudging Elements**
Hotkey: **Arrow keys**
With one or more elements selected you can "nudge" them using the up/down and left/right arrow keys. The nudge action is based on which tool is selected - Move, Rotate, Scale, Extrude or Bevel.

You can set the nudge amount for the Move, Rotate and Scale element tools by double-clicking on the tool icon to summon the nudge settings dialog. You can set different nudge amounts for each of these tools.
The Bevel and Extrude tools use the nudge amount set in the Move Element Tool settings dialog. The Extrude Tool Settings dialog allows you to choose between nudging by percentage or by distance.

Just as in nudging whole selected objects, the nudge keys move the selected elements in the expected direction in both the top and front views when the active grids are parallel to the view. These directions stay consistent - regardless of the view you are in.

Modifier keys for nudging elements in Polygon Edit mode:
**Command-Shift** (Mac), **Control-Shift** (Win)= moves the elements perpendicular to the active grid.
**Command** (Mac), **Control** (Win) = moves each selected element along its own normal.
**Shift** = increases the amount of the nudge by 10 times its usual amount.
**Option** (Mac) or **Alt** (Win) = decreases the amount of the nudge to 1/10th its usual amount.

**NOTE:** If you are using the Shift key as part of another hotkey combination, it will **not** accelerate the nudge. For example, if you press Shift-Spacebar to temporarily summon the View Rotate Tool, the view rotation will occur at normal speed.

## Using Custom Grids and Guides

Custom grids and guides are particularly useful in polygon mesh editing. You can create a grid or guide in the exact position and orientation you need, and then use it to precisely constrain the movement of elements while editing polygonal mesh objects.

For more information about creating and using custom grids and guides see **Chapter 4 - Advanced Modeling.**

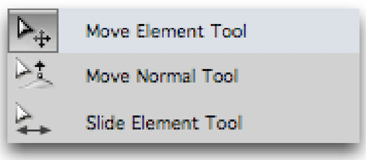
**NOTE**: You can use grids and guides with the Rotate and Scale element tools in Polygon Mesh editing mode. Normally, the center of the rotation for these tools is the center of the object or selection. However, the **origin** of a grid or guide can be used instead of the default, and the origin can be positioned in different ways.

The origin of the grid or guide can be active or inactive. In the active state, it becomes the center of rotation. If the origin is active, it will appear red. If the origin is not active, it will appear blue.
You can toggle the Active state on or off using the Project window controls (see below). You can also toggle this setting on or off for all grids and guides at any time by using the **Shift+ "."** (period) modifier keys.

## Polygon Mesh Edit Tools

All of the Polygon Mesh editing tools have **hotkeys**, and can be selected with one keypress. Pressing the hotkey for one of the tool group pop-ups selects the first tool in the menu.
Hitting a tool's hotkey again selects the next tool in the pop-up. Holding the hotkey down selects the associated tool temporarily. When you release the hotkey the selected tool will revert to the previously selected tool.

### Move Tools




Hotkey: **M**

The **Move Tools** are accessed through the Move Tool pop-up menu at the top of the Edit Tool palette, and are used to move selected points, edges or faces. You can move elements freely, or you can move them relative to the active grid. You can use the standard x,y or z grids; or you can create and use a custom grid. You can also use a standard or custom guide to constrain the movement of selected elements.

Double-clicking on any of the Move tool icons summons the Tool Settings dialog, where you can set the Nudge Amount. The value set in this dialog applies to each of the Move tools.

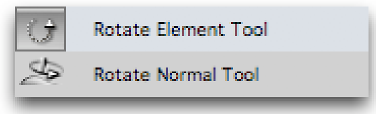
**Move Element Tool**
You can use the Move Element Tool to move selected elements freely, or you can constrain the movement. Select the element(s) you want to move, and drag

in the general direction you wish to move. You can also use the nudge keys for precise control.

**Move Normal Tool**
Use the Move Normal Tool to move selected elements relative to the element's normal. Select the element(s) you want to move, then click and drag or use the nudge keys.

**Slide Element Tool**
Hotkey: **Shift-S**
This tool works (and appears) in Edge mode only. Use the Slide Edge Tool to slide an edge or edges along two adjacent faces. Moving edge(s) in a positive direction constrains the movement of the edge along one face. If you move an edge in a negative direction, the movement will be constrained to the other face.

## Rotate Tools



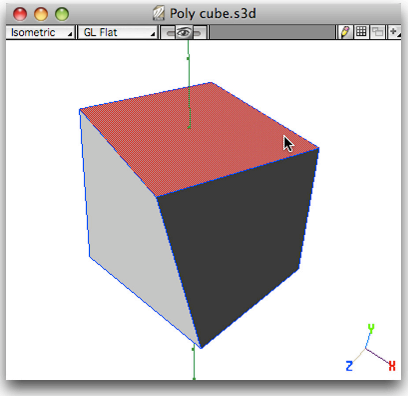

Hotkey: **J**

The **Rotate Tools** are located in the Rotate Tools pop-up menu, and are used to rotate selected elements. With one element selected, rotation occurs around the center of that element. With multiple elements selected, the default behavior is for rotation to occur around the center of the selected elements.

Double-clicking on any of the Rotate tool icons summons the Tool Settings dialog, where you can set the Nudge Amount. The value set in this dialog applies to each of the Rotate tools.

**Rotating with Guides and Grids**
The default behavior for the Rotate Element Tool is for selected elements to rotate around the center of the selected elements. If a guide is used to constrain rotation, the rotation will occur around the axis of the guide. If a grid is used, the axis of rotation is perpendicular to the plane of the grid.

**Rotate Element Tool**
Rotating works much like moving elements. To use the Rotate Element Tool, click on one of the selected elements and drag in the general direction you wish to rotate. When you click and drag, a temporary guide line appears to indicate the axis of rotation.



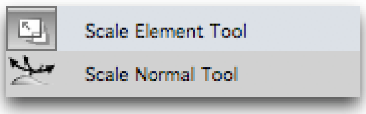

By default the selected elements(s) will rotate as a group around an axis central to the selected elements. The axis will be perpendicular to the active grid. To change the orientation of the axis, simply change the active grid.
You can also use a custom guide to constrain an element's rotation. For more information see **Chapter 4 - Advanced Modeling.**

You can use the nudge keys to rotate the selected elements around an axis. Double-click the Rotate Tool to set the nudge angular amounts.

**Rotate Normal Tool**
With this tool, you can rotate elements around the individual surface normals. Each selected element will rotate about its own normal unless two or more are adjoining. If two or more are adjoining they will rotate about an axis that is the average of the adjoining selected elements' normals.

To use the Rotate Normal Tool, click on one of the selected elements and drag in the direction you wish to rotate.

## Scale Element Tools

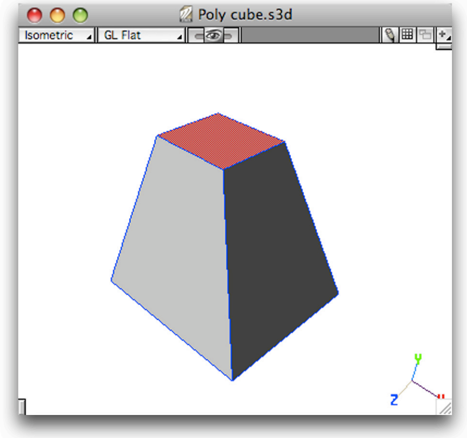



Hotkey: **K**

The **Scale Element Tools** are located in the Scale Tools pop-up menu on the Edit Tool palette. They include the Scale Element Tool and the Scale Normal Tool. You can use the Scale tools on multiple or single points, edges or faces.

Use the nudge keys for precise scaling control. Double-clicking on the Scale tool icon summons the Tool Settings dialog, where you can set the Nudge Amount. The value set in this dialog applies to each of the Scale tools.

Holding down the **Shift** key while dragging with one of the Scale Tools constrains movement to 10% increments.



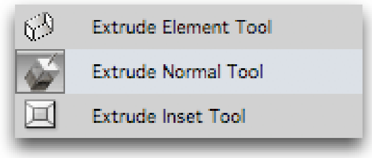

**Scale Element Tool**
The Scale Element Tool allows you to scale selected elements. Use the Scale Element Tool to click on an element. Selection and scale can be done in one move. Click and drag in the general direction toward or away from the center of the selected elements, or use the nudge keys to scale elements.

**Scale Normal Tool**
Using the Scale Normal Tool, you can scale one or more selected elements.

To scale elements individually, select the Scale Normal Tool or use Command/ Control to temporarily summon the Scale Normal Tool. Click on one of the selected elements, and drag in the direction you wish to scale.

With multiple elements selected, each element will scale around its own center unless two or more are adjoining. If two or more are adjoining they will scale around a point that is the average of the adjoining selected elements' centers.

## Extrude Element Tools




Hotkey: **U**

The **Extrude Tools** are located in the Extrude Tools pop-up menu on the Edit Tool palette. They include the Extrude Element Tool, the Extrude Normal Tool and the Extrude Inset Tool. You can use the Extrude tools on multiple or single points, edges or faces.

You can click and drag to perform an Extrude operation, or you can use the arrow keys to nudge elements with one of the Extrude tools selected. The Extrude tools use the Nudge Amount set in the Move Element Tool settings dialog.

You can perform **multiple** Extrude operations on the same element by hitting return to **commit** the first operation. For example, select a face and then Extrude it. Next hit the Return key. With the extruded face still selected, you can perform a **new** extrude on that face.

Follow the same procedure if you want to Extrude and then Inset the same face. First perform the Extrude function, then hit the Return key to commit it. Next select the Extrude Inset Tool and perform the Inset.

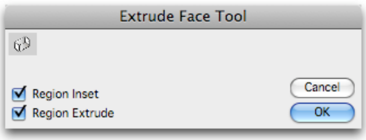
When extruding points and edges you will notice that the tool "breaks" the surfaces around the point or edge. The initial distance of this break is defined by the nudge distance (set using the Set Units dialog box, accessed from the Edit menu). For example, if the Units are set to Inches and the nudge sub-divisions are set to 10, then this initial break distance will be 1/10th of an inch.

You can alter the distance of this break line immediately after performing the extrude operation by tapping on the left and right arrow keys on your keyboard.

You can also use the Extrude Tool to break the surface around a point, edge or face without moving the element. To do this, select the element, then select the Extrude Tool. Next, without dragging the element, use the right or left arrow keys to create the break line. Once the break line has been created you can continue to move the break line using the arrow keys. You can also move the original element itself after the break line has been created by using the Extrude Element Tool to drag the element in the direction you wish.

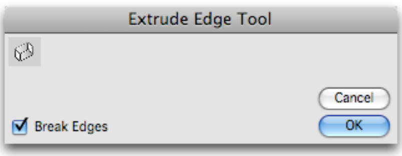
**Extrude Tool Settings**
To access the Extrude Tool settings dialog, double-click on the Extrude Tool icon. The options available depend on the mode you have selected.

**Region Inset** and **Region Extrude** are available in **Face** mode. They cause the Extrude Tool to treat the current selection as a region instead of as individual faces. With these options enabled, connected faces are extruded or inset as a group, as if they were a single face. With these options disabled, each face will be Extruded or Inset individually.

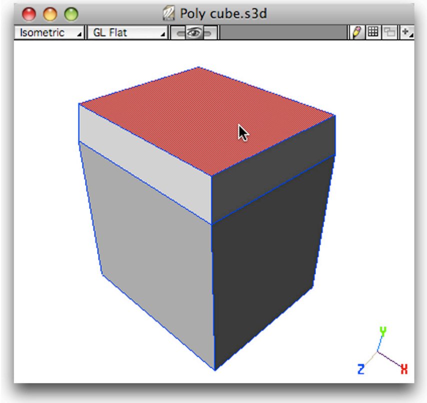



**Break Edges** is available in the Tool Settings dialog in **Edge** mode. Enabling this option causes edges to “break” when extruded, while disabling it allows an edge to be extruded around an axis without breaking at the previous edge(s).

With Break Edges enabled, adjacent edges get cut into by the Move nudge amount. If Break Edges is disabled, the edge is extended with no changes to the adjacent edges.

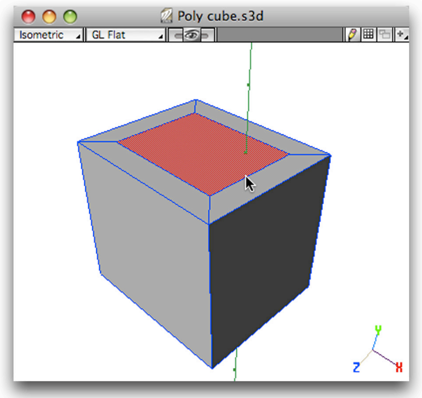



**Extrude Element Tool**
The Extrude Element Tool operates on one or more selected elements. You can use this tool to select and extrude in one move. Points, edges and faces can be extruded by clicking directly on that element and dragging in the direction you wish to extrude. The tool will extrude relative to the active grid, perpendicular to the active grid or relative to the selected elements’ normals, depending on which modifier keys, grids or guides you use.




**Extrude Normal Tool**
This tool is very similar to the Extrude Tool, except that it moves the selected elements in the direction of the element's normal. You can select the Extrude Normal Tool temporarily by using **Command** (Mac) or **Control** (Win).

**Extrude Inset Tool**
The Extrude Inset Tool works differently depending on the whether you are working on points, edges or faces. You can use this tool on a single or multiple elements.

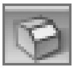



In **Face** mode, Extrude Inset takes the selected face information, creates a new face within it, and scales it proportionally to create an inset. In Face mode you can create a true inset (or outset), or stair-stepping effect. Dragging with the mouse or using the nudge keys controls the size of the newly created face.

In **Edge** mode, Extrude Inset does not create new geometry, but rather creates new edges, and insets the new edges. You can then use the Extrude Element Tool to move the new edges or faces that were created.

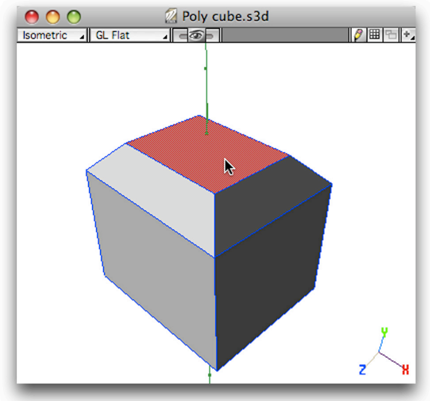
In **Vertex** mode, the Extrude Inset tool creates a break line on each face that is connected to the original selected point, creating new edges on each face that the point is connected to. You can then use the Extrude Element Tool to inset or outset the new edge or faces.

## Bevel Element Tool



Hotkey: **"]"** (Right Bracket)

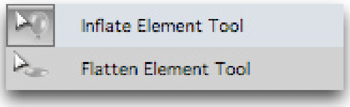
Beveling points and edges flattens the surface in the direction of the normal of the selected element. Beveling faces chamfers the edges surrounding the face.




As with the Extrude Tools, you can use the Bevel Element Tool on single or multiple selected elements. The Bevel Tool can also select and bevel in one move. To bevel multiple elements, first select the elements you want to bevel. Then use Bevel Tool to click on one of the selected elements and drag in the general direction you wish to bevel.

You can click and drag to perform a Bevel operation, or you can use the arrow keys to nudge elements with the Bevel tool selected. The Bevel tool uses the nudge amount set in the Move Element Tool settings dialog.

## Deform Tools

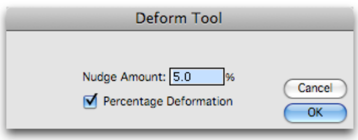



Hotkey: **Q**

This tool group contains the Inflate Element and Flatten Element tools. These tools can create unique effects. They work by moving selected elements towards or away from the center of an object.

Holding down the **Shift** key while dragging with one of the Deform Tools constrains movement to 10% increments.

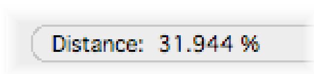
**Deform Tool Settings**
Double-clicking the Inflate Element or Flatten Element tool icon summons the Deform Tool Settings dialog. In this dialog you can set the Nudge Amount as a percentage or as distance. Use the numeric field to enter the Nudge Amount.




The **Percentage Deformation** checkbox allows you to nudge or drag elements using percentage or distance.

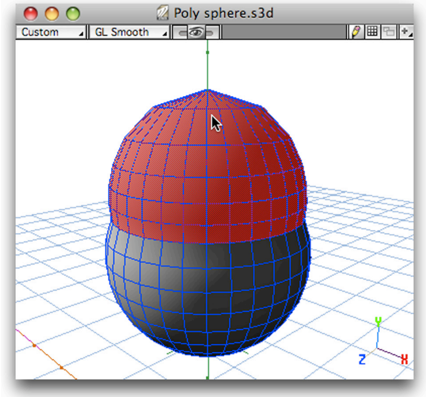
**Percentage** - With Percentage Deformation enabled, elements will Inflate or Flatten in the direction you choose by a relative amount (percentage).
**Distance -** With the checkbox disabled, selected elements will Inflate or Flatten in the direction you choose by distance.

If you use the mouse to Flatten or Inflate elements, the Feedback area in the Button Bar shows the distance or percentage that the elements move.

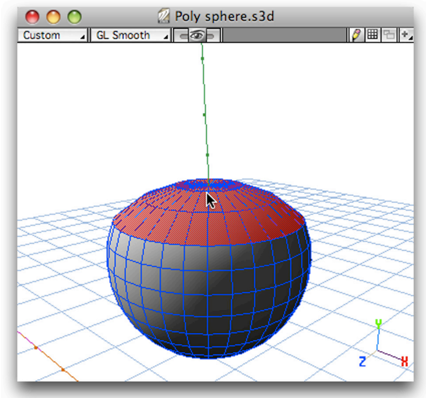



**Inflate Element Tool**
This tool moves selected elements along their normal out from the center of mass of the selection, relative to the active grid or guide. In other words, it pushes elements out from the center of the object, like blowing up a ball.

You can use any tool to select the elements you want to move. Once you have made your selection, click and drag with the Inflate Element Tool. You can also use the nudge keys to move the selected elements.




**Flatten Element Tool**
With this tool, you can flatten selected elements towards the center of the object, relative to the active grid or guide.



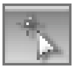

The active grid can be the default x, y or z grid, or you can use a custom grid. The Flatten Element Tool moves selected elements along the active grid normal, making them more coplanar to the center of mass of the selection.

You can also use a default or custom guide with the Flatten Element Tool. Using a guide, the elements will flatten towards a plane defined by the origin and axis of the current guide.

You can use any tool to select the elements you want to move. Once you have made your selection, click and drag with the Flatten Element Tool or use the arrow keys to nudge the elements.

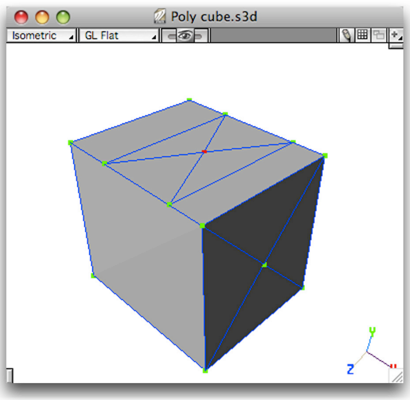
You can choose from several Context menu commands to Flatten selected elements in different ways. The context menu is accessed by using the right mouse button (**Control-click** on Macs with a single button mouse) with any tool. The menu displays next to the cursor position.
**Flatten to Grid** - moves the selected elements planar towards the active grid, at the point that is closest to the grid.
**Flatten Center to Grid** - moves the selected elements planar to the active grid at the center of mass of the selection. In other words, it flattens the selected elements to the center of the object.
**Flatten Onto Grid** - moves the selected elements **on** to the grid. All of the selected elements will end up on the grid.
**Flatten to X, Y or Z -** these work in the same way as Flatten to Grid, except that you can choose to flatten to the default x, y or z grid instead of the active grid.

## Add Point Tool



Hotkey: **“\”** (Forward Slash)

The Add Point Tool is used to cut edges and faces by adding (and connecting) a point (vertex) wherever the tool is clicked on the polymesh. This tool ignores any previous selection and only cuts once with each click.




**To add a point to an edge**, simply select the Add Point Tool and click on the desired edge.

**To add a point to a face**, just click on the desired position within the face. A new point will be added and new faces will be created joining the point with the surrounding edges. Holding the **Shift** key before clicking with the Add Point Tool will constrain the cut to the center of the edge or face being cut.

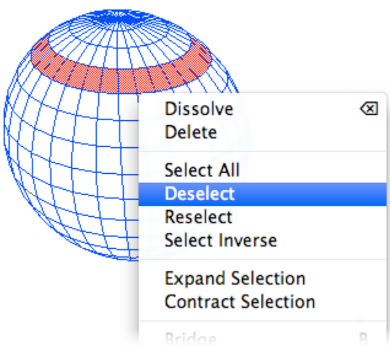
You can also use the Add Point Tool to connect two points to create a new edge on an existing face.

**To Create a New Edge Using the Add Point Tool:**
1) Select the first point you want to cut from by clicking on the point, then;
2) Click on the second point (on the same face) that you want to cut to. A new edge will be cut into the face of the polygon. The second point you select must lie on the same face as the first in order to create a new edge.

## Context Menus

In addition to using tools in the Edit tool palette, you can also do a number of modifications to selected elements using context based commands. The context menu is accessed by using the right mouse button (**Control-click** on Macs with a single button mouse). The menu displays next to the cursor position.

Some of the menu contents change depending on which of the three modes (Vertex, Edge, Face) you're in. Also, the way the commands function are relative to the mode you're in, and based on any selection you may have made. For example, if you're in Vertex mode and you choose Select All, all the points for the object will be selected - not the edges or faces.



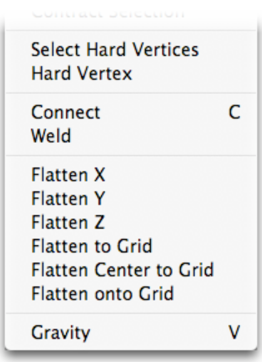

**Common Context Commands**
These commands are available in all modes, and all function in the same way in Vertex, Edge or Face mode.

• **Dissolve:** (Hotkey: **Backspace**) This command attempts to remove the selected element(s) while leaving behind the surrounding structural elements. This is useful for keeping a mesh closed while removing large portions, or for removing an edge in the middle of a face.

If you are using Dissolve in **Edge** Mode, you can hold down the **Shift** key to delete any vertices that are only connected to two edges. For example, if you select an edge and then choose Dissolve from the Context menu, the default behavior is to leave the edge's adjacent points in place. Using Shift deletes these "stray" vertices.

• **Delete:** (Hotkey: **Option/Alt - Backspace**) This command deletes the selected element(s). Using Delete can result in a hole in your surface. This is useful when you need a hole or when you have elements outside of your intended shape.
• **Select All:** (Hotkey: **Command/Control-A**) This commands selects all of the points, edges or faces for the object, depending on which mode you are in.
• **Deselect:** (Hotkey: **Command/Control-1**) This commands deselects any elements of your object that may have been selected. This is the same as clicking in the empty space around the mesh being edited.
• **Reselect:** This command reselects any elements that may have been selected prior to any deselect operation - whether the de-selection was a result of clicking off of the object or using the Deselect command. This can be especially helpful if you had a complex selection made and you accidentally deselect.
• **Select Inverse:** (Hotkey: **Command/Control-Shift-I**) This command selects all of the elements of your object that were not previously selected. Any elements that were selected will become unselected. If no elements were selected then all will be selected.
• **Expand Selection:** (Hotkey: **"+"**) This command expands the selection to adjoining elements. For points, this would mean that each time you use this command the unselected points closest to the select points would become selected. The selection grows by one level each time you use the command.
• **Contract Selection:** (Hotkey: **"-"**) This command is the inverse of the Expand Selection command. With each use of this command the selection will be reduced from its borders inward by one set of elements each time.
• **Flatten:** The Flatten commands are the same as described previously in the **Deform Tools** section. They are in the Context menu for convenient access.

**Vertex Mode Commands**
• **Select Hard Vertices:** This command provides a way to select only those points marked as "Hard."




• **Hard Vertex:** This command marks the selected point as "Hard". This command is useful for defining a sharp or hard point. For subdivision objects this will create a sharp point that the surface will be pulled up to. When a selected point is hard this context menu command will be marked with a check mark. To remove the hard mark from the point just select the edge and choose the command again.

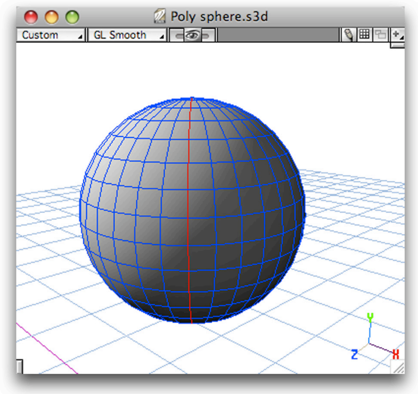
• **Connect:** (Hotkey: **C**) Connect works between two points only, these points must be on the same polygon, and must not share the same edge. Using the connect command on two selected points yields the same result as clicking from one point to the other with the Add Point Tool.

• **Weld:** (Hotkey: **"."**) This command welds two or more points together. It works in two ways. If you select one point, and then shift-select another, the first point is moved to the location of the second point. If you select multiple points, they are placed at the center (average) of the original location of the points.

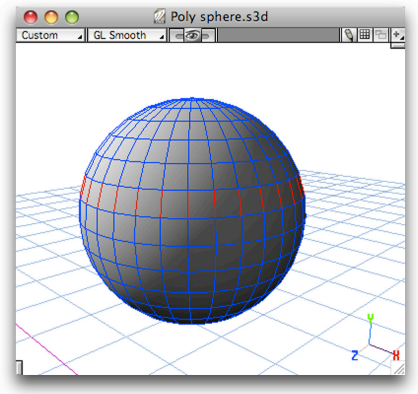
• **Gravity:** (Hotkey: **V**) This is the same Gravity feature that was described earlier. It is included in the context menu for easy access and quick use when editing points.

**Edge Mode Commands**

• **Loop Select:** (Hotkey: **L**) This command attempts to extend an existing selection of an edge to adjacent edges that share a common point. The selections will run in a "loop" around the edges of objects. If the end point of the selected edge is shared by multiple adjacent edges, unpredictable selections can occur.




• **Ring Select:** (Hotkey: **N**) This command attempts to select edges that are parallel to the selected edge and that are connected on either side by joining edges. For example, if you select an edge on a cube shaped object, Ring Select will select the three edges that are parallel to the first edge, going around the cube.




• **Select Hard Edges:** This command provides a way to select only those edges marked as “Hard”.

• **Hard Edge:** This command marks the selected edge(s) as “Hard”. This command is useful for defining a sharp or hard edge. For subdivision objects this will create a sharp edge that the surface will be pulled up to. For standard polygon objects Hard Edge will tell the renderer not to smooth across this edge (or “average the normals” as it is technically known) - regardless of what the “Smooth Angle” is set to in the Object Properties palette. The edge will be rendered as a sharp edge.

When a selected edge is hard this context menu command will be marked with a check-mark. To remove the "hard" designation from the edge just select the edge and choose the command again.
• **Connect:** (Hotkey: **C**) This command connects two or more selected edges by creating new edges. The new edges are created by joining the center point of the selected edges to the center point of the other edges. Connect only works if the selected edges are on the same face.
• **Bridge:** (Hotkey: **B**) This command creates a new face between two selected edges. The new face is not connected to any other edges except the two selected ones.
• **Fill:** (Hotkey: **O**) This command creates a new face inside of three or more edges. The edges must enclose a hole to be filled.
• **Split:** This command divides the selected edge into two equal sections, placing a new point directly in the center.

**Face Mode-Only Commands**
• **Bridge:** (Hotkey: **B**) This command creates a tunnel-like bridge between two selected faces. It can be used to create holes in geometry, or to close open areas. To use this command, select two faces of an object, then select Bridge. The two faces must be made up of the same number of points or edges, but do not need to be the same size or shape.
• **Mirror:** (Hotkey: **Shift-M**) Mirror duplicates the full geometry of the polygon mesh symmetrically across the axis of a single selected face. The Mirror face must be a planar polygon.
• **Flip:** (Hotkey: **L**) This command flips the surface normal of all selected polygons. The face is now "backfacing" and cannot be reselected, and the shading and rendering of the individual polygons will be effected.
• **Unify:** This command unifies all the surface normals of all selected faces. This is especially useful when you have a mesh that is rendering as if it has "holes" in it, and you cannot select those polygon faces. Select-all first, then choose Unify to correct this on the entire object.
• **Triangulate:** This command breaks non-triangular faces (faces with four or more edges) into three sided triangles.

*Chapter 7*

# Special Modeling Tools

## Deforming Objects

In addition to being able to create and edit models, Strata Design 3D CX allows you to **deform** an existing object.

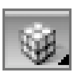
**NOTE:** You can also use the Subdivide command to temporarily or permanently change a polygon mesh. The Subdivide command creates a Subdivision Surface, and is one of Design 3D's most powerful and frequently used modeling features. For more information see **Chapter 6 - Working With Polygon Meshes**.

The **Deform Tool** uses a Deform Object, or a modifiable 3D box, to control the deformation of objects. An object can either be permanently changed, or it can change over time as it passes through the Deform Object.

Deform Objects are three-dimensional objects used to deform other objects in your model. By manipulating points on the Deform Object, you can change the shape of objects that come in contact with it. These Deform Objects are construction geometry only, which means they are used to help you create other objects in your model. They are visible only in the Modeling window, and are never visible in rendered images.

You decide which objects in your model are affected by each Deform Object by associating the Deform Objects only with the objects you want them to affect or deform. In this case, other objects completely ignore the Deform Object and will not be changed by it.

### Using the Deform Tool



Hotkey: **L**
The Deform Tool is located in the Deform Tools pop-up on the Tool Palette.

You can create Deform Objects in more than one way:
• **Create a Deform Object directly on an object:** Select the Deform Tool, then simply click on any object in your model. A Deform Object is created directly on the object. The size of the Deform Object is slightly larger than the size of the object's bounding box. This object is automatically associated with the Deform Object.

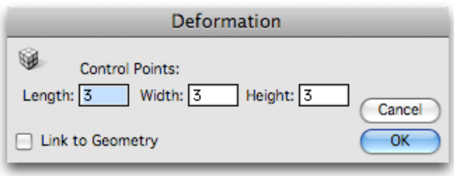
• **Create a Deform Object in 3D space:** To create the Deform Object, select the **Deform Tool** from the Deform Tools pop-up menu of the Tool palette, then click-and-drag to define the size of the object. You can also use the three-click method to define its size, similar to creating a Cube primitive.

A Deform Object created this way is not associated automatically with any existing geometry. However, once a Deform Object has been created, the Attach Tool can be used to create an association between it and one or more objects in your model.

The **Attach Tool** is located in the Joint and Bone Tools pop-up menu on the Tool palette. Detach is accessed by holding down **Option/Alt** while you click on the Attach Tool.

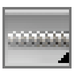
## Deform Tool Settings

You can change the default behavior of the Deform tool through the Tool Settings dialog. To access this dialog, double-click on the Deform Tool icon.




• **Control points.** These fields let you determine the number of control points in the length, width and height of the Deform Object.
• **Link to geometry**. This checkbox only affects lattices that are created by clicking directly on an object. If this box is checked, when you click on an object the object is automatically associated with the Deform Object and a link is created between the two.

## Associating Objects and Deform Objects



Hotkey: **J**

Use the **Attach Tool** to associate existing geometry with a Deform Object. Select the Attach Tool from the Joint and Bone Tools pop-up menu of Tool palette, then click-and-drag from the Deform Object to the object you want to deform. You will notice that both the Deform Object and the object you are deforming will highlight in red boxes as you click on them.

Always select the Deform Object first, then the object. You can associate any number of objects, groups, or shapes to a single Deform Object. If you change your mind, you can use the Detach Tool to remove the association between the Deform Object and object it affects.
A Deform Object only affects associated geometry. Any unattached geometry is not affected by it, even if it comes in contact with the Deform Object.

Use the **Detach Tool** to remove an existing association between a Deform Object and geometry. The Detach Tool is accessed by holding down **Option/Alt** while you click on the Attach Tool.

Select the Detach Tool, then select the Deform Object. When the Deform Object highlights, drag the cursor to the object you want to disassociate from the Deform Object. The object will also highlight, indicating that it is no longer associated. When using the Detach Tool, always select the Deform Object first, then the object. Once the object is no longer associated with a Deform Object, that Deform Object has no affect whatsoever on the object, regardless of the object's proximity to it.

## Editing Deform Objects

A Deform Object has no effect on objects until it has been altered in some way. Deform Objects are edited in Edit mode, just like other types of geometry in your model.

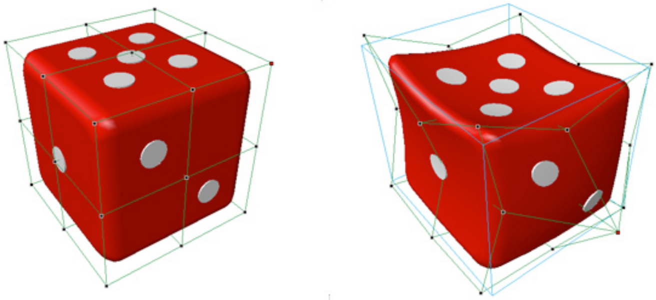
Design 3D compares the changed Deform Object with the original or base Deform Object to determine the extent of the deformation that occurs when an associated object encounters the base Deform Object. Base Deform Objects appear gray and can be shown or hidden in the Object Properties palette. Altered Deform Objects appear green.

Select the Deform Object you want to edit, then select the **Edit Object** command from the Modeling menu or the Edit button at the top of the Tool palette, or even double-click on the Deform Object to Edit it in a new window.

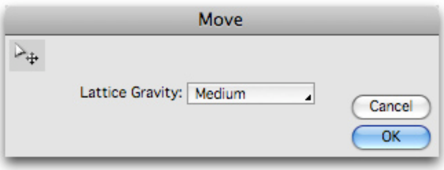
When you Edit a Deform Object, the Tool palette changes to include only tools that are appropriate to working with Deform Objects.

Use the **Move Element Tool** to select and move points on the Deform Object. The points on the Deform Object are visible whenever the Move Point Tool is selected. They appear black when unselected, and red when selected.

To Edit the Deform Object, simply select one or more points and drag in any direction. You can also pull more than one point at a time. To select multiple points, hold down the Shift key while selecting additional points. You can also select multiple points by drawing a marquee around them.



**Point Gravity**
To enable Deform Object Point Gravity, double-click the **Move Point Tool** to display the **Tool Settings** dialog. When Gravity is enabled, pulling a single point causes other points to move as well, depending on the proximity of each point to the point being moved.




You can control the degree to which gravity affects the move operation by selecting either None, Low, Medium, or High from the Deform Object gravity pop-up list. When Gravity is enabled, the distance other points move lessens with their distance from the point being dragged.

## Deforming Associated Objects

The base Deform Object determines at what position in space the deformation of associated geometry takes place. The deformation begins at the point where the associated object intersects the location of the base object, and continues as the associated object passes through the Deform Object. Then, as the object emerges from the Deform Object, it returns to its previous shape as it passes the extents of the base shape of the Deform Object.

**NOTE:** No deformation takes place on any part of an object's geometry that is outside the boundaries of the Deform Object's base shape.

## The Joint Tool

Hotkey: **J**
You can use the **Joint Tool** with Deform Objects. The Joint Tool connects one object to another, and is located in the Joint and Bone Tools pop-up menu on the Tool palette.

You may want to join a Deform Object to an non-associated object. Perhaps you want an object to "drag" a Deform Object behind it, affecting any associated geometry that it encounters along its path.

The Joint Tool is used to join the child to the parent. If you want the Deform Object to follow the object whenever the object moves, select the Deform Object (child) first, then the object (parent). This causes the Deform Object to remain with the object at all times.

If you move the object, the Deform Object moves with it. Then, by altering the Deform Object at different points in time, you are able to animate the deformation of the object, or of the objects the Deform Object encounters during the animation.

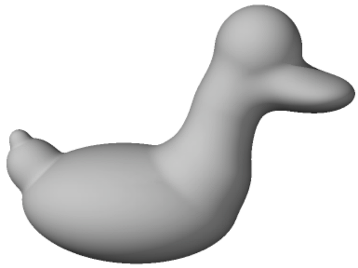
Objects can be unjoined from Deform Objects with the **Break Joint Tool.** To access Break Joint, hold down the **Option/Alt** key while selecting the Joint Tool.

# Using Meld

Meld objects, or MetaSurfaces, are smoothly blended surfaces that are made up of two or more enclosure-defining objects. Objects that work well are Sphere and Rounded Cube primitives, but many other objects that define an enclosed space work as well. Meld objects can be described as being like gobs of solid mercury that melt together as they get closer to each other. How they blend, or Meld, is controllable.

## Meld

To create a Meld object, select two or more objects and apply the **Meld** command from the Modeling menu or the Modeling Commands palette. If only one object (even a group or shape) is selected, then the command is dimmed and unavailable. You have full control over how close the objects must be to one another before they begin to blend together. Objects can even be animated prior to being included in a Meld objects object to create a flowing, melting effect.



Only certain types of objects can be used to create a Meld object. Some 3D primitives, such as spheres and cubes, and polygon mesh objects which don't contain holes or concave areas can be used to create a Meld object. All other object types, such as Bézier surfaces, Lathe, Extrude, Skin, etc., must be converted into polygon mesh objects prior to being used with Meld.

Grouped objects must be ungrouped before they can be used. Any number of objects can be used in a single Meld operation, assuming enough memory is available. An object that is already a Meld object cannot be used in a new Meld operation.

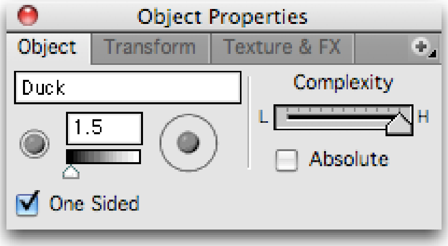
Any textures that were applied to the objects before the Meld modeler is used will not appear on the Meld object. Once the Meld operation is complete, textures can be re-applied. If you use the UnMeld command, any textures that were previously applied to the individual objects will reappear.

## Editing MetaSurfaces

To rearrange the objects that make up an existing Meld object you must first break it into its constituent objects. To do this, select the object and then choose the **UnMeld** command from the Modeling menu or from the Modeling Commands palette. Once the Meld object has been broken into individual objects you can reposition, rotate and scale them - even animate them. When all the objects are set up the way you like, use the Meld command again.

### Meld Object Properties

The Object panel of the Object Properties palette provides settings that allow you to edit some important parameters of a Meld object. This includes options for changing the name, the complexity when rendered, and whether the object is one-sided or not. The setting that is unique to a Meld object is the Range of Influence.




• **Range of Influence:** The Range of Influence slider determines how the individual objects will merge into a Meld object. Imagine a sphere of influence around all objects in the MetaSurface, and when these spheres intersect, the two objects will stretch and blend towards one another with the goal of becoming a sphere.

A value of 2.0 creates a range of influence with a radius that is twice the size of the objects themselves. A value of 3.0 creates a range of influence with a size three times the size of each of the objects. Acceptable values for Range of Influence range from 1.1 to 5. Certain types of objects (such as sharp-cornered Cubes) need very high Influence to Meld with other objects.

### UnMeld

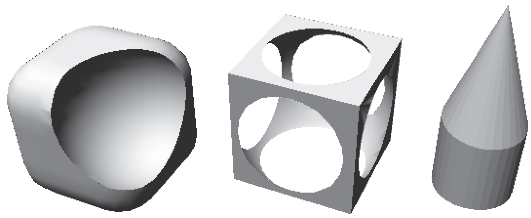
This command lets you undo the Meld operation on a selected Meld object. If no Meld object is selected, the button is dimmed and not available. You can access this command by selecting **UnMeld** from the Modeling menu.

When you UnMeld a Meld object, the range of that entity becomes the new default setting for future Meld operations. This simplifies the process of editing. This default setting remains in effect until a new radius is specified in the Object Properties palette, or until you UnMeld another object.

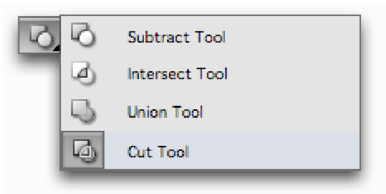
If you select the UnMeld command, textures applied to the object are lost, and any textures that were originally applied to the objects before the Meld operation will be restored to the individual objects again.

## Using Boolean Modeling

Boolean modeling lets you use two fully enclosed 3D objects (of any shape or type) to produce a new object by calculating the interior space of each object and using the areas where they intersect. The effects can be similar to gluing or carving with blocks of wood. Boolean operations can even be "nested" inside each other to create very complex shapes with various Booleans.



Design 3D provides four tools to perform various Boolean operations: **Intersect, Union, Subtract,** and **Cut**. These are all located in the Boolean Tools pop-up menu on the Tool palette. Each tool is described individually below.




Hotkey: **K**
To effectively use the Boolean tools, the two objects must overlap in 3D space and be selectable. For example, if you want to Subtract one object from another, position the first intersecting the second where you want the shape to be removed. Then select the Subtract Tool, click on the first object and drag to the second. You will notice that the bounding boxes of the objects will be highlighted in red.

**NOTE:** If one of the objects used in a Boolean operation is a shape instance, the link to the parent object is broken. Any future changes you make to the shape will no longer affect that object. Also, do not apply textures until you are through with the Boolean and UnBoolean operations.

Booleans can sometimes produce unexpected results. This is due to the very complex math associated with these operations. At any time, you can **UnBoolean** any Boolean object to reverse the effects. Sometimes you will find that changing the position or orientation of one of the objects just a little can produce more satisfying results.

## Intersect Tool

The **Intersect Tool** creates an object that consists of only the over-lapping portions of two objects. This tool can be used for creating cross-sections of the internal structure of objects and for defining overlapping areas in a model.

First position the objects so they intersect in the desired location, then select the Intersect Tool, and click-and-drag to select both objects. When you release the mouse button, the new object is created.

For this tool it doesn't matter which object you select first; the results will be the same. Once the Intersect operation is complete, the origin point is placed at the geometric center of the resulting object.

## Union Tool

The **Union Tool** performs a Boolean operation that physically joins two objects at their intersecting points, creating a single, more complex object. Once the Union operation is complete, the origin point is placed at the geometric center of the resulting object.

Position the two objects so they overlap, then select the Union Tool, click-and-drag from one object to the next. It doesn't matter which one you select first. When you release the mouse button, the two objects fuse together into one with no interior surfaces.

## Subtract Tool

The **Subtract Tool** allows you to remove geometry from an object to create holes, indentations, or voids. This is done by removing some of the geometry of one object from another object. In the process, the first object completely disappears from your model.

When using the Subtract Tool, the order of selection is very important. First, position the objects so they overlap as desired, then select the Subtract Tool and **click-and-hold** on the object you want to use to subtract geometry (it will be highlighted in Red). Then **Drag** to highlight the second object from which geometry will be subtracted.

The overlapping section of the first object is always subtracted from the second object. Once the Subtract operation is complete, the origin point is placed at the geometric center of the resulting object.

## Cut Tool

The **Cut Tool** creates a new shape by deleting all of both objects except the surface of the first object which is inside the second object. This makes the Cut Tool similar to the Intersect Tool, except that the final object consists of only the overlapping portion of the **first** object. And, unlike the Subtract Tool, the Cut Tool does not supply any additional surfaces. Therefore, a sphere cut by another sphere results in a bowl-shaped object.

To use the Cut Tool, position the objects so they intersect in the desired location. Then select the Cut Tool, and click-and-drag to select the objects.

When using the Cut Tool, the order of selection will effect the outcome. First, position the objects so they overlap as desired, then select the Cut Tool and **click-and-drag** from the object that encloses your desired geometry (it will be highlighted in Red) to the second object which will have a portion retained. Once the Cut operation is complete, the origin point is placed at the geometric center of the resulting object.

## Editing Boolean Objects (UnBoolean)

Boolean objects can be broken down back into their member objects using the **UnBoolean** command. The command can be accessed by selecting the **UnBoolean** command from the Modeling menu or in the Modeling Commands palette.

Select the Boolean object, and the UnBoolean command will become available to use. Select the UnBoolean command to return any Boolean object back into its component objects. Any transformations (Move, Rotate, Scale) that were applied to the whole Boolean will still be applied to the component objects.

Each time you select Unboolean the Boolean object is undone one level. You can also use the History panel of the Details palette to undo an action or series of actions.

You can only edit the surface of a Boolean object by converting it to another object type, such as a polygon mesh. Once it has been converted it can be edited using the Edit Object mode.

## Boolean Rendering

Design 3D also offers you the option of performing Boolean renderings instead of using the tools. Boolean renderings can simulate objects created with the Subtract and Intersect tools. You can designate an object as **“Anti-Matter”** in the

**Project window.** To do this just open up the object by clicking on the arrow icon to the left of the object name in the Project window. You will see the anti-matter check box just below the name. When you render the image, anti-matter objects will not render, nor will any portion of other objects that they overlap. The rendered objects appear as though they were created with the Subtract Tool.

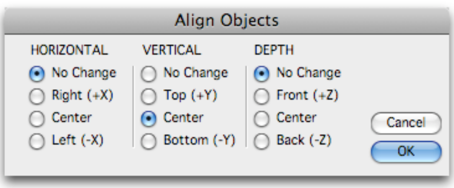
If two anti-matter objects overlap, only the overlapping portions render; all other portions of the anti-matter objects will not be visible. These rendered objects appear as though they were created with the Intersect Tool.

Boolean renderings do not change the geometry of objects as do the Boolean tools; they only affect the way in which the objects are rendered. Boolean rendering has the advantages of supporting animation of the objects and supporting texturing. The texture of the anti-matter object is applied to the hole it creates in any objects it intersects.

## Align

The Align command allows you to align selected objects on the horizontal, vertical, or depth axis, either separately or in any combination of the three. Align is available whenever two or more objects are selected. The **Align** command is accessed by selecting it from the Modeling menu or the Button Bar.

The Align dialog allows you to specify which combination of alignments you want. When you first open the dialog, the settings default to No Change on each axis, so to make any alignment at all, you must choose an option for at least one axis.




The alignment options in the dialog box (left, center, top, front, etc.) are relative to the **Front** view in world coordinates. You can align the objects horizontally by either their left or right sides, or by their centers. The vertical alignment can be by the tops, bottoms or centers of objects, and depth alignments are by front, back or object centers.

If none of the selected objects are locked, the location of the outermost object on each axis determines the boundary for the edge alignment point. If the position of one of the selected objects is locked (on the Transform panel of the Object Properties palette), the command uses the outermost dimensions (extents) of the locked object(s) as the alignment boundaries.

## Recenter Origin

The Recenter Origin command positions the object's origin point back to its geometric center after the origin point has been moved. The **Recenter Origin command** is found in the Modeling menu and the Button Bar. The Recenter Origin command is only available when an object is selected.

The object origin point is the point that the object rotates around. This point is usually, but not necessarily, at the geometric center of the object. When the display method is set to Wireframe, Outline, or PointCloud, you can see the object origin point whenever an object is selected. It appears as a small blue diamond about the size and shape of the red handles of the object.

When you first create an object, the origin point is located at the geometric center of the object. However, you may want to move the origin point to a new location. The position of the origin point can affect the object in the following ways:
• It sets the axis for rotation on the object.
• It is where a child object is linked to its parent.
• It locates the object on its animation path.

To move the origin point without moving the object itself, hold down the key **Command** (Mac) or **Control** (Win) while dragging the origin point to its new position. This position now becomes the point around which the object rotates. Instead of grabbing the origin point, if you hold down the Command key (Mac) or the Control key (Win) and grab the object, the object moves and the origin point remains stationary.

You can move the origin point in any direction on the active grid or in a plane parallel to the active grid. To move the origin point perpendicular to the active grid, you must switch to a perpendicular grid.

The Recenter Origin command is the easiest method for putting the origin point back in the geometric center of an object, although you can reposition it back to its center manually, as well. The origin point of objects imported from other applications may not be located in the geometric center. You may need to use the Recenter Origin command on objects after importing them into your model.

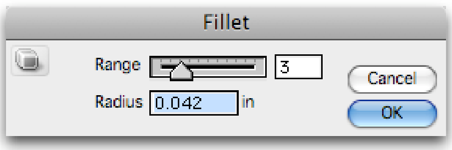
## Fillet

The Fillet command rounds all of the edges of polygonal objects, according to the Range and Radius you specify. The Fillet command can be used only on three-dimensional Polygon Mesh objects, and it cannot be constrained to only certain corners or edges.

**NOTE:** Because this tool works on individual polygon edges, it is highly recommended that you use this tool on either very simple polygonal meshes, or ones with mostly planar polygons. This is because every polygon in your mesh is filleted if it meets another polygon at any angle. This is especially detrimental to Sphere or Cylinder shapes.

### Fillet Controls

To use the Fillet command, select a Polygon Mesh object, then select **Fillet** from the Modeling menu.
The dialog which appears includes a slider for the **Range** and a numeric entry box for **Radius**. Each edge that you smooth is divided into a set number of segments (the Range), which are then rounded at a specific Radius cutting inward from all of the corners of your object.




**Range** can be set from 1 through 10, and this is the direct number of additional polygons along each edge that are created. The more the edges are divided, the smoother the edges, but keep in mind that higher values also create more polygons, so use the smallest number necessary to get the results you want.

Because the **Radius** is expressed in the actual units of your model, be sure to use a value that is proportional to your object. With a two-inch cube, the largest radius you should use is one inch, which produces a sphere. Higher values should be avoided because they will give you unpredictable results.

## Flip Faces

Occasionally you may find a model that seems to be shaded exactly opposite from what you would expect based on how you have the lighting set up. This most often happens with imported geometry. In other words, the surface lighting may appear as if it were facing in the opposite direction than it actually is (i.e. lit as if it were the bottom of the object, although it is actually facing up).

This incorrect surface direction (stored internally in Design 3D as the surface normal) can sometimes be corrected using this command. Flip faces will actually tell the surface normals to point in the opposite direction.

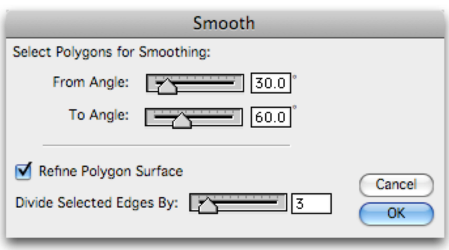
To use the Flip Faces command, first select the object, and then select **Flip Faces** from the Modeling menu or the Modeling Commands palette.

## Smooth Mesh

The Smooth Mesh command lets you fine-tune the surfaces of a polygonal mesh object by adding geometry to its surface, or by simply manipulating the way light reflects from the surface.

**NOTE:** Smooth Mesh should not be confused with the Subdivide command. Subdivide creates a new mesh surface with a different shape, but one that is based on the original mesh points. Subdivide can also be reverted back to the original mesh surface at any time by using the UnSubdivide command. The Smooth Mesh command will permanently modify the mesh structure, but not the shape.

The **Smooth Mesh** command is found in the Modeling menu. If you do not have a Polygon Mesh selected, Smooth Mesh will not be available. When you select Smooth Mesh, a dialog appears which allows you to set how the command will refine or resmooth your selected mesh.



**To Smooth the Surface Without Adding Geometry:**
If you want to refine the surface of an object without adding any geometry, be sure the Refine Polygon Surface checkbox is **Unchecked**. Without refining the mesh, this changes the surface normals (the direction light reflects from the surface) of an object to give the appearance of a smoother edge.

If the edge of the polygonal mesh falls between the values specified in the **From Angle** and **To Angle** fields, the edge is smoothed. Otherwise, no smoothing occurs and the edge remains creased.

**To Smooth the Surface by Adding Geometry:**
To add geometry to the surface of an object, enable the **Refine Polygon Surface** option at the bottom of the dialog. This feature is especially useful when you need more polygons on the surface of an object to create a particular shape.

If the edges of the Polygon Mesh fall between the values specified in the From Angle and the To Angle fields, the Smooth Mesh extension adds polygons to smooth the surface. The additional polygons are added by subdividing each face the number of times specified in the dialog.

**To Add Polygons Without Changing the Shape:**
You may also want to use the Smooth command to generate additional geometry for modeling purposes. As long as **none** of the surfaces fall within the range specified in the Smooth dialog, none of the edges will be smoothed. Instead, with the Refine Polygon Surface option checked, additional geometry will be generated at that refinement level without affecting the basic shape of the object.

**Using Smooth to Reduce Polygon Count:**
The Smooth Mesh Tool can also be used to reduce the polygon count of a polygonal mesh object. This makes modeling redraws faster and speeds up renderings.

If an object can be more easily described with less polygons, the Smooth Mesh Tool will reduce the amount of polygons in the object. For example, a square used in modeling could initially be defined by multiple triangles, but could be described by just two polygons.

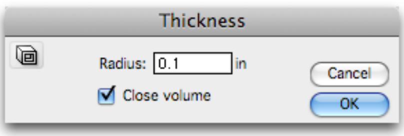
**NOTE:** For polygon **reduction** to take place, the Refine Polygon Surface checkbox must be unchecked in the Smooth dialog. Also, the object must be able to losslessly be reduced into a simpler form.

## Thickness

Thickness adds width to Bézier or polygonal mesh objects in your model. This command is great for quickly making an object with thickness while modeling.

To use the Thickness command, select the object, then select **Thickness** from the Modeling menu or the Modeling Commands palette.

**Thickness Tool Settings**
This dialog allows you to specify the thickness you want to add to the selected object. Your results will depend on the type of object you have selected.

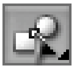



• **Radius:** This value sets the thickness of the object. Normally, if you use a positive number for the radius, the thickness is added to the outside of a 3D object. Negative numbers typically create the thickness on the inside of the object - effectively leaving the object looking the same but as a hollow shell. On a 2D object, a positive number adds thickness to the top; a negative radius adds thickness to the bottom.
• **Close Volume:** The status of this checkbox determines whether or not the surface of the object becomes a solid surface, or if a separate, unconnected surface is added.

The Thickness Tool can be used on two-dimensional polygonal meshes as well. You may need to first convert your 2D filled object to a Polygon Mesh.

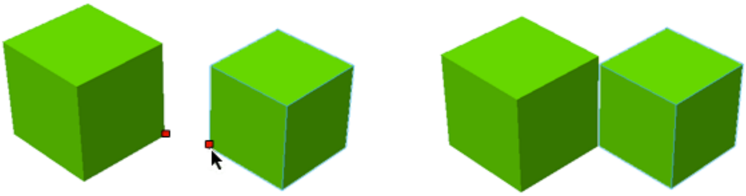
**NOTE:** Make sure you use values in the Thickness dialog that are proportional to your object; otherwise you may get unexpected results. Also, when you add thickness to an object, any textures are removed and must be reapplied.

## Snap-To Tool

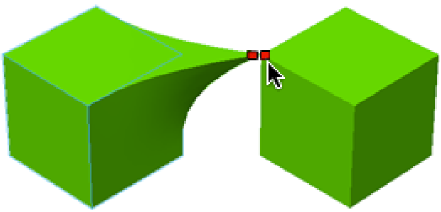


Snap-To is a very useful tool that allows you to select two points on two different objects, and then snap them together. **Snap-To** is located in the Move Tools pop-up menu on the Tool palette.

You can use Snap-To to position and align objects quickly and easily. And you can constrain the objects' movement along the grid or perpendicular to the grid. You can snap corner points, edge points or surface points. Snap-To pulls one point of an object to the selected point on another object, allowing you to easily position objects in relation to each other.

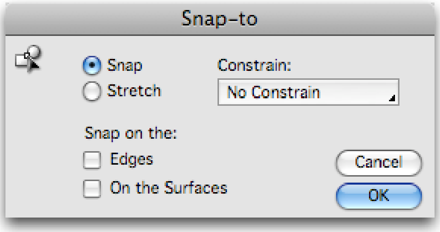


**Stretch** is another great option for Snap-To. It stretches the actual geometry of the selected point on one object to the selected point on another object. Stretch works only on objects that allow stretching - those with points, such as Bézier and Polygon mesh; and on Bézier lines or regions. A point on a mesh object can be stretched to a point on an object that is not a mesh, but not vice versa.



### Snap-To Controls

Summon the Snap-To Tool settings dialog by double-clicking on the Snap-To icon in the Move Tools pop-up menu of the Tool palette. The options define how the Snap-To Tool functions each time it is invoked. These settings also can change it from a Snap-To to a Stretch tool.




•**Snap-To or Stretch:** Select either Snap-To or Stretch using the radio buttons at the top of the dialog.
•**Constrain:** There are three ways to constrain the Snap-To or Stretch movement.
- Perpendicular to the grid. "Up" or "down."
- Along the grid. Side to side.
- No constraint. Free movement in any direction.
•**Snap On The:** There are two filters for snapping point selection.
- Edges: lets you select Snap points from the edges of objects.
- Surfaces: lets you select Snap points from the surfaces of objects.

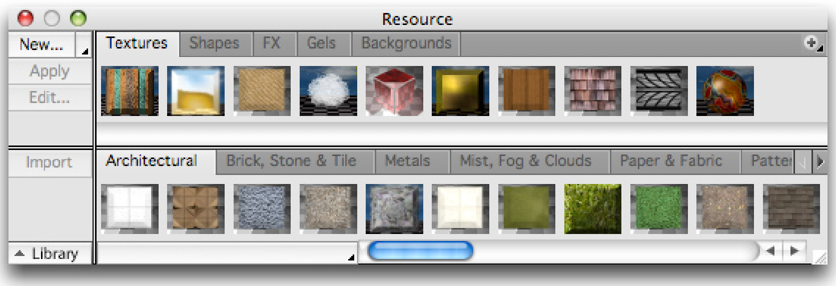
**Using Snap-To and Stretch**
Snap-To and Stretch work by selecting two points on two different objects. When you select the Snap-To Tool, the mouse cursor becomes a locator for the Snap points by clicking-and-dragging. The first place you click on an object in the scene will be the start point for the Slave surface or curve (the one that moves or stretches). By holding down the mouse button after this initial click, you can slide the cursor to the Target surface or curve. When you release the mouse button the two locations will meet in 3D space (with the first moving or stretching, and the second remaining stationary).

# Texture Basics

Textures are a complex combination of attributes that determine how a surface will appear when you render an image or create an animation using the Rendering Tool or the Render Image dialog. Even though they offer many options, textures are actually easy to make and use.

## Managing Texture Resources

All of the controls for textures can be accessed from the **Textures panel** of the **Resource palette**. This is also where you can find the Library of pre-made textures that ships with your copy of Strata Design 3D CX. From the Textures panel you can create new textures, edit existing textures, or apply a texture to an object.

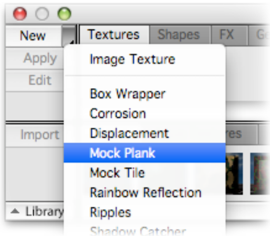



The top portion of the palette displays all of the textures that are loaded into the active model. If no textures have been loaded into the model, this preview area remains blank. When expanded, the bottom portion of the palette displays the textures library.

The hotkey to show, hide or collapse the Resource palette is "**R**".

## Creating New Textures

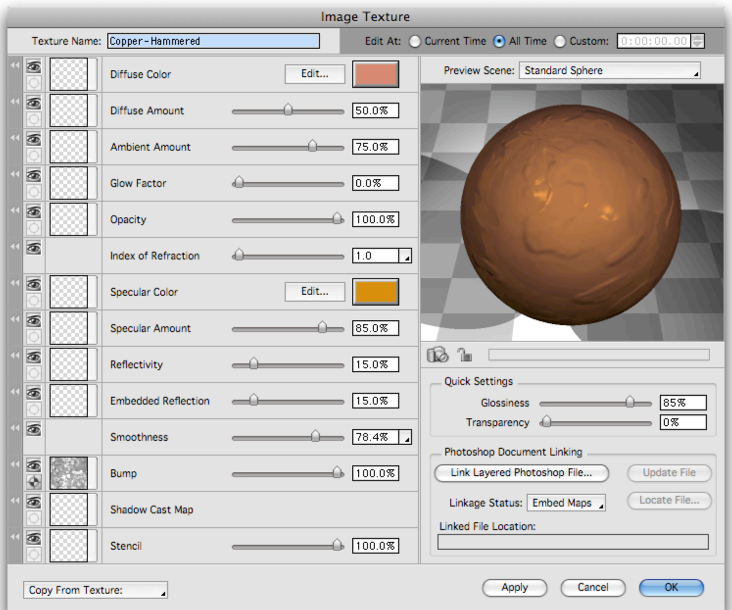
To create a new Image Texture just click on the **New** button at the top left of the Textures panel of the Resource palette, below the Edit button.




There is also a pop-up menu to the right of the word "New" which contains several additional special texture types. At the top of the list, choose Image Texture to open the Image Texture dialog, where you can create a new texture from scratch. The center section of the list contains special texture types, and the lower section contains special effects such as Clouds and the volumetric textures Fog, Haze and Mist.

For more information see **Chapter 10 - Special Texture Types**, and **Chapter 11 - Special Effects**.

When you click the New button the **Image Texture** dialog appears. This dialog provides access to all of the Image Texture channels, map fields and other controls. For a complete description of these options, see **Chapter 9 - Using Image Textures.**



When you create a new texture it gets stored with that model, even if you never apply it to any object. If you discard the model without saving, the texture is lost unless you have saved it to disk separately from your model file.

## Applying Textures

There are several ways to apply textures to the surface of objects. They can be **automatically applied** when you create a new texture while any object is selected. You can also use the **Apply button** on the left side of the Textures panel, or you can **drag-and-drop** a texture from the Resource palette directly onto an object in your scene.

You can use the Texture Library to quickly access a number of pre-made textures, and even save your own favorite textures into new or existing folders in the Resource Libraries for use in other scenes at any time. To see this section, click the **Library button** at the bottom of the Resource palette to expand the palette (if it is not already expanded). Next click the Textures panel at the top of the palette to display all of the textures available in the Library.

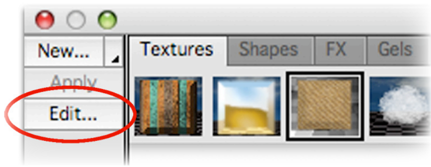
You can select a texture by its icon either from the Library or from your scene's textures by clicking directly on the **rendered preview icon**. When you select a texture, a black outline appears around it to indicate that it's selected.

You can also select a texture by using the **Texture pop-up menu** in the lower left corner of the Resource palette. This menu is structured according to the Library folders, with submenus for each folder name in the pop-up list. Textures that are already loaded into the active scene appear at the bottom of the list (below the  break line).

## Editing Textures

You can edit any texture on the Resource palette. A quick way to jump-start your textures is to begin by editing a Library texture. To do this, select a texture from the library and then click the **Edit button**. This loads the texture into your scene and opens it for editing. **Double-clicking** on a library texture preview also loads the texture and opens the Texture Editing dialog.

**NOTE:** When you edit a Library texture, you are actually editing a copy of it that is loaded into your scene. The original Library item remains unchanged, and can be loaded in its original state at any time.




When you click the Edit button, the texture dialog for the selected texture appears. You can change any of the parameters for the texture definition. You can also edit any texture applied to the selected object through the Edit Texture command from the Modeling menu.

## Importing Using the File Menu

In addition to importing from the Texture Library you can import a texture from another source to use in your model, using the **Import** command found in the **File** menu. Only file types recognized by Design 3D will be available with this command. Once you import a texture using this command it will appear in the top portion of the **Textures panel** of the **Resource palette** as a loaded texture in the current model.

## Moving Textures to Other Models

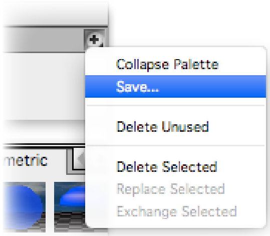
When you create a new texture, it becomes part of the model and is saved with the model. If you want to be able to access the texture for use in another model there are two ways you can do this; either by **copying-and-pasting** a textured object into another open model or by **saving the texture** for later use.

To paste a texture into another model you need to copy-and-paste it via an object that has the texture applied. Once you paste an object into a model, any textures applied to that object will now be in the new model. The textures will appear in the loaded section of the Texture & FX panel of the Resource palette. After you've pasted the object, you can delete it and the textures will remain in the model.

The second way to get a texture from one model to another is to save it using the **Plus** menu, as outlined below.

## The Plus Menu

When the Textures panel is active, the Plus menu in the upper right corner of the Resources palette contains entries that apply to handling textures. These specific options are detailed below.




• **Save:** When you create a new texture, it automatically becomes part of the current model and is saved with it. You may, however, want to access a texture to use later in other models.
To save a texture to your Textures library, choose the **Save** command from the **Plus menu** on the Resource palette. A dialog appears allowing you to specify a name and the location for the save function.
To have your saved texture appear in the Library, you must save the texture file to the Textures folder in the Resource Libraries folder of your Strata Design 3D CX installation on your system. You will also find folders that correspond to each panel in your Texture Library. To create a new panel, simply create a new folder in the Textures folder.
• **Delete Unused:** You can also delete all of the textures from the model that are not being used. Removing unneeded textures decreases the amount of memory required for the model. If the texture has already been saved using the Save command from the Plus menu, this command doesn't delete the textures from your disk, just from the model itself.
• **Delete Selected:** This command deletes the selected texture from your model, but not the Textures library.

**NOTE:** The Replace Selected and Exchange Selected commands apply to shapes and objects. For more information see **Shapes** in **Chapter 4 - Advanced Modeling.**

## Animating Textures

Design 3D allows you to create animated textures in several different ways. You can use a movie in the map fields, animate the texture settings over time, or combine textures by animating the Stencil channel to achieve a morphing effect. Each one of these methods is outlined here.

### Using Movies in Textures

You can use a movie as an image map. You can load any movie (or sequentially-numbered files in formats supported by Design 3D) into the map fields of

Design 3D textures. This includes all the channels in the Image Texture and the map in Displacement textures that determines the height of the surface displacement.

Each frame of your movie or image sequence is used for each frame in your rendered animation. Therefore, if you must match the animation of the 2D movie to that of the rendered 3D animation to get predictable results.

In many cases if your video card can interactively display Image Texture maps on the shaded 3D surfaces in your Modeling window, then when you press the playback control in your **Project window**, the movie will play frame-by-frame on the surface of the object as well. You must have **Show Textures** turned on in the Windows panel of your Preferences to see this.

## Animating Texture Settings

You can animate a texture's settings using the section at the top right of the texture dialog. A texture's animation is done separately from an object that it may be applied. The ability to animate the settings can be found in all of Design 3D's texture types. When you edit a texture, the "Edit at" fields at the top of the Texture Editing dialog allow you to specify the time at which the settings occur. Varying the settings in the dialog at different times causes the appearance of the texture to change over time.

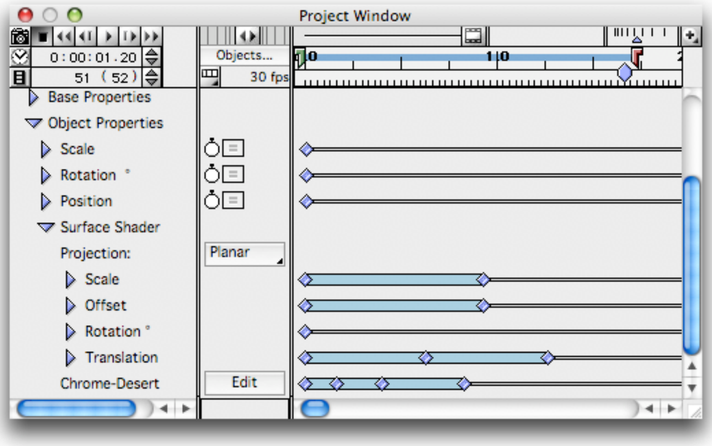

To animate settings from within the dialog only, select the **Custom** radio button at the top of the dialog. Next, use the time controller on the top right to set the time points you want to establish keyframes. Adjust your texture to how you would like it to appear at that moment in time, and then click the **Apply** button at the bottom of the dialog.

To animate the texture settings with the animating model, use the Project window to set the time where you wish to establish a keyframe for the texture. Now, open the texture and select the **Current Time** radio button. Adjust the setting to the levels you want them to be at for that point in time. Now click the OK button.

When editing an animated texture with the Custom option enabled, you can use the **Shift key** with the up/down scroll arrows in the Custom numeric field to jump to the next key frame.

To access the keyframes you create for the animating texture, open the **Project window**, turn down the arrow for the object which has the texture applied. Next, turn down the arrow next to Object Properties. You will see an entry called Surface Shader within the Object Properties section. By opening this Surface Shader section you can see the controls and keyframes (if animated) from within the Project window.

**NOTE**: Each time you click the Apply button, a keyframe is created. If you Cancel the Image Texture dialog rather than clicking OK, this information will be lost.



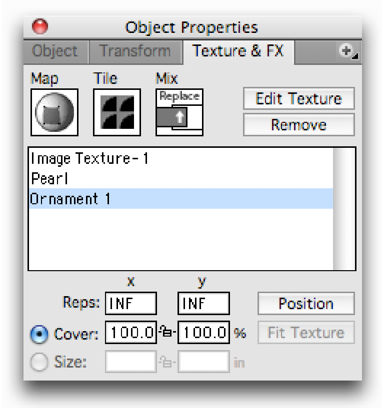

## Texture Morphing

This method uses animated settings but specifically targets the Stencil texture channel to morph, or fade, from one texture to the one applied under it in the Texture Layer stack. The Stencil channel can be adjusted in the Image Texture dialog, which is described in full in **Chapter 9 - Using Image Textures**.

Using the techniques described above to animate the texture settings, animate the Stencil slider to gradually transition from one texture to another. Setting the Stencil slider to zero in any texture dialog will completely “block out” that texture, and the texture below will show through instead. (You do not need to have a Stencil map loaded to use this slider.) By varying the value in the Stencil sliders for multiple layered textures, you can create textures that gradually change or “morph” into other textures.

# Controlling Textures on Objects

The **Texture & FX panel** of the **Object Properties** palette allows you to control the placement and mixing of textures on a selected object. These settings only allow you to change the way a texture appears on a selected object - **not** how the texture appears on other objects.



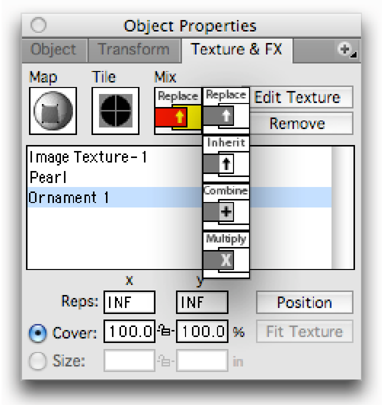

## Texture Layering

Design 3D allows you to apply more than one texture to an object. The way these textures mix together affects the final appearance of the object when it is rendered. At the top left of the Textures panel is a list of all the textures that are applied to the selected object.

When you apply a texture to an object the texture is placed on top of any other textures that have been applied, and it appears at the top of the list. You can change the position of a texture in the list by grabbing the name of the texture and dragging it to the desired position in the list.

### Texture Mixing

You can specify the rules for mixing multiple textures on an object. These rules apply to all channels of the selected texture. Mixing rules determine how the selected texture will mix with those below it on the list.



The default setting is Replace. With Replace, the top texture is displayed. The exception to this rule is if the top texture has one or more channels turned off (using the Eye Button in the texture dialog), or if the bottom channel provides channels the top texture does not have. The complete list of mixing rules includes:

• **Replace:** Replace all lower textures in the Layer list with this texture.

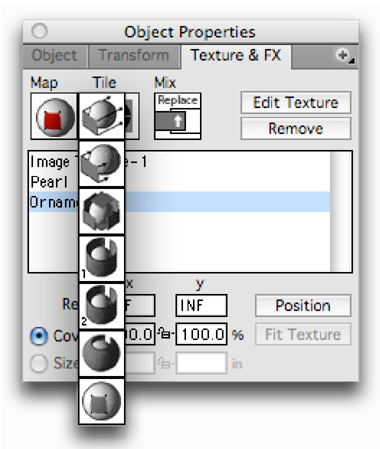
• **Inherit:** Inherit all properties of the texture below. (Useful when the lower texture lacks a property that the higher texture does include.)

• **Combine:** Combine the settings of this texture with the settings of the texture below. For example, Opacity settings of 70% for the top texture and 30% for the bottom texture would equal a combined 100% on your object.

• **Multiply:** Multiply the values from this texture with the values in the texture below. For example, Opacity settings of 70% for the top texture and 30% for the bottom texture would be multiplied and equal 21% on your object.

## Texture Mapping Styles

Texture mapping refers to how an image texture is wrapped around the geometry of an object. Each texture on an object is mapped separately.

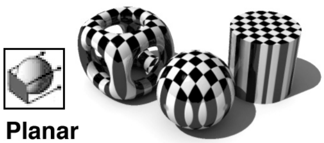



**NOTE:** If the selected texture is a **Solid** procedural texture, several of the fields are dimmed. Because these texture types are three-dimensional in nature, and the textures contain no maps, the Mapping and Tiling menus are dimmed and unavailable. Also, the numeric fields change to control the scale, position and orientation of the Solid. If the selected texture is a **Volumetric** texture, none of the fields in the Object Properties palette are available. For more information about Volumetric textures such as Fog, Haze and Mist see **Chapter 10 - Special Texture Types.**

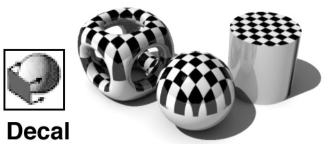
The Map pop-up list contains several different ways to set the mapping of a Image Texture. Select the texture for which you want to change the mapping parameters and then select a Mapping Style from the visual pop-up menu.


UV

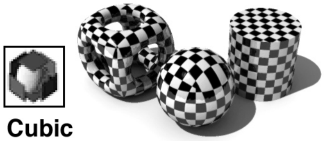
• **UV:** This method of mapping wraps the texture onto the object by matching the texture to the object's UV coordinates. With this method the image maps follow the contours of the surface, stretching and squeezing where necessary. Texture maps retain their relative position on the object even when the object is twisted or folded.


Planar

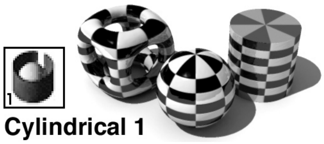
• **Planar projection:** This method pushes the texture straight through the object. The texture shows on all faces of the object, even the inside and back.


Decal

• **Decal projection:** Similar to Planar, except this method applies the texture to only one side of an object.

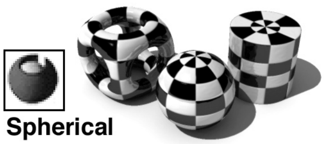



• **Cubic:** This method applies the texture from six directions, even if the selected object isn't a cube.




• **Cylindrical 1:** This method wraps the texture around the object in a cylindrical fashion. If the texture is longer than the object (top and bottom), the texture smears to the center of the object on the top and bottom end caps.


• **Cylindrical 2:** This method wraps the texture around the object in the same cylindrical pattern as Cylindrical 1, but the aspect ratio of each pixel is retained.

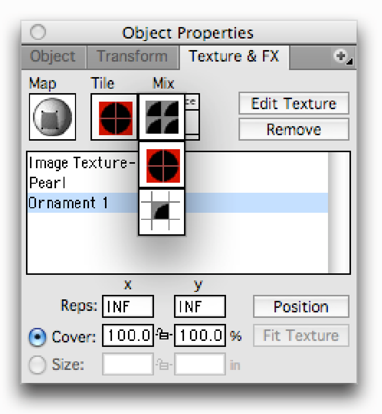



• **Spherical:** This method wraps the texture around the object in a spherical manner, and then gathers the texture together at the top and bottom poles.

## Texture Tiling

### Tile Controls

An image map can be repeated, or tiled, over the surface of an object in different patterns. Tiling is only available for non-procedural surface textures, and is most useful for Image Textures that are scaled to be smaller than the object they are applied to.




• **Normal:** The map repeats in a straight manner, beginning over each time the previous pattern ends.
• **Mirrored:** The image alternates end-for-end each time it repeats across the surface.
• **None** (No tiling): The image appears once at the scale or coverage specified.

## Other Texture Controls

### Repetitions

You can specify the number of times to repeat the map across the surface of an object. The default setting is INF or infinite in both the horizontal and vertical directions. The INF setting ensures that an object will be completely covered no matter how large or small the map is scaled relative to the object.

### Coverage

This option scales the size of the map to cover a specified percentage of the object's UV space or the mapping projection's space. Enter a percentage in both the horizontal and vertical fields. To maintain the proportions of the map, make certain the Lock icon between the fields is in its locked (closed) position. When locked, you'll only need to enter a value in one field; the value in the second field is determined for you to keep the dimensions of the map proportional.

### Size

This option defines the actual size of the map. You can specify the size of the map in both directions. If you want the map to remain proportional, make sure that the Lock icon between the fields is in its locked (closed) position.

**Texture List Command Buttons**
On the right side of the Texture & FX panel are the Texture Layer List command buttons. Each button effects only the currently selected texture in the Layer List.
• **Edit Texture:** You can edit the texture by clicking the Edit Texture button. The appropriate Texture Editing dialog is displayed.
• **Remove:** To delete the selected texture from the object, click the Remove button. This action removes the texture from the object; it does not remove the texture from the model.
To remove the texture from the model, you can use the Delete Unused command from the Plus menu on the Resource palette.
• **Position:** The Position button allows you to change the position of the selected texture on the object through interactive controls presented in the Modeling window. Clicking the Position button is the same as selecting the **Position Texture** command from the Modeling menu. Positioning textures is described in the next section.
• **Fit Texture:** The Fit Texture button allows you to center the texture on the object with 100 percent coverage. This is the default texture orientation. This button is only active when you are positioning an Image Texture. It is grayed-out at all other times.

**NOTE:** Some procedural and Volumetric texture types (Wildlife and Mist for example) don't offer a way to position the texture. When one of these types of textures is selected the Position button is grayed out.

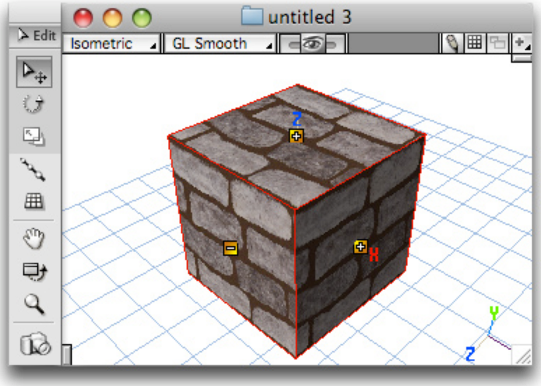
## Positioning Textures on Objects

You can position a **non-UV** mapped texture interactively from the Modeling window.

In the Texture panel of the Object Properties palette, select the texture from the list and click the **Position** button. You can also use the Position Texture command from the Modeling menu.

**NOTE:** If the selected texture is UV mapped, the Position button summons the Position Maps dialog. The Position Maps dialog is described in **Chapter 9 - Using Image Textures.**

When you click the Position button, the **Tool palette** changes, similar to the modeling Edit modes. Texture positioning tools are provided for Moving, Rotating or Scaling textures directly on the object.




You can interactively move, rotate, or scale the texture as needed by using the available **3D Texture Handles**. The handles display "+" and "-" symbols to indicate up/down, front/back and left/right. For textures applied with the Decal projection, the front and back handles (in the "Z" axis to the texture) are also used to determine the depth or distance that the decal penetrates the object.

**TIP:** If you're using an interactive renderer capable of displaying textures in the Modeling window, such as OpenGL Flat or Smooth, you'll find it much easier to precisely position the texture on the object. (The Show Textures option must also be enabled in the Windows panel of the Preferences dialog.)

### Moving Textures

Select the Texture Move Tool to reposition the texture on the object. Grab a face handle to constrain the movement of the texture perpendicular to the plane of the selected handle. Grab the center handle to move the texture freely in any direction. If you click and drag while holding down the **Command** (Mac) or **Control** (Win) key, this centers the texture on the geometric center of the object.

### Rotating Textures

Select the Texture Rotate Tool to rotate the selected texture on the object. Grab the rotation handles and rotate to the desired position. Holding down the **Shift** key constrains the rotation of the texture to 45 degree increments.

### Scaling Textures

Select the Texture Scale Tool to scale the selected texture on the object. Scaling the texture maps affects the way in which the maps tile onto the surface of the object. If you hold down **Command** (Mac) or **Control** (Win) while Scaling, this sets the object scale at 50% coverage. Holding down **Option** (Mac) or **Alt** (Win) sets the object scale at 100% coverage.

#### Finishing the Position

When you're finished positioning and aligning a non-UV texture on the object, click on the End Position button or select the End Edit command from the Modeling menu. You can also click the Edit button at the top of the Tool palette to exit the texture positioning mode.

#### Fit Texture

The Fit Texture button allows you to center the texture on the object with 100 percent coverage. This is the default texture orientation. This control is available in the Texture & FX panel of the Object Properties palette. The Fit Texture button is only active when you are positioning an Image Texture and is grayed-out at all other times.

## Positioning UV Textures

UV mapping wraps the texture onto the object by matching the texture to the object's UV coordinates. The image maps follow the contours of the surface, stretching and squeezing where necessary. Texture maps retain their relative position on the object even when the object is twisted or folded.

#### Positioning Uv Mapped Textures

When using the Position button or command on a texture that is UV mapped to the object, the **Position Maps** dialog for that texture will appear. Positioning the maps within this dialog moves them in the UV space of the object as well as every other object as well. This is the only Position operation that affects how the texture is composed on all objects it is applied to. The Position Maps dialog can be accessed through the Object Properties palette, or the Image Texture dialog.
For more information see **Position Maps Dialog** in **Chapter 9 - Using Image Textures.**

## Burn UV

Sometimes the UV coordinates aren't projected onto an object in a way that's most useful. This often occurs after importing meshes or performing Boolean operations. With the Burn UV command you can project a different set of UV coordinates onto a Polygon Mesh or single Polygon.

Another reason to you may want to use this command is if you're planning on exporting the geometry in a format that only supports UV mapping of textures, such as rendering to **Strata Live 3D CX**. In this case, any non-UV texture projections will not be included, so it is necessary to "burn" the UV mapping of the texture to insure that it is retained on rendering to Live 3D.

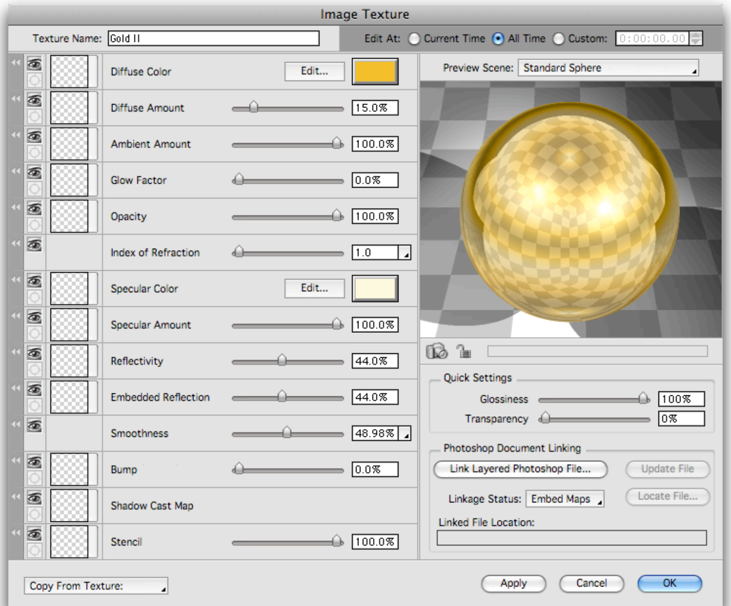
**To Change the Uv Coordinates:**
From the **Map** pop-up on the **Texture & FX** panel of the **Object Properties** palette, select the projection mapping style (Spherical, Cubic, etc.) that you want to use to establish the object's new UV coordinates. (You must already have a surface texture applied to the object in order to access the Mapping style pop-up. However, once the new UV coordinates are established, you can remove or change the texture because the UV coordinates are a property of the object, not the texture.)

Once you've got the mapping and positioning of the texture just right, select the **Burn UV** command from the Modeling menu. New UV coordinates are established, and the Mapping style pop-up on the Object Properties palette immediately changes to UV.

**NOTE:** You can also change the position of the texture on the object before burning in the new UV coordinates. Click the Position button on the Object Properties palette to change the orientation of the texture.

# Using Image Textures

The most common and powerful texture type in Strata Design 3D CX is the Image Texture. These textures can utilize image maps to enhance the realism of renderings. Image mapping gives you pixel-by-pixel control of the look of your texture. The Image Texture dialog contains all the controls you need to create complex, realistic textures.




There are a number of common controls in the Image Texture dialog that are used in nearly every texture in Design 3D. These include the name of the texture, a rendered Preview (very helpful), texture animation controls, and even an option to copy settings from another texture.

• **Texture Name:** This field contains the name of the new texture. This is the name that will appear in the pop-up list on the Resource palette. Using a descriptive name will help you remember its name and locate it again later.
• **Copy Texture From:** This field allows you to copy the settings from one texture to create a variation for a new texture. Simply choose the desired texture from the pop-up list. (Only Image Textures that are already loaded in your

model are listed here.) All settings from that texture are applied to the new texture; the original texture is unaffected.

• **Preview:** This area allows you to see how the texture will appear when rendered. A pop-up list above the preview area lets you select the type of preview object used. Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

• **Edit at:** including **Current Time, All Time,** or **Custom**. These buttons control the animation of the texture you are editing. If you select Custom, enter the time that you want these settings to start taking effect for this texture. You can create textures that change over time by changing the settings in this dialog and hitting the Apply button at different points in time. For more information see **Animating Textures** in **Chapter 8 - Texture Basics**.

**Dialog Navigation**

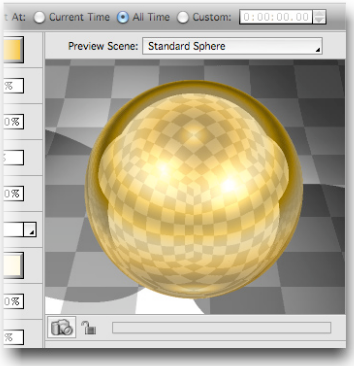
Navigating through the Image Texture dialog is quick and easy. Use these shortcuts to quickly access the settings you need:

• **Tab key:** Moves from one numeric field to another in the dialog.
• **Shift:** Holding down the Shift key while tabbing reverses the tabbing order.
• **Arrow keys:** Use the up and down arrow keys to increase or decrease settings in selected numeric fields.
• **Spacebar:** Opens or closes a texture channel settings drawer.
• **Section name:** Clicking on a texture channel name, such as Smoothness, Opacity, etc., opens and closes the channel drawer.
• **Scroll wheel:** Moves the focus up or down through the channels. If you open a drawer, the scroll wheel will move the focus from one drawer to the next.
• **Option/Alt click on Eye icon:** Toggles all the **other** texture channels on or off. The Eye button turns an individual texture channel on or off.

## Preview Area

You can preview your texture at any time by clicking the camera icon in the Preview area of the Image Texture dialog. Previews reflect any changes in the texture settings, and can help you adjust your settings.

To **start** a preview, click on the camera icon located in the lower left corner of the preview area. To **stop** a preview click on the icon that appears while the preview is rendering.




Use the **Lock** icon to enable or disable the Preview's **auto-update** feature. Auto-update automatically updates the Preview whenever you make a change to any texture setting. When the icon is Locked, auto-update is on, or enabled. To turn off auto-update, Unlock it by clicking the Lock icon.

In the Preview Scene menu, you can choose one of the standard options, or you can save and then use a custom preview model.

There are specific locations for storing custom texture previews. You will want to store these custom settings in different places, depending on your needs:
• **Machine wide**, for multiple users to access on the same machine: Inside of /Library/application Support/Strata Design 3D CX 60/.
• **User-specific**, for you to use on a system that has multiple users: Inside of your home folder found at Users/(your account)/Library/Application Support/Strata Design 3D CX 60/.

## Quick Settings

You can quickly set a texture's Glossiness and Transparency levels using these fields. Changes in the Quick Settings interact with and change several of the other texture channel settings. The Quick Settings are a simple way to control a texture's appearance, or to find a beginning point which you can later fine-tune.

• **Gloss**: This slider and percentage entry box determines how shiny the texture appears by controlling several of the texture channel values with a single slider. The effects can be very dramatic, but are easily controlled with this setting.
• **Transparency:** This slider and percentage entry box determines how opaque or transparent the texture appears. This slider also controls a number of channel settings with a single slider.

## Using Image Maps

An Image Map is an image or movie that's used to define some aspect of the surface characteristics of an object. It's quite common to use the same image in several map fields. Typically, these maps are created from the same master image. That way, they are guaranteed to align correctly when the images are mapped to the variable surfaces of your 3D objects.

Each surface property field - also referred to as a "channel" - allows you to set values which control the effect each map has on the final texture. There is a slider and numeric field that control the primary value for the texture channel. Some channels have an Edit button and Color field, which both summon a Color picker dialog. Many channels also have drawers containing more advanced settings. These are described later in this chapter.

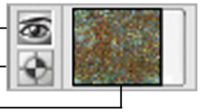
With the channel settings, you can make changes to the various surface properties without the need to change the image maps themselves. For example, perhaps the grayscale map in the Reflectivity field creates a texture that is slightly more reflective than you want. Instead of taking the map back into an image-processing application and toning down the grayscale values, you can simply reduce the value from 100 percent to 90 percent.

If a field contains no map, the values you set become global settings for the texture. Each image map simply provides a way to vary this percentage across the surface of the object that the texture is applied to.

In addition to the numerical field and slider that most channels provide, most channels contain three control buttons. The **Eye button** allows you to turn any of the texture channels on or off. This also makes any associated maps invisible. When you click the Eye, it **toggles** between its ON (open) and OFF (closed) state. **Option/Alt** clicking on the Eye toggles all the other texture channels on or off.

The button just below each Eye button is the **Position Maps** button. This button opens the Position Maps dialog where you can scale, rotate and align all of the image maps in your texture.

The larger field to the right of the Eye and Position Maps icons is the **Load Map** button. It opens the Image Map dialog, where you can locate and load an image map for use in the texture channel.



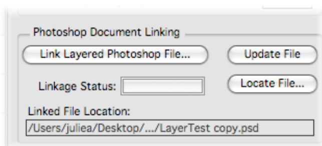

## Linked vs. Embedded

In Design 3D you have the option to bring images in as **linked maps** or as **embedded maps**. Linked images may be loaded for use, but they retain a "live link" to the original file on your disk or network. If you make a change to the linked file, Design 3D will update the texture. Conversely, if you embed the image it gets saved directly into your Design 3D model file and can only be changed if you replace the image map in the texture dialog.

You can link image maps to a Design 3D texture in two ways - by linking the maps one channel at a time or by loading a layered image file using the Photoshop Document Linking options.

To link image maps one channel at a time, click on the Load Map button. This summons the **Image Map dialog** where you can locate and link an image map.

## Photoshop Document Linking




This section of the dialog allows you to link a layered Photoshop file to multiple texture channels at once. It contains many of the same functions as the Load Map section of the Image Map dialog.

Loading a Photoshop layered file fills multiple surface channels at once from all of the pixel-based layers in the file. Because all layers are the same pixel dimensions and can be edited in the same file, this is a very convenient way to create and manage image-based textures.

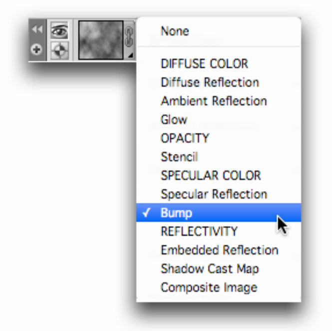
**NOTE:** With Adobe Photoshop® files, special attributes like transparency, masks, vector objects, adjustment layers and layer folders are ignored. Transparent areas are replaced by white pixels, and all special layers are imported as blank layers. If you need transparency in your texture, apply a grayscale map to the Stencil channel and use the Design 3D transparency for the whole texture.

To load a file, click on the **Link Layered Photoshop File** button, and locate the layered file you want to use.

Design 3D will automatically distribute the layers to the channels in your Image Texture - taking the top layer in the image file and placing it into the top channel in the texture and so on.

Once you load a file, a **link icon** and an **arrow** appear on the right side of the Load Map field. The linked icon indicates the presence of a linked Photoshop file.


Clicking the arrow opens a Load Map pop-up menu that contains the names of the layers of the imported file. You can use the Load Map pop-up menu to specify different layers for the channels. You can also choose None from the pop-up if you do not need a map in a particular texture channel.




The Photoshop Document Linking section of the Image Texture dialog provides these options:

• **Link Layered Photoshop File:** This button allows you to locate and select a layered Photoshop file.

• **Update File:** When you click this button Design 3D attempts to reload the file from your local hard drive location. This will refresh the image held in memory.

• **Locate File:** This button allows you to relocate a linked file, if the linked file has been moved from its original location.
• **Linkage Status Pop-up:** In this menu, you can choose whether the texture's Image maps are linked to a layered Photoshop file or embedded within the model file. The selected option in this menu appears with a mark beside its name.
- Custom. This option indicates that some of the maps are linked (to the same or different files), and some are embedded.
- Embed Maps. The maps are saved within the model file. Choosing this option breaks the link to the Photoshop file.
- Link Maps. This breaks the file link to the entire Image Texture while keeping the images linked to the individual texture channels.
- Linked to File. The maps are linked to a layered Photoshop document. This is the default behavior once you load a layered file into an Image Texture.
• **Linked File Location:** This field displays the location of the linked file.

## Image Map Dialog

When you click on the Load Map field in a texture channel, the Image Map dialog appears. The Image Map dialog is used in many places in Design 3D besides Image Textures, such as when importing image maps into Backgrounds.

You load images or movies into the Image Map dialog by either pasting a file from the Clipboard or by using the Load button. The Load button allows you to embed or link images and movies in an identical manner to the main Image Texture dialog.

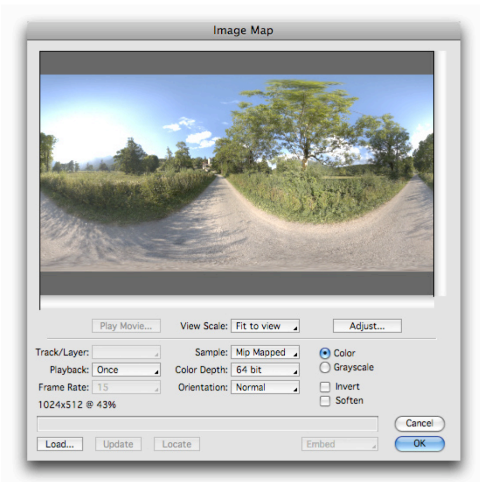


**Image Map Dialog Controls**

The Image Map dialog provides settings to preview and control a movie-based map, scale the view of the map in the dialog, and customize how a map is utilized.

**Movie controls**

The **Movie** controls are located on the left side, above the Map Control cluster. They are only active when a multi-frame movie file is loaded in the Image Map dialog. The controls include the ability to select the Track or Layer, Playback characteristics, and Frame Rate.

• **Play Movie:** This button displays the animation playback window and plays the movie specified in the Map field.

• **Track/Layer:** This field lists all the tracks in the current movie or file. This is the only control in this group that is also used for image files. If you have a layered file linked to the document, the available layers will be displayed in the pop-up. If no movie or layered file is present, this field is not available.

• **Playback:** This pop-up controls how the movie plays back. You can choose these options:

- Once. Plays the movie one time, from beginning to end.
- Loop. Repeats the movie over and over again, each time from the beginning to the end.
- Back and Forth. Plays the movie from beginning to end, then reverses and plays the movie backwards. This forward-backward cycle repeats itself over and over again.

• **Frame Rate:** Select a frame rate for the movie in this field.

**Map Controls**

The general **Map** controls for still images are located in the center of the dialog above the Loading cluster. These Controls include options for selecting the type of Image Sampling that is used, specify or change the Bit Depth of the image, or even change the Orientation of the entire image. At the top is an option for setting the display scale of the preview image in the dialog.

• **Sample:** This pop-up lets you specify how the pixels within the image are sampled.

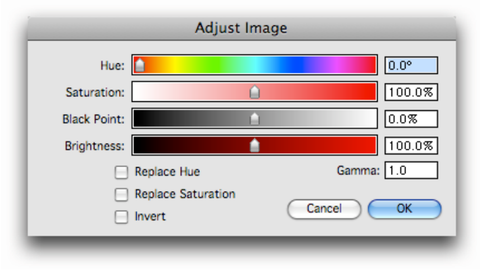
- Direct. Pixels in the image are left as is, with no interpolation.
- Smooth. Pixels are interpolated (values of the adjoining pixels are averaged together) to produce a smoother appearance.
- MIP Mapped. Pixels are interpolated, and also super-sampled to prevent moire patterns and/or background flickering.

• **Color Depth:** Select a color depth for the image or animation from this pop-up list.

• **Orientation:** You can change the orientation of the map. The options include Normal, Flip Horizontal, Flip Vertical or Flip Both.

**Image Adjustment Controls**

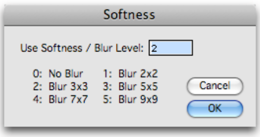
• **Adjust:** This button summons the Adjust Image dialog, where you can set the image map's Hue, Saturation, Brightness, Black Point and Gamma. Adjustments you make in this dialog affect only the image as used in the Design 3D model, not the original image file.
Saturation, Brightness and Black Point can be set above 100%. This is especially useful with HDR images, which often have values that are very high.



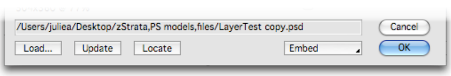

- Hue. Color reflected from or transmitted through an object, measured by degrees as located on the standard color wheel.
- Saturation. This is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue. It is usually measured from 0% (gray) to 100% (fully saturated), although you can use higher values.
- Black Point. Use the slider or numeric field to determine which value in the image will be considered black. Every other value will become darker or lighter, depending on whether you use a positive or negative value.
- Brightness. This is the relative lightness or darkness of the color, generally measured as a percentage from 0% (black) to 100%(white), although you can use higher or lower values.
- Gamma. Changing the gamma value allows you to compensate for differences in the presentation or perception of light intensity changes. In some situations, you may want to adjust the gamma value of images due to the way they were captured, or to pull out details in the scene. The default setting is 2.2.
- Replace Hue. Enabling this checkbox replaces all of the colors in the image with the value selected in the Hue setting.
- Replace Saturation. Normally, saturation values are scaled throughout the image. Enabling this checkbox causes the current saturation setting to replace all existing saturation values in the image.
- Invert. This checkbox inverts the image values, resulting in an image that looks like a film negative. It works by taking the existing image and subtracting the pixel values from 100%. If you have an HDR image with values above 100%, the invert function stops at zero to avoid unexpected negative light results.

• **Color/Grayscale:** These buttons indicate the status of the currently loaded map. You can change a color map to grayscale by clicking the Grayscale button. Non-color channels default to grayscale and cannot be displayed in color.
• **Invert:** Use this button to invert the image map. This is useful, for example, if you want the light areas of the map to become the depressions in the surface of an object, rather than the high areas. You can simply invert the grayscale map and use it as the new bump map.

• **Soften:** If your image map is too hard-edged, you can add a slight blur with the Soften option. **Option/ Alt** clicking on the Soften option will open the blur settings dialog where you can set a more specific Softness/Blur level using the numeric field.




**The Map Control Cluster**
At the bottom of the Image Map dialog is the Map Control cluster. This cluster includes controls to load a file, update a linked file, locate a linked file and embed a linked file. These controls also appear in the Photoshop Document Linking section of the Image Texture dialog. If you have already linked a layered document into the texture, these controls do not appear in the Image Map dialog.

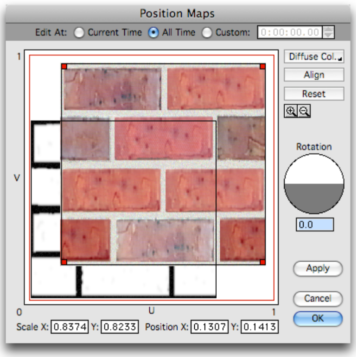



These controls have the following functions:
• **Load:** This button allows you to load an image or movie to use as a map by presenting a file browser for you to find the 2D, pixel-based image file.
To load animations consisting of sequentially numbered files, locate and load the first file; Design 3D will load all other sequentially numbered files with the same name that are present within the same folder.
If you wish to load a simple color instead of an image file (perhaps for a field that does not have a Color component otherwise) hold down **Option** (Mac) or **Alt** (Win) while clicking on the **Load** button in the Image Map dialog. A color picker will appear allowing you to select a color.
• **Update:** When you click this button Design 3D attempts to reload the file from your local hard drive location. This will refresh the image held in memory.
• **Locate:** Clicking this button allows you to relocate a linked file. This can be valuable if the file has been moved to a different location on your disk or network.

• **Link/ Embed** pop-up menu: This menu gives you the option to leave a file as a linked file or to embed the file so that the map (or maps, if it is a layered file) are saved within the model file.

## Position Maps Dialog

When you press the Position Maps button (below the Eye button in each channel), a dialog is displayed that allows you to position, scale and rotate the image maps within the texture itself, regardless of the object it is applied to. This is based on the internal U and V directions of the texture. If you alter how the maps are positioned in the Position Maps dialog then all places where the texture is applied will be affected by this change.




The **Position Maps** dialog consists of animation controls at the top, a Map selector and control buttons, a large layered preview of all of your loaded Image Maps, and Position, Scale, and Rotation controls.

### Animation Controls

The main Map composition dialog includes the basic animation controls common to all texture dialogs at the top of the box, but these settings apply specifically to the Position, Scale, and Rotation of each Image Map in the current texture.

### Map Controls

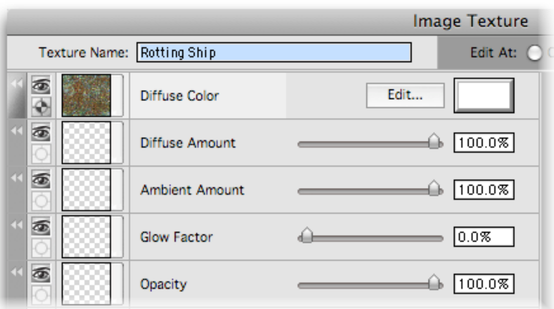
In the upper right corner are the controls for selecting and inspecting the various image maps in your texture. If you have no Image Maps loaded in your texture this area will be grayed out and the entire dialog will have no utility. The controls are as follows:

• **Map list menu:** This pop-up contains all of the maps loaded in the current texture definition. Select the map from the list that you want to position.

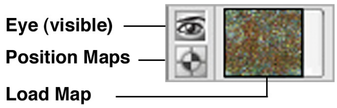
• **Align:** This button aligns the settings of all other maps in the texture with the selected map. Align applies to the rotation, position and scale of the maps.
• **Reset:** If you're unhappy with the placement of the selected map and want to revert to its original position, click the Reset button. The map will return to the orientation it was in at the time this dialog was last opened.
• **Editing window:** You can click and drag the selected map in the editing window and move it to any position. Scale the image by selecting the red handles in the corners. You can also set Scale and Position more precisely via the entry boxes at the bottom of the dialog. To rotate the map, use the interactive Rotation control to the right of the editing window, or use the numeric field to enter rotation in degrees.
**NOTE:** When using UV mapping, the Edit window, from zero to one in both directions represent the entire surface of the object to which this texture will be applied, both width and height.
• **Apply button:** You can edit the settings in this dialog so that they change over time. Define the settings as you want them initially, click the Apply button, then change the time in the Edit At field at the top of the dialog. Then, adjust the settings as you want them at the time specified, and click Apply again. Repeat this procedure until the texture maps are animated as desired.

## Texture Channel Settings

This section of the Image Texture dialog includes controls for creating complex textures. Most of these fields in the Image Texture dialog use image maps, but **Index of Refraction** and **Smoothness** do not, so the settings for these fields are always global in nature and apply to the overall texture.




**Diffuse Color, Specular Color,** and **Shadow Cast Map** are the only fields that contain maps that use color information. All of the other maps are treated as grayscale maps. The value of each pixel in the map determines the level of effect for that particular surface property for that pixel in the final rendered image. For example, if you use a map in the Bump channel, the gray values of the map's individual pixels will determine the apparent bumpiness (in a rendered image).




Next to each Map is an **Eye** and **Position Maps** icon. The Eye icon enables or disables the effect this channel has on the texture's appearance. This applies whether you have a map loaded or not.

Clicking the Position Maps icon opens the Position Maps dialog, which allows you to position and scale the texture's image maps. The Position Maps button is grayed out and unavailable if no maps are loaded. For more information see the previous section **Position Maps Dialog.**

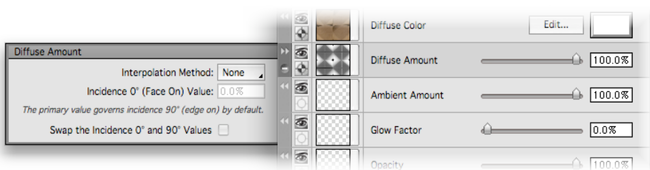
The larger field to the right of the Eye and Position Maps buttons is the **Load Map** field. Clicking this field opens the Image Map dialog. For more information, see the previous section **Image Map Dialog.**

**NOTE:** Even if no 2D image is loaded into a channel, each channel is still active (if the Eyeball is open) and can affect the texture's appearance based on the slider or any color values used.

## Primary Texture Setting

To the right of the map controls you will notice the name of the **texture channel** (such as Diffuse Amount, Bump, etc.) Most channels contain a linked **slider** and **numeric entry field**. The Diffuse and Specular Color fields also have an Edit button and a color field, both of which summon a color picker dialog.

Each texture channel's slider and its associated numeric field control the Primary texture setting - the overall effect of the channel on your texture. Any map you have loaded serves as a modifier to this amount, changing the percentage over the surface of the texture.



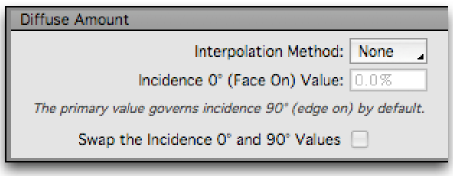
The effect texture channel settings have on an object's appearance depends on which texture channel you are working with, the channel's map, if any, and the **drawer settings**.

The Primary setting controls the texture's appearance without regard to the viewing angle (**angle of incidence**), unless you select an **Interpolation Method** in the texture channel's drawer settings.

The angle of incidence measures the difference between the angle at which a light ray hits the surface of an object and the object's normal. A normal, or surface normal, is a line perpendicular to the surface.

## Interpolation Settings

Most of the texture channels have advanced settings, located in a **drawer** on the left side of the channel sections. In most cases, the drawer contains the **Interpolation Method** pop-up, and the related **Incidence 0° (Face On) Value** and the **Swap the Incidence 0° and 90° Values** checkbox. A few channels contains other options, or no options. The individual texture channels are described in detail in the next section.




To access a texture channel's drawer settings, click the arrow on the far left of the channel section, or click on the channel's name.

The Interpolation Method controls how the Primary (edge on) and secondary (face on) values blend across the surface of an object. This affects how the appearance of a texture changes with the angle of incidence. This setting is particularly important on curved surfaces, however, the appearance of most objects in the real world changes significantly as the viewing angle (angle of incidence) changes.

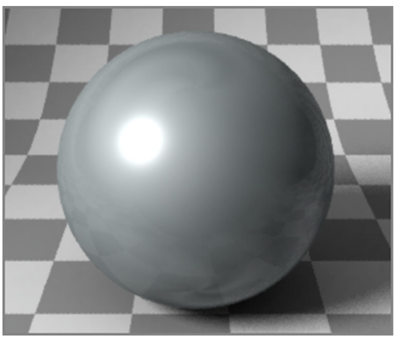
The Interpolation method controls this change in appearance from the straight-on view to the edge view. Which Interpolation Method you choose will depend on the type of surface you are simulating with the texture. Most surfaces in the real world are most accurately represented with the Cosine or Fresnel interpolators.

When you select an interpolation method (other than None), the Primary value controls the edge value (angle of incidence 90°). The Primary value is set with the texture channel's slider and/or associated numeric field. The Incidence 0° (Face On) Value controls the texture's appearance at a direct or face-on view. This setting is made in the texture channel's drawer.

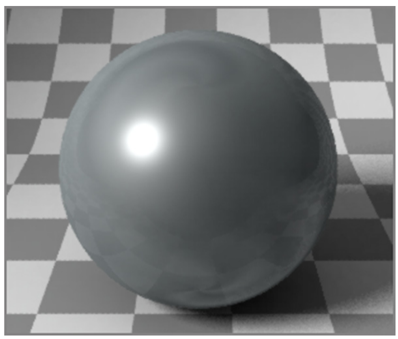
You can control how much of the surface of an object is affected by the Primary (Incidence 90°) and Incidence 0° controls by changing the values in the two numeric fields. The Primary value is most apparent at the edge of an object, while the Incidence 0° Value is most obvious in the center of an object.

Using the Preview field can quickly show you how changing the values in these fields will affect the appearance of an object in your final rendering.

**• Interpolation Methods:**
- None. No interpolation is used. The appearance of the surface of the object does not change with the angle of incidence.
- Linear. The appearance of the texture changes in a linear way as the angle of incidence changes. With Linear, there is a direct relationship between the angle of incidence and the appearance of the textured surface.

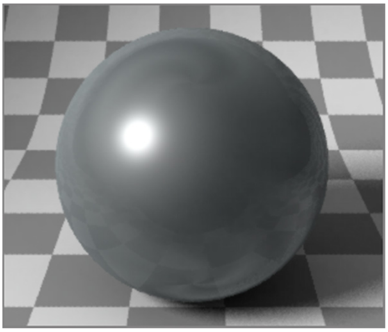


**None**

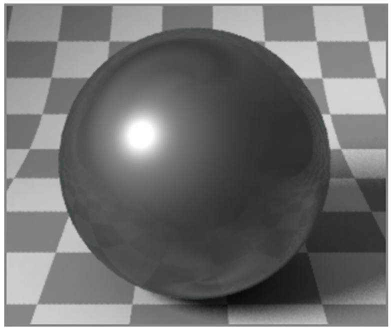


**Linear**

- Cosine. The appearance of the texture changes according to the cosine of the angle of incidence.
- Fresnel. The appearance of the texture changes according to a Fresnel equation. The Fresnel effect is based on the way that the amount of reflectance you see on a surface depends on the angle of incidence. For example if you look straight down from above at the surface of water, you will not see very much reflected light. At a low or glancing angle, you will see a lot more specular and reflected light on the water's surface. On a curved surface, reflectivity increases as you get closer to the edge of the object.



Cosine

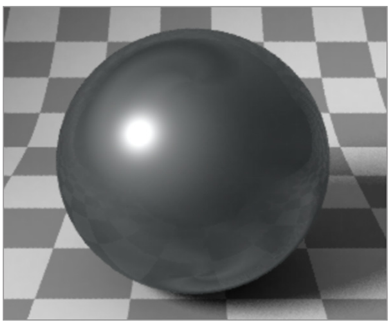


Fresnel

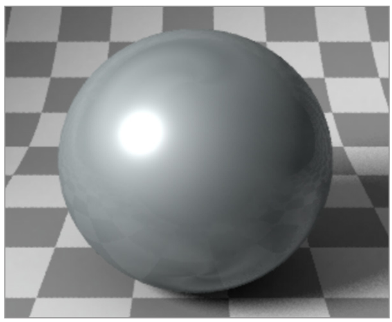
• **Incidence 0° (Face On) Value:** This sets the value of the texture channel in the center of objects. It is based on a view angle of 0 degrees. This setting interacts with the Primary value.

• **Swap the Incidence 0° and 90° Values:** Enabling this checkbox reverses the values of the Primary slider (or numeric field) and the Incidence 0° Value.

This has the same effect as if you had manually interchanged the Primary value (Incidence 90°) and the Incidence 0° Value. This results in the Primary value showing up more near a low angle of incidence on the object's surface.

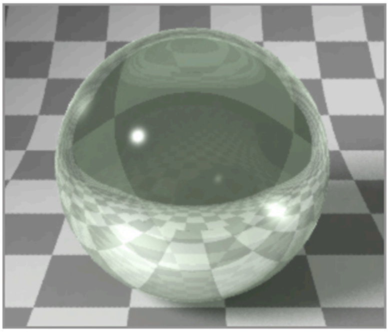


Fresnel Interpolation

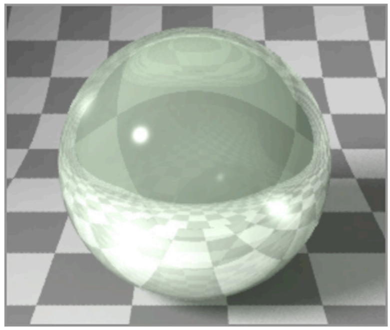


Fresnel with Swap Incidence Values checkbox enabled

Using the Fresnel interpolation method can produce very realistic textures, especially on glass. The Fresnel interpolation method is dependent on the texture's index of refraction.



Glass with Fresnel Interpolation Method



Fresnel glass with Swap Incidence Values enabled

## Texture Channels

The following surface property channels appear in the Image Texture dialog:

**Diffuse Settings**

• **Diffuse Color:** Diffuse Color is visible when light from Spotlights, Point Lights, or distant lights reflects off the surface. Diffuse color is the primary way to assign color to a texture. Click the Edit button or the Color field in the Diffuse channel to summon a color picker dialog.

• **Diffuse Amount:** This parameter determines how much light is either absorbed or reflected by the material. A value of 100% means all incoming light is bounced off the surface. A value of 50% means 50% of the light is absorbed by the material, and 50% is bounced back. This has the effect of darkening and desaturating the surface. A value of 0% means the surface will absorb all incoming light and thus appear black. Spot, point, and distant lights affect the diffuse channel.

• **Ambient Amount:** Ambient light is non-directional background illumination. The amount of ambient light that a surface receives controls the overall brightness of the surface, but this channel is most apparent in shadow areas. Ambient light originates from the Ambient Light global setting on the Lights panel of the Environment palette, or from Raydiosity generated bounce light.

• **Glow Factor:** Glow determines the amount of luminance a surface emits, without reflecting light from an outside source. This is similar to the way the surface of a neon light tube appears. The color becomes increasingly white, and the shading (or dark areas) become more uniformly flat as the inner light expands on the surface. A high Glow value can overpower all other surface properties, but it can also cause any surface with this texture to function as a light source when used with the Raydiosity Renderer!

• **Opacity:** Opacity describes the texture's ability to prevent light from passing through it, and the camera's ability to see what is behind the surface. A value of 100 percent results in a fully opaque surface, while a value of zero is fully transparent and therefore invisible, except for its color and refraction changing the appearance of objects behind it (like colored glass). However, fully transparent objects can also have ambient and diffuse values which cause the surface to become much brighter, and if set too high, can obscure the objects behind it. If you're creating a transparent texture, remember to lower the amounts of ambient and diffuse light, as well.
- Blurred Transparency. This checkbox activates blurred transparency. Your scene must be rendered with the Raydiosity renderer, and the texture needs to have transparency for the effect to be visible.
**NOTE:** Opacity is best used for simulating glass and transparent materials because it includes the Diffuse, Ambient, and other channels in its display. If you wish to cut holes in your object with an image map, or reduce all channel visibilities, it is best to use the Stencil channel for this instead.
• **Index of Refraction:** This value is used to control the amount of refraction visible through a transparent surface, without a map. Refraction causes light to bend whenever it travels through one medium and then another. For example, if light travels through air, then glass, and back to air there will be visible refraction which causes objects on the other side of the glass to be distorted according to the thickness of the material. A value of 1 simulates Air with no perceived refraction at all.
**NOTE:** Refraction is apparent only if the texture also contains transparency and is applied to a solid, one-sided object. Objects with double-sided surfaces appear hollow, like a hollow shell, and do not refract light. In these cases, the Refraction amount has no effect on that object.
- Refraction Presets: You can select a refraction index from a pop-up list of common refractive materials. The slider and numeric field update to reflect your selection.

**Specular Settings**
• **Specular Color:** Specular highlights simulate the reflection of the light sources in your scene. A more polished or shiny surface will have brighter, smaller and sharper specular highlights, while a rough or dull surface will show wider, dimmer, or no specular highlights. (See Smoothness.) Specular Color controls the color of these highlights. Using black results in no visible specular highlight from any light source.
• **Specular Amount:** Specular Amount controls the color and intensity of the specular highlight. A value of zero results in no visible Specular highlight from any light sources If a Specular map is used its pixel values determine the total amount of specular light reflected. White areas of the map are fully bright (as determined by the specular percentage) while black cause the specular to be fully dim.

• **Reflectivity:** This field determines the level of mirror-like reflection a surface has. For a perfectly reflective surface, use no Ambient or Diffuse, but set full Reflectivity and Opacity. However, very few surfaces, except mirrors, are perfectly uniform in their reflectivity. You can create more realistic-looking shiny objects by using an image map to define the variations in the reflectivity of the surface. The color displayed in the Specular Color preview determines the color of the reflected light.

- Blurred Reflections. This checkbox activates blurred reflections. Your scene must be rendered with the Raydiosity renderer, and the texture needs to have reflectivity for the effect to be visible.

• **Embedded Reflection:** Embedded reflections act as an environment, adding surrounding reflections to the objects in your models, creating a more realistic appearance. This field allows you to build a reflective background directly into your texture to control the reflections that appear in shiny surfaces. This is in addition to any reflective background or objects that may actually surround the object. This built-in reflective environment only reflects to the degree set in the Reflectivity channel. You can use a Grayscale map to attenuate the amount of embedded reflection.

- Reflected Background Pop-up. You can select an Embedded Reflection from the pop-up menu in the drawer.

• **Smoothness:** The smoothness of a surface affects the way light reflects from it, particularly the Specular Reflection. Smoothness settings simulate the smoothness of an object on a microscopic scale. Metallic surfaces have a high degree of specularity and the hot spots tend to have halos around them. Smoothness allows you to simulate this “halo” effect. The Smoothness settings can also introduce blurred reflections and transparency to any texture, whether metallic, glass-like or even a matte glazed tile.

Smoothness values simulate the surface of an object. The Primary Smoothness value defines the overall smoothness of the object. The higher this value is, the smaller the primary specular highlight will be. The Secondary Smoothness determines the level at which irregularities are removed from the surface when polished. The lower this value, the larger the secondary specular highlight is.

- Primary Mix Ratio. Controls the mix of the Primary and Secondary Smoothness values. A setting of 100% uses only the Primary value, while a setting of 50% uses an equal amount of the Primary and Secondary values.

- Smoothness Presets pop-up. Design 3D provides a variety of preset values for various materials. You can select a preset from the pop-up list to the right of the slider and numeric field. The materials listed in the pop-up are followed by the Smoothness channel values for that particular material. The values in the pop-up are listed in fractions, rather than the percentages used in the Image Texture dialog. The Primary Value (the slider and associated numeric field) is listed first. The second number (if present) is the Secondary Smoothness value, which is set in the channel drawer.

**Other Settings**

• **Bump:** This field allows you to create objects that appear to have uneven surfaces, even though the geometry isn't altered in any way. The shading of the surface is modified in a very fast and efficient way to simulate a change in the geometry along the surface. To the renderer, the object appears to have high areas and depressions.

Bump mapping works with surface normals. A surface normal is the direction the surface is facing, which, in turn, determines the direction which light reflects from an object. It doesn't alter the geometry of the object; bump maps just change the direction the surface normals are facing. White areas of the map indicate areas of raised height; dark areas indicate depressions in the surface.

**NOTE:** Because a Bump Map does not actually change your surface, the effect will not be visible when the object with the texture is viewed at its edge. There is no change in the geometry, so the Bump seems to disappear. You can use a Displacement texture to really modify the geometry, but that takes longer to render.

• **Shadow Cast Map:** This channel affects the shadow of an object, so the (caustic) effect isn't apparent on the object that it's applied to; it is only visible where the object's shadow is cast. This channel is a quick way of simulating the effect of light passing through a material such as water - similar to way light is affected as it passes through the water in a swimming pool, creating patterns of light and dark on the bottom of the pool. This channel simply projects the shadow cast map where the normal shadow would lie.

• **Stencil:** This channel is controls the visibility of the entire texture, not just its transparency. You can use a Map to create holes or semi-transparent regions, or you can set the entire texture to be invisible or opaque, which is especially useful when Layering textures. You can apply a grayscale map to determine which areas are fully transparent (Black) or completely opaque (White) or a mix of the two (Gray). Very complex objects can be simulated with this channel alone!

- Stencil Reveals Default. This pop-up contains two entries: White and Invisible. If no other texture has been applied to the object when this texture is applied, any areas outside the area covered by the maps (areas of the object that are normally visible) will appear either white or invisible (transparent), depending on your selection. The currently selected option appears with a mark beside its name in the pop-up list.

## Chapter 10

# Special Texture Types

This section explains the special texture types provided by Design 3D. This includes what is available through the Resource palette's New pop-up menu and Library section. There are three basic categories of these special texture types: Surface, Solid and Volumetric.

• **Surface:** All surface textures essentially consist of 2D images that are wrapped, or projected, onto the object's surface. These images can be based on externally generated maps (such as photographs) or they may be mathematically generated within the texture type itself.

• **Solid:** Solid textures are true 3D textures in that they calculate the appearance of the surface based on a point-by-point calculation of the surface's position in 3D space.

• **Volumetric:** These special texture types actually don't alter the appearance of the surface of the object itself but rather the space defined by the object. Effects such as fog are created this way.

## Surface Textures

All surface textures use or generate an image that gets projected or wrapped around the surface of an object. Surface textures are basically two-dimensional maps that are applied to surfaces in 3D space.

The primary surface texture type, and the default texture type in Design 3D, is the Image Texture. The Image Texture utilizes imported maps and numeric settings to achieve its results. By contrast, most of these surface texture types are generated with mathematical algorithms.

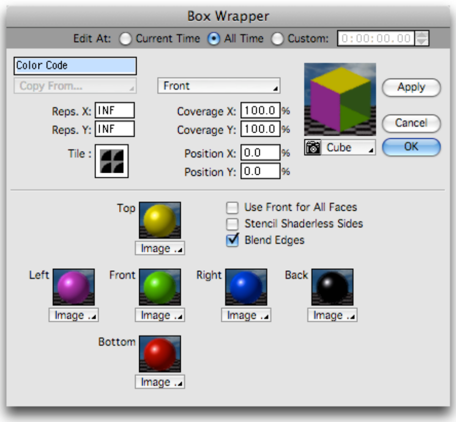
### Box Wrapper

Box Wrapper lets you map and align up to six different textures on a single object in a "box-like" arrangement. This makes it easy to create a texture with a different map on two or more surfaces, such as a cereal box, a book, or any other object that is approximately cubic, or six-sided. It is not restricted to six-sided objects, but it works especially well with them.

While it is possible to achieve similar results without this special texture, you would need to apply up to six different textures to the object, and each texture would require that you use a separate map in the stencil channel.

**Box Wrapper Controls**

The Box Wrapper editing dialog allows you to select up to six different textures, either from your scene, the Libraries, or custom created ones of any type, then each texture is applied to the surface normals that are perpendicular (or within 45 degrees of perpendicular) to the faces of a virtual box, as defined in the Box Wrapper dialog.



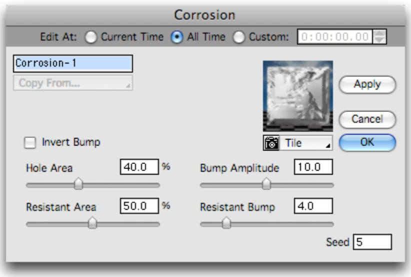

Some special controls in the Box Wrapper texture dialog allow you to set some unique properties. These properties are outlined below.

• **Use front for all faces:** If you want to use the same texture on each face, check the checkbox, then place a texture in the Front field. This option must be unchecked to load Textures for all faces.
• **Blend edges:** If the object has only 90-degree angles, such as a cube, you will always have a sharp border between textures because the surface normals at any point on the face are exactly perpendicular. However, on curved surfaces, you can gradually blend the two maps together, creating a smooth transition from one map to the other. To do this, check the Blend edges box.
• **Stencil shaderless sides:** The Stencil shaderless sides option places a black stencil map on each entire face, allowing the texture below to show through. If this box is not checked, any face that doesn't contain a texture renders with the default white texture instead, even though there may be another texture applied below.

## Corrosion

The Corrosion texture ages or corrodes an object, eating away at the surface to give an old, worn appearance. This texture is a procedurally generated bump map that also creates transparency to simulate holes in the texture beneath it. It can add a lot of realism to many objects by removing that "too-perfect," computer generated look.

The Corrosion texture is designed to be layered on top of other, base textures. This is because the Corrosion texture does not include color information, or many other surface characteristics. You can check the **Texture & FX panel** of the **Object Properties** palette to verify its position in the **Layer list** applied to each object. If it's not on top, simply grab it in the scrolling list on the Object Properties palette and drag it to the top of the list.




The controls in the Corrosion texture dialog control the Bump characteristics, the Hole (or transparent stencil) characteristics, and the way the corrosion covers the object it is applied to. Use the controls in the dialog to corrode the surface of the object as much or as little as you want. As you adjust the controls, you can preview the texture with its current settings by clicking the camera icon.

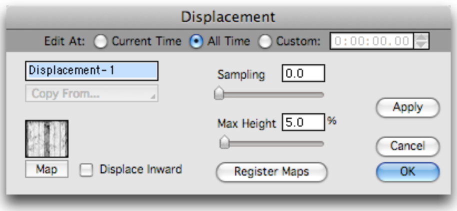
## Displacement

The Displacement texture allows you to deform geometry with a 2D image file or movie. Displacement only works on Bézier or mesh objects, so if you have some other kind of object, you must first convert it to either of these types. Applied to an object, Displacement samples the gray values in the map, then translates the differences in brightness into differences in the geometry's elevation.

Displacement is fundamentally different from using a Bump Map. Instead of simulating variations in the object's surface, Displacement actually changes the geometry of the object. This means that the displacement is visible even in profiles of the surface, and the effect takes longer to render as it gets more detailed.

This texture is time-variable in two ways. You can use a movie instead of a still image to make the object ripple or change shape over time. And you can change the settings in the texture dialog over time, for example making a word or shape rise up out of the surface of your object.

**NOTE:** Displacement works best on Bézier objects. It can also be used on polygon mesh objects, but sampling is significantly slower. You can use the Subdivide command to add detail to a polygon mesh object to make Displacement more effective.




**Displacement Controls**
The Displacement controls include the basic naming and animation controls, as well as some very specific settings for the displacement of your object's surfaces. Some of these specialized options are summarized below:

• **Map:** This button summons the standard Design 3D Image Map dialog. Click Load to select a still or movie image for your Displacement texture.

• **Sampling:** this determines how often a Bézier patch or mesh is sampled. The default setting of zero uses an eight-by-eight grid sampling to deform a Bézier patch. The slider range is 0 to 100, but you can enter a higher value in the entry field above the slider.

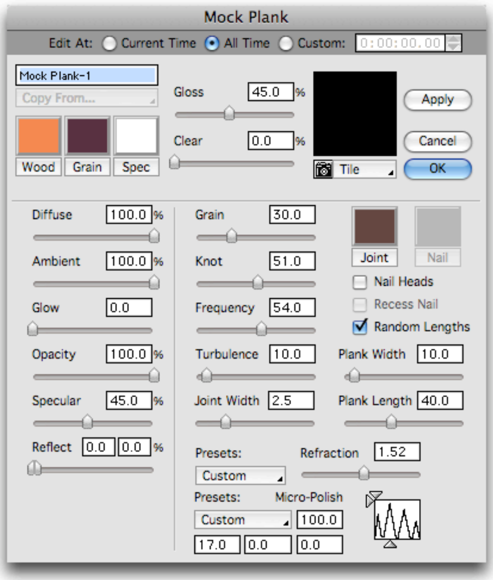
• **Maximum Height:** This amount will determine how much displacement you want the brightest areas of your image to represent. The value is based on their percentage size of your object. The value can exceed 100% for more than double the displacement distance for the brightest regions.

• **Register Maps:** When you click this button, a dialog is displayed that allows you to position, scale and rotate the image map(s). This is based on the internal U and V directions of the texture. For more information see **Position Maps Dialog** in **Chapter 9 - The Image Texture Dialog**.

## Mock Plank

Mock Plank is a 2D procedural surface texture that simulates wooden boards arranged as planks, like flooring or the deck of a wooden ship. You can adjust the length and width of the boards, randomize the colors and grain, and even include nails with recessed heads! In addition to the controls on the wood planks themselves, you can create joints between the planks (or boards).

You can create many different varieties of wood by adjusting the controls found in the Plank dialog. The Grain, Knots, Frequency, and Turbulence fields each control a specific characteristic of the wood. However, they all work in conjunction with each other, so you may want to experiment to get a feel for how they interact with each other.




**Mock Plank Controls**

The Mock Plank dialog contains several controls found in most Design 3D editing dialogs, such as Gloss, Glow, and Opacity. However, it also contains controls for the procedural color of these wood-like planks. The Expert (lower) section of the dialog provides most of the controls, and some of the most important settings are outlined below.

• **Plank Width and Length:** These allow you to vary the width and length of the planks. The values entered here represent a percentage of the total width or length of the object. For example, if you enter 10 in the Plank Width field and 50 in the Plank length field, you'll get 10 repetitions on the width, and 2 repetitions on the length.

• **Joints:** If you want visible joints between the planks, set the Joint Width to anything greater than zero. When this field is set to zero, a plank texture with no visible joints is created. Even though the joints aren't clearly visible, the

individual planks may still be distinguishable from each other because of the variation in the grain of the wood.
• **Nail Heads:** Check this box if you want a nail placed at the corner of each plank. If you want the nail heads slightly recessed, check the Recess Nail box. Otherwise, the nail heads are raised slightly above the surface of the plank.

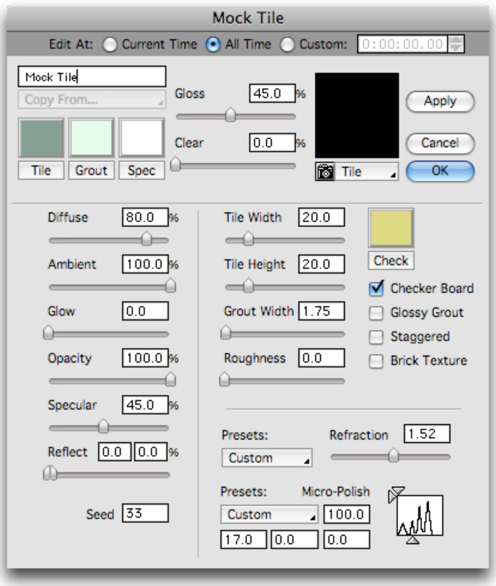
## Mock Tile

Mock Tile is a 2D procedural surface texture that simulates a variety of interesting tile textures. The tile can have a smooth, shiny surface, like glazed ceramic tile, or you can create tile that has a rough, textured surface like brick.

You can control the size and colors of the tile, as well as the color and width of the grout (the material in the seams between tiles). The grout is even slightly recessed, just as real grout would be. Because this is a procedural texture, the tile will lay on curved surfaces better than a Surface Texture using an image of tile would, and any variations in the surface will not repeat like an image would.

### Mock Tile Controls

The Mock Plank dialog contains several controls found in most Design 3D editing dialogs, such as Gloss, Glow, and Opacity. However, it also contains controls for the procedural color of these tiles.



• **Color:** You can specify the main color of the tile and the color of the grout. You can also change the color of the specular light, or the highlights, that reflect from the surface of the tiles.

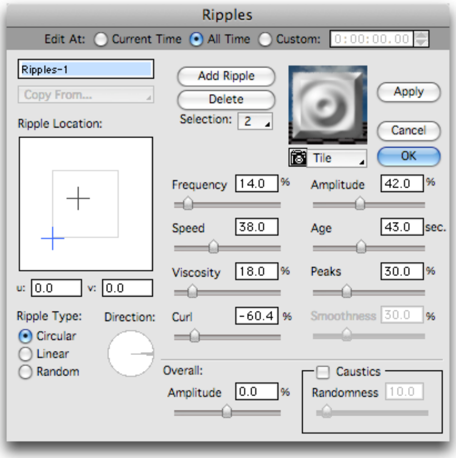
**NOTE:** Your tile texture can contain two different colors of tiles. The Expert (lower) section of the dialog contains a secondary color field that lets you create a checkerboard pattern using two different colors of tiles.

The Expert (lower) section of the dialog provides most of the controls. Many of them are the same as other dialogs. The important settings are outlined below.
• **Tile Height and Width:** Use these fields to adjust the size of the individual tiles. The values entered here represent a percentage of the total width or length of the object. If your surface is not of equal proportions, your tiles will not be either, unless you set non-proportional sizes here as well.
• **Grout Width:** This setting determines the width (percentage) of the grout between the tiles. The Grout area also contains a bump map to recess the grout slightly. (You can eliminate the grout entirely, so you can also use this texture to create other things, such as checkered fabric for a tablecloth, wallpaper for a wall, or linoleum for a floor. Get creative!)
• **Checker Board:** When this box is checked, you get a checkerboard tile texture that uses a secondary color. To change the secondary color, click the color preview to display the color picker dialog.
• **Staggered.** This box allows you to stagger the tiles so the tiles do not line up along one axis in a grid. This option allows you to create a realistic procedural 2D brickwork pattern in combination with the Roughness and Size parameters.

## Ripples

Ripples is a procedural texture which generates ripples across the surface of any object it is applied to. It works by replacing the bump and caustics channels of any texture applied to any object to simulate very complex, water like surfaces. This texture includes its own very powerful animation controls, and is best used in an animated scene.

The Ripples texture is designed to be layered on top of other, base textures. This is because the Ripples texture does not include color information, or many other surface characteristics. You can check the **Texture & FX panel** of the **Object Properties** palette to verify its position in the **Layer list** applied to each object.




**Ripple Types**
There are three types of Ripple effects available. Each type has specific settings, and simulates different disturbances to the otherwise smooth surface of any object. The three types are:
• **Circular:** ripples that start at a single point, then move outward over time, according to the specifications you have set. Similar to drops hitting water.
• **Linear:** ripples that behave more like waves, moving in parallel rows.
• **Random:** used to create a very rough, disturbed surface. When you click the Random radio button, the Viscosity and Curl fields are grayed out because they are not available with Random: these attributes will be generated randomly.

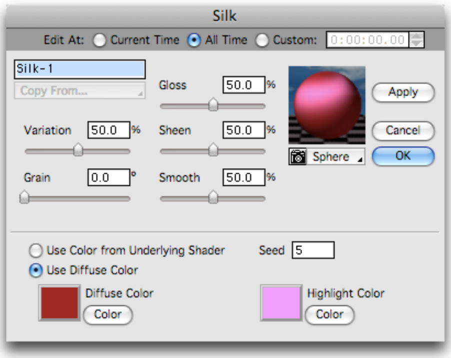
The specific settings for each type of ripple can be controlled for amplitude, direction, frequency, and lifespan. When animating the texture, you can even adjust the controls to have new ripples appear at precise locations over time, or have them grow, reflect, and shrink like real fluid ripples.

## Silk

Use this texture to create colorful, silky textures with a lustrous sheen. You can create new silk fabric textures, or add a silk finish on top of any existing texture when layered above them.

The Silk texture specifically mimics materials that have “anisotropic” highlights. Any material will exhibit this effect if it has very closely spaced, reflective details, as is the case with shiny fabrics, grooved discs and brushed metals. This is because their overall surface highlights are actually shaped by thousands of tiny, linear highlights from the reflective details of the pattern or weave. The Silk texture mimics the wide, rolling highlights of these materials.

This "highlight" texture can be used on its own, with constant colors applied to it, or it can be layered on top of another, base texture to simply add anisotropic specular highlights. When used this way, the Specular color and the Micro-Polish fields of the texture layer beneath Silk are overridden.




**Silk Controls**
The Silk texture dialog includes all of the typical settings and previews for most textures, along with some unique settings for Silk. You can set the color, randomness, and grain of the highlights from these controls, but there are a few key settings that effect the overall look of the Silk texture. These are outlined below.

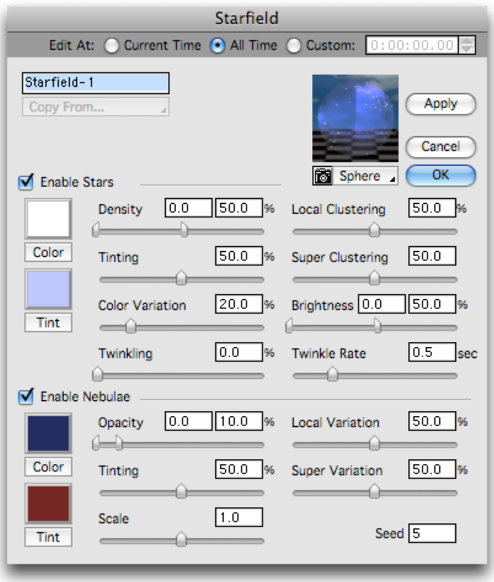
• **Gloss:** This controls the amount and brightness of specular and highlight reflections that appear on the surface of the object.
• **Sheen:** This controls the iridescent spread of the highlights, which in real materials is determined by the fineness of the individual details. The higher the Sheen setting, the more the highlight spreads out along the grain of the fabric.
• **Smooth:** This controls the overall smoothness of the texture. All of the details simulated in the highlights may not be uniform in size, and therefore the surface may be slightly uneven or irregular with a low Smooth setting. This setting also effects the appearance of Gloss and Sheen.

## Starfield

Starfield is a 2D surface texture that creates the look of a starry night or the view of distant galaxies from space mapped onto your objects. You can use stars, nebulae or both; and you can vary their color, brightness, and scale. Both stars and nebulae can be clustered in small groups or in super-clusters, and their densities can be controlled as well.

**NOTE:** It is important to note that this surface texture cannot be applied to the Background of your scene, but there is an identical Background shader called "Starfield BG" that can be set as the overall background of your scene.

**Starfield Controls**
The Starfield texture dialog includes all of the typical settings and previews for most textures, along with some unique settings for stars and nebulae. You can set the color, randomness, and variation from these controls, but there are a few key settings that effect the overall look of the Starfield texture. These are outlined below.




• **Seed:** This field applies to both Starfield and Nebulae. It is a random value that gives the texture a unique pattern. Changing the seed will change the look of the texture in a random way.

• **Enable checkboxes:** These boxes enables stars or nebulae, and activate their associated controls to include in your texture. You can use either stars or nebulae, or both.

**NOTE:** If you use Stars without Nebulae, make sure you use the appropriate settings. The Scanline renderer will be most effective for rendering just stars on a black background. If you need to use Raytracing, lower the value in the Maximum Tracing Block Size field. To do this, click the Expert button in the Render dialog to summon the Raytracing Settings dialog.

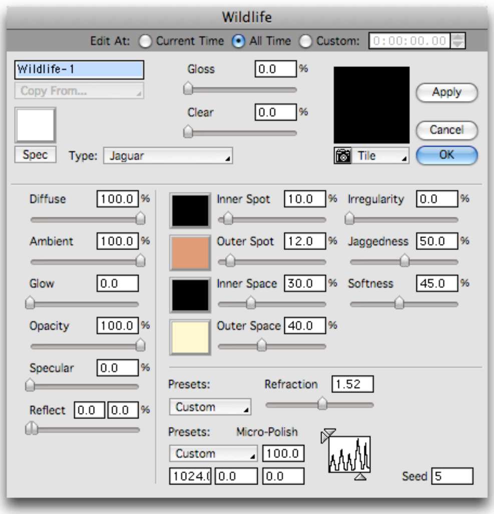
•**Opacity:** These sliders set how opaque the nebulae are. Opacity is useful when you have applied Starfield to an object. When Starfield is used as a Background, however, changes in the Opacity settings have no visible effect. Backgrounds, by definition, have nothing behind them.

## Wildlife

Wildlife is a 2D surface texture that creates random patterns that simulate the coats of several different animals. Five different preset pattern types are included. Select the one that's closest to the effect you're trying to achieve, then change the settings accordingly.

You're not limited to the animal types listed in the preset pop-up. You can vary the color and size of the spots to create many different animal looks. The Wildlife dialog contains controls for customizing any of the six different Wildlife types to fit your needs.

**NOTE:** Depending on the type of wildlife selected, each spot and space consists of one or two colors. The dialog also contains controls that let you specify the relative sizes for each of the fields, and settings to adjust the shape and softness of the spots.Although all of the different types of Wildlife dialogs function similarly, there are some important differences that you should be aware of.




#### Wildlife Controls

Many of the controls found in this dialog are common to all Design 3D texture editing dialogs, while some of the more specialized are detailed below.

• **Type:** Select a Wildlife texture type from the pop-up list. Choose one that's closest to the pattern you're trying to create. Remember, it's the pattern of the texture that you're selecting here; the colors can be customized later as desired. This texture consists of spots and the spaces between them.
• **Giraffe** (both types): This uses only one spot color and one space color. However, there are some differences between these two types of giraffes. For example, you can't merely adjust the spot size of the tippelskirchi giraffe to create a reticulata giraffe. The spots on the tippelskirchi giraffe will always be smaller, and have more jagged edges, than the spots on the reticulata giraffe.
• **Cheetah:** This Wildlife type uses only one spot color and one space color.
• **Leopard** and **Jaguar:** The Jaggedness control on both of these Wildlife types are related to the Inner Space field in the texture. Increasing this control increases the jaggedness of the Inner Space, giving it a more blotchy appearance.

**NOTE:** Jaguar is the only type that uses both an inner and outer spot and an inner and outer space, and spots on the Jaguar tend to be somewhat larger than spots on the Leopard.

## Solid Textures

Solid textures often appear to be carved out of a three-dimensional block. For instance, when a Solid Wood texture is applied to an object, it appears as though the object was carved from a solid block of wood, with the grain changing as the surface goes away from or closer to the core of the grain rings.

An important distinction between Surface textures and Solid textures, is that Solid textures do not use any of the usual texture mapping styles (such as Projection, Cubic, Cylindrical, UV, etc.). They instead rely on the X, Y, and Z axis transformation parameters (including Position, Rotation and Scale) as set in the **Texture & FX panel** of the **Object Properties** palette. These values are edited relative to each object that has the texture applied to it.

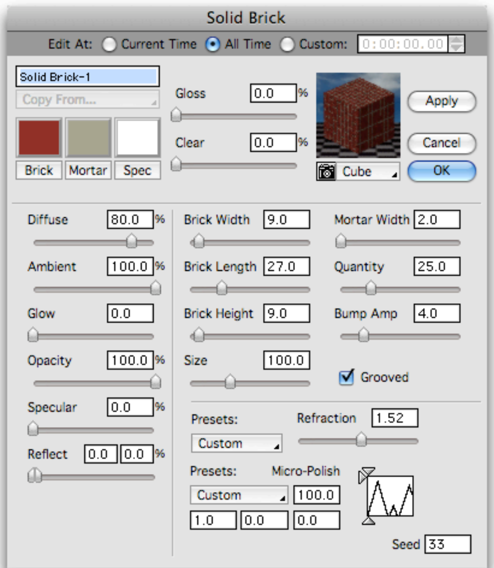
Solid textures can also render faster than many Surface textures. However, they do not give you the same pixel-by-pixel control as image maps. Surface property settings in a Solid texture are global in their effect. For example, all areas of the surface reflect the same amount of diffuse light. You can control the total amount of light reflected, but the entire surface reflects that light uniformly. You cannot use a Diffuse image map to control the amount of light reflected from different areas of the surface.

Another thing that the Solid surface texture types have in common with the Image Textures are the core fields that can be controlled. These include Diffuse, Ambient, Glow, Opacity, Specular, Reflection, Micro-Polish and many others. These fields are described in the Image Texture section and so won't be covered here.

## Solid Brick

Solid Brick is a procedural (mathematically generated) texture that simulates 3D bricks and mortar in all directions, as if your object was created form a solid arrangement of bricks. It has a matte finish and variable brick and mortar colors. You can adjust the size of the bricks, the width of the mortar, and the amount and depth of a pattern in the bricks' surface.

**TIP:** The main brick color defaults to "brick red" for obvious reasons. This color is constant for all bricks that are simulated. If you would like a variation in the Brick color, you can also use the Mock Tile texture to simulate multicolored bricks, but that is a surface-aligned texture, not a 3D Solid texture.




**Solid Brick Controls**
Many of the controls found in this dialog are common to all Design 3D texture editing dialogs, while some of the more specialized are detailed below.
• **Brick Width, Brick Length** and **Brick Height:** These settings let you vary the dimensions of your bricks. This is independent of the shape and size of any object this texture is applied to and is based in your World Units.

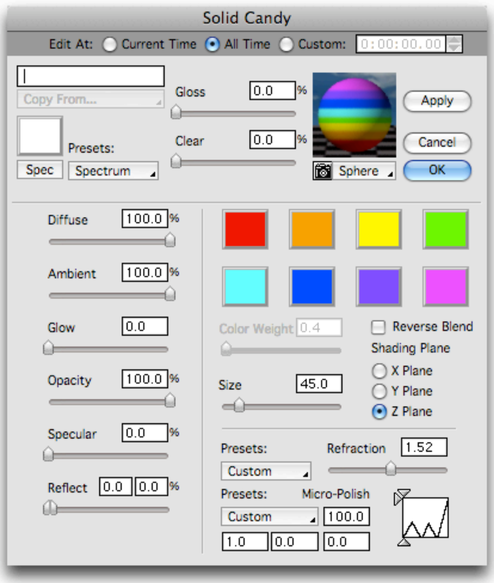
• **Quantity:** The amount of pitting in the surface of the brick. Higher values in this field give the brick a more finely pitted appearance.
• **Bump Amp:** The depth of the pits (set in Quantity, above) in the brick.
• **Grooved:** Creates mortar that is indented from the surface of the brick.

## Solid Candy

Solid Candy lets you create three-dimensional textures that contain up to eight different colors. You can use shades of the same color, creating textures that gradually transition; you can select several colors and make rainbow-colored textures; or, use only two or three alternating colors to create a striped texture.

### Solid Candy Controls

To make choosing colors easier, there is a Preset pop-up that provides a wide range of preset color combinations. When you select a preset from the pop-up, the colors in the Color fields change to display the preset you select.




The Solid Candy texture dialog also includes all of the typical settings and previews for most textures, along with some unique settings. You can set the colors used and the blending from these controls, but there are a few key settings that effect the overall look of the Solid Candy texture.

• **Color Weight:** When the Reverse Blend checkbox is checked, this slider becomes available. If you increase this setting, Design 3D pulls in additional colors and mixes them together with the colors you've specified. The higher the setting, the more bands of colors used.

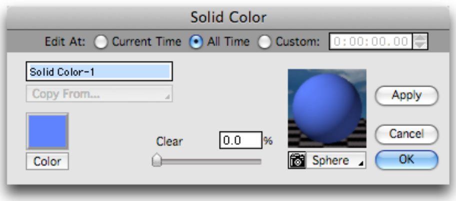
• **Size:** When you apply a Solid Candy texture to an object, the center of the texture (the boundary between colors in the top row and the colors in the bottom row) is placed at the center of the object. Leaving the size at the default value places the color spectrum on the object so that each band of color is the same size.

Decreasing the value in the Size field decreases the size of all the **inner** colors, stretching the first and last colors to fit the object. Increasing the value in the Size field creates wider bands of color. Design 3D centers the spectrum at the center of the object, so some of the colors at either end of the spectrum may not be visible.

• **Shading Plane:** These radio buttons let you specify the plane on which the texture is applied to the object. You can create some interesting texture variations by creating identical spectrum textures, but with different Shading Plane settings, then changing the mixing rules.

## Solid Color

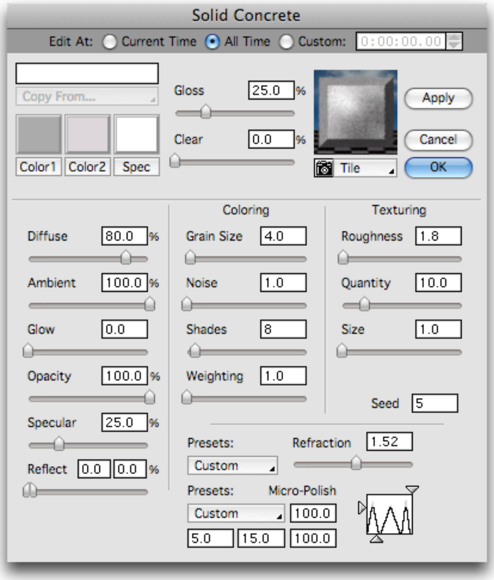
Solid Color is a very simple texture that applies a constant color to the surface on an object. This type of texture also allows you to control the opacity of the texture, but otherwise lacks most of the settings common to all other textures. Solid Color textures require less memory than most any other texture.




**TIP:** Because the Solid Color lacks many common characteristics such as Gloss, Glow, Bump, Reflect, etc., when layering this texture on top of another texture it will inherit these characteristics from any texture below it. This makes it ideal for quickly or temporarily changing just the color and opacity of another, more complex texture. Solid Color is also an excellent choice for matte surfaces, or as a base texture for other colorless methods of texturing to be layered above it.

## Solid Concrete

This 3D texture creates a procedural 3D texture that simulates concrete, but it can create a wide range of different textures by varying the settings in the dialog. You can customize the roughness, color, etc. to achieve the specific look you want.




**Solid Concrete Controls**

The Solid Concrete texture dialog also includes many of the typical settings and previews for most Solid textures, along with its own unique settings. You can set multiple colors to be used and the grain and noise in the concrete from these controls, but there are a few key settings that effect the overall look of the Solid Concrete texture.

• **Shades:** This is the number of steps in the gradation from Color1 to Color2 when blending them together. A setting of 2 means there is no blending.

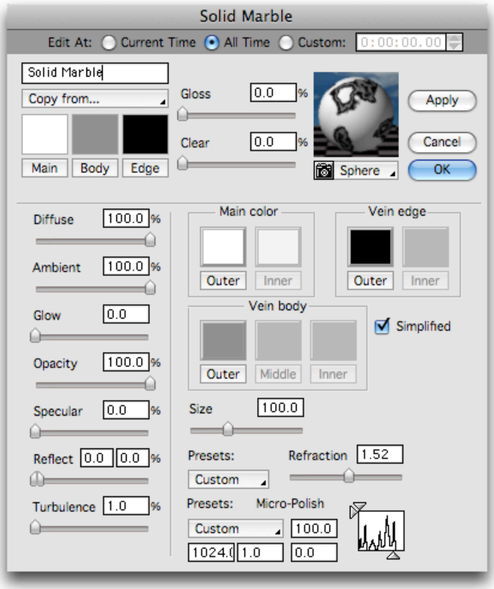
• **Weighting:** This field determines the amount of Color2 (grain color) used, relative to the amount of Color1 (main color).

• **Roughness:** This setting is used to create a bump map to control the depth of the pitting that appears on the surface. The higher the value in this field, the deeper the pits.

• **Quantity:** This value determines the amount of pits in the bump map. The higher the value in this field, the more "pitted" the surface appears. As the value in this field increases, the size of the individual pits decreases to make room for the additional pits. When you lower this value, there are fewer but larger pits in the surface.

## Solid Marble

The Solid Marble texture lets you create your own unique marble textures. It can also simulate many other organic materials and patterns, such as leaves, animal furs, and even terrains seen from space.




### Solid Marble Controls

The Solid Marble texture dialog also includes many of the typical settings and previews for most Solid textures, along with its own unique settings. You can set any of the multiple colors to be used, as well as the overall size from these controls, but there are a few key settings that effect the overall look of the Solid Concrete texture.

• **Turbulence:** This slider determines the degree to which the veins join together. The higher this setting, the more the veins appear to spread apart and blend together with nearby veins.

• **Main color:** Outer color is the main color, or background, of the marble surface. Inner color is the color of any areas completely contained within the vein.

• **Vein edge:** This field is used to specify two different colors for the edges of the veins: Outer color and Inner color.

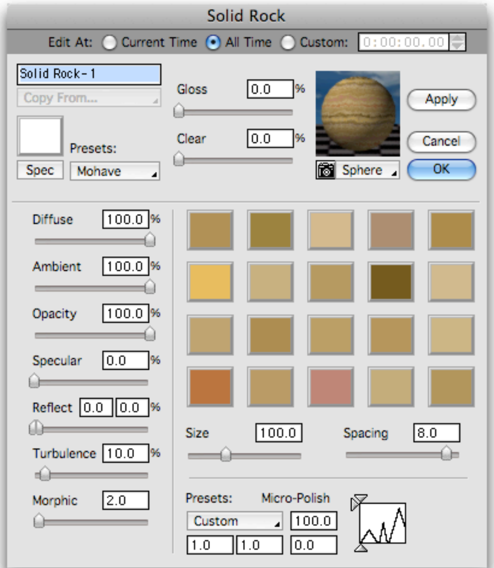
• **Vein body:** This field is used to select three different colors, or gradations of a single color, for the body of the vein.

• **Simplified:** When this box is checked, only the Outer color selections are used in the texture definition (Outer Main color, Outer Vein edge, Outer Vein body).

These are the colors that appear in the upper portion of the dialog. Also, when this box is checked, you can't edit any of the colors that don't apply (Middle or Inner colors).

## Solid Rock

This procedural 3D texture simulates layered rock of many different types. With 34 different striations made from 20 different colors, you can create a wide range of sedimentary and metamorphic rocks.




The controls available for Solid Rock make it possible to create an infinite number of interesting variations of layered rock textures. For example, just by varying the colors and adjusting a few of the settings, you can create stones that look like turquoise, jasper, malachite, or a wide variety of other fascinating stones. When you apply this texture to an object, it appears as though it is carved out of a solid piece of stone.

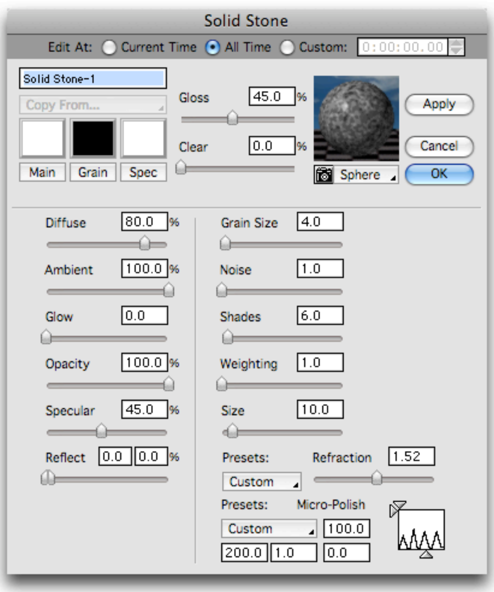
### Solid Rock Controls

The Solid Rock texture dialog also includes many of the typical settings and the same preview as in most Solid textures, along with its own unique settings.

• **Presets:** Five different sets of preset colors are available. Select the one that's closest to the color combination you want to use, then change the layer colors as desired.
• **Morphic:** This setting allows you to simulate the look of metamorphic rock. As sedimentary rock is subjected to intense pressure and temperature over time, its texture, composition, and structure are altered. The higher the setting in this field, the greater the extent of the alteration.
• **Turbulence:** This field controls the amount of agitation or irregularities of the jags, or folds, of the striations. A low number in this field produces rock with very straight layers with a striped appearance, while a very high value in this field produces a texture where the striations seem to blend together.

## Solid Stone

The Solid Stone texture produces a procedural 3D noise map that simulates various types of composite stone. This texture is also a good choice for layering on top of an otherwise flat-colored texture to add some more light and dark variations in the color. For this function it is best to set this texture's **Layer Mix** style to **Multiply** in the Texture & FX panel of the Object Properties palette.




### Solid Stone Controls

The Solid Stone texture dialog also includes many of the typical settings and the same preview as in most Solid textures, along with special controls for the various colors in the Stone, as well as the Grain and overall Size. A few more specialize controls are explained below.

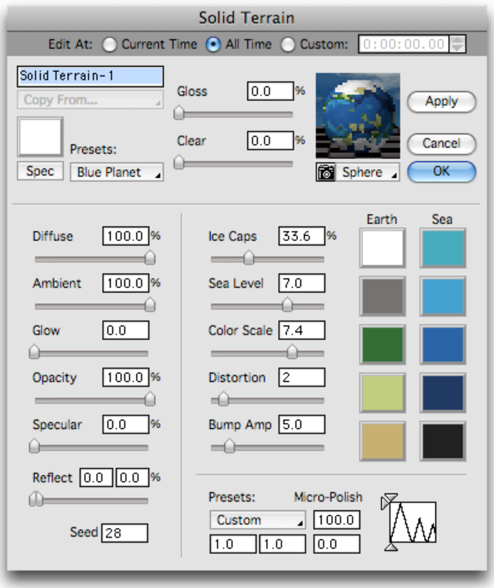
• **Noise:** This field determines how erratic the pattern in the stone appears. The more noise present, the more disorderly the pattern.

• **Shades:** This field indicates the total number of shades of the specified grain color that are used in the stone texture.

• **Weighting:** This field determines the amount of the grain color used relative to the amount of main color used.

## Solid Terrain

The Solid Terrain texture simulates the organic variations of planetary terrain as seen from space. You can create an infinite variety of planets by using different colors for different "elevations" of the object. Obviously, this texture best simulates planets when applied to Spheres, but it can be used for many other things as well.




In addition to a subtle bump map, this texture works by procedurally calculating the mix of different colors to achieve its effect. This is done with ten different colors: five Earth colors and five Sea colors.

The first color-selector in the Earth column represents the area controlled by the Ice Caps slider. The second color represents the highest mountains; the third color, slightly lower elevations, and so on. The top Sea color represents the most shallow areas of the ocean; the bottom Sea color represents the deepest seas.

The Solid Terrain dialog contains three preset color combinations: **Blue Planet** (similar to our own Orbis Terrarum), **Red Planet,** and **Ice Planet.** Select the preset with the colors that are closest to the look you're trying to achieve, then change the colors accordingly.

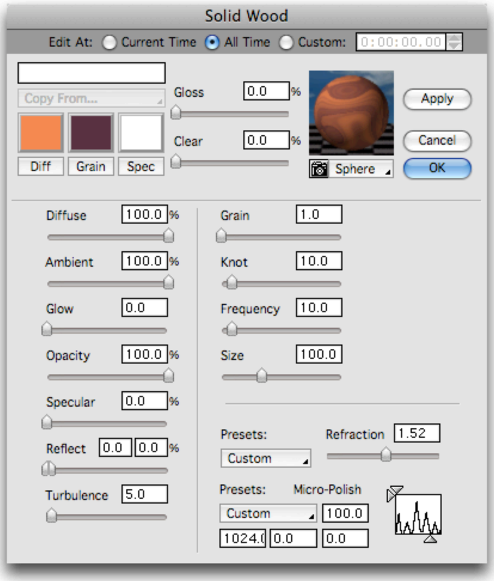
### Solid Terrain Controls

The Solid Terrain texture dialog also includes many of the typical settings and the same preview as in most Solid textures, along with its own unique settings, some of which are outlined below.

- **Ice Caps:** This field lets you control how much of the polar regions are covered by ice. (The ice cap region is represented by the first color in the Earth column.)
- **Sea Level:** This field is used to weight the amount of Sea colors, relative to the amount of Earth colors. As you increase the level of the sea, less Earth colors are used, and more Sea colors are used.
- **Color Scale:** This scales the bias of colors from the deep to shallow regions. Scaling the colors in this manner is equivalent to uniformly changing the overall elevation of the planet. The ice cap regions on the planet are not affected by this setting.
- **Distortion:** Use the Distortion slider to change the way the planet looks. The higher this value is the more disorderly and chaotic the land masses are.
- **Bump Amp:** This field controls the amplitude of the bump map that is applied to the land masses. Higher values create regions that simulate mountainous terrain. Lower settings create flatter land masses. This setting does not affect the areas of the sea.
- **Seed:** Changing this value makes the planet look different even when all the other settings are the same. (Which is useful for large planetary systems.)

## Solid Wood

This texture creates 3D procedural wood effects that extend realistically beyond the surface of your objects. You can create many different wood patterns by adjusting the settings in the Solid Wood dialog. Depending on the settings, you can create a wide range of other textures.

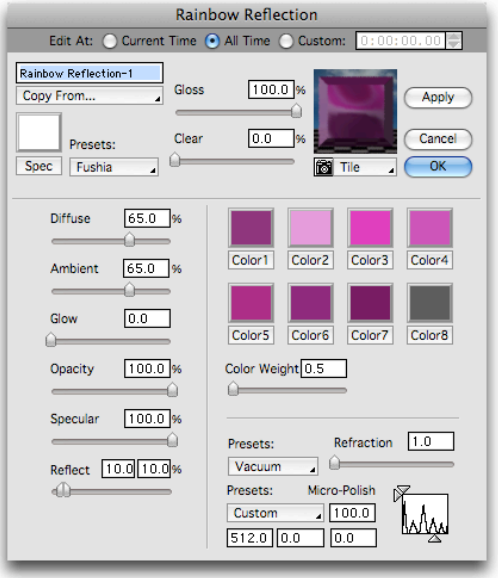



**Solid Wood Controls**
The Solid Terrain texture dialog also includes many of the typical settings and the same preview as in most Solid textures, along with its own unique settings.
• **Turbulence:** This value indicates the amount of agitation or irregularities in the appearance of the wood texture.
• **Grain:** This value represents the amount of variation in the direction of the grain.
• **Knots:** This field determines the frequency of the knots in the wood. The higher the value, the more frequently knots appear in the texture.
• **Frequency:** This setting determines the amount of spacing or waviness present in the grain of the wood. Lower values result in a smoother grain appearance.

## Rainbow Reflection

Rainbow Reflection textures are view-relative solid textures. You specify several different colors; the color of the surface at any given point is determined by its position relative to the Y axis of the view. You can create brilliant, lustrous, rainbow-like colors that shift when the object is viewed from different angles.

To really get the full impact of the possibilities available with this texture, you need to see it on an animated object. First apply a Rainbow Reflection texture to an object; then rotate it and render the animation. This is also an excellent texture for simulating smooth gemstones with opalescent qualities.




**Rainbow Reflection Controls**
The Rainbow Reflection texture dialog also includes many of the typical settings and the same preview as in most Solid textures, along with its own unique settings, some of which are outlined below.
• **Color** (1-8): You can specify eight different colors, as well as the color of the specular reflections, or highlights, that appear on the surface of shiny objects.
• **Presets:** To change the overall hue of the reflection very quickly, select a preset with colors closest to those you want to use, then change any or all of the colors accordingly.
• **Color Weight:** You can achieve dramatically different results by changing this setting. When you weight the color, Design 3D pulls in additional colors and mixes them in with the colors you've specified.

## Shadow Catcher

This is a special type of texture in Design 3D. It is neither a Surface nor a Solid texture, but rather a way of extracting just the shadows cast by other objects onto the surface with this texture applied.

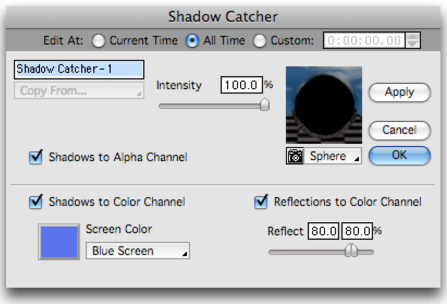
Use this texture when you want to composite realistic shadows cast by 3D objects onto a 2D image, making the image itself appear three-dimensional. When you apply Shadow Catcher to an object, the object itself does not appear in the rendered image; only the shadows that fall on the object render. Shadow

Catcher objects will also cast shadows on other objects, as long as those objects do not also have a Shadow Catcher texture applied to them.

**NOTE:** A Shadow Catcher texture cannot be used inside another texture. For example, it can't be used as one of the six textures in a Box Wrapper texture. Also, the Raytracing and Raydiosity renderers are the only renderers capable of catching shadows.

In some cases an animation may have a complex scene with lots of static elements, and only a few moving elements that cast shadows. By rendering the scene without any objects in it as a static background, and then rendering the animated elements with a shadow catcher they can be composited with far less rendering time.

You can use an image editing application such as Adobe Photoshop® to composite single frames. However, if you're creating an animation, for best results you'll want to use an application with support for video composition, such as Adobe After Effects® or Apple Shake®.




**Shadow Catcher Controls**
• **Intensity:** Use this slider to set the opacity of the shadow. Decreasing the intensity increases the transparency of the shadow and allows the underlying image to show through.
• **Shadows to Alpha Channel:** This checkbox lets you generate shadows in the alpha channel. You can composite the shadows onto a 2D image later with image or digital video editing software.
• **Shadows to Color Channel:** Shadows can be saved to a color channel. Then, using an application capable of chroma-key color differencing, you can use the blue screen or the chroma-key method to indicate areas of transparency and composite the data onto a 2D image.
• **Reflections to Color Channel:** The Shadow Catcher texture can save reflections to the color channel. You can set the level of reflectivity with the sliders provided.

## Volumetric Textures

Volumetric textures include Clouds, Fog, Haze, and Mist. They can be applied to the entire model on the **Air panel** of the **Environment palette**, or they can be applied to individual objects within your model.

When applied to objects, Volumetric textures occupy the entire volume or space enclosed by the objects to which they're applied. Typically, objects with Volumetric textures applied are used merely for the purpose of defining the volume to which the texture (mist, fog, etc.) is confined. Objects with no other textures applied will turn from the default dull white to transparent when the Volumetric texture is applied, allowing the Volumetric texture inside it to be seen.

This allows you to place fog, for example, within a cube; but when the scene is rendered, only the fog is visible. The cube's exterior is not visible when rendered if no other textures were applied to the cube.

**NOTE:** Volumetric textures, such as Fog, Mist, and Haze, must be applied to solid, one-sided objects only in order to be visible when rendered. If a Volumetric texture is applied to a double-sided object, it will not be visible when rendered. This is because Volumetric textures need to know what part of the object is the "inside" and a one-sided object defines an enclosed surface.

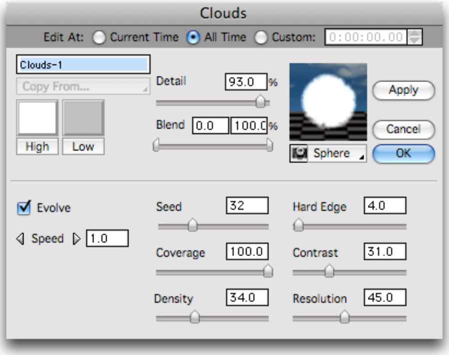
The common Texture Edit dialog options for naming, animating, copying from, and previewing a Texture also appear on all of the Volumetric texture editing dialogs. These fields and their functions are described in the Image Texture section and so won't be covered here.

### Clouds

The Clouds volumetric texture simulates a variety of realistic clouds in your models when applied to closed, one-sided 3D objects. The color, density and detail level are controllable, and you can even animate the cloud texture by having it randomly evolve over time, just like real clouds.

To be visible in an object, Clouds must be applied to one-sided objects only. The cloud fills the entire volume of the object and falls off according to settings detailed below, but the object itself will not be visible unless another texture has also been applied to the object.

**TIP:** To achieve the best results, use Primitive spheres for your cloud objects. Make the spheres quite large, relative to your model, for more realistic-looking clouds. Avoid overlapping multiple cloud spheres, as this increases the density by adding the cloud cover together where they overlap.




**Clouds Controls**

The Clouds texture dialog includes many of the typical settings and the same preview window found in most textures. (Generally, you will want to use Sphere for previews.) In addition to the standard volumetric settings like Density, Detail, and Color selectors, Clouds also has very unique settings.

• **Detail:** This is the amount of variation in the cloud. A low setting will give you a smooth cloud, while a high setting will give you a very irregular, noisy appearance.

• **Blend:** This field controls how high and low colors are blended together. With both sliders set at 50 (together), you will get an even color. If one color is blue and one color is red, for example, and the settings are 25 and 75, the color of the cloud will vary from reddish purple to bluish purple. Settings of 0 and 100 will give your cloud the full range of variation from the low color to the high color: blue to red for example.

• **Evolve:** Enabling this checkbox makes your clouds change shape over time, within the constraints of the settings you have made. The cloud's characteristics remain the same, but the shape will change.

• **Speed:** This control is used with Evolve, and controls the speed at which the cloud's appearance changes over time. The default speed of 1 will give you a very subtle, slow change. Higher numbers will give you faster motion.

• **Seed:** Changing this setting gives your Fog texture a unique, randomly generated appearance, even if all other settings remain the same.

• **Coverage:** This setting determines how much of the volume of the object the cloud covers, as defined by the Hard Edge setting.

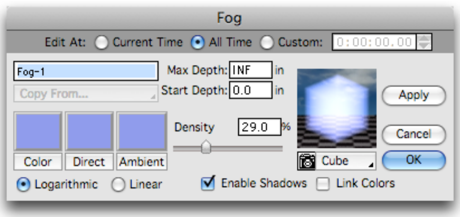
• **Density:** This sets the density of the cloud. This simulates the water droplets that make up a real cloud, and controls how close together and how big the water particles are.

• **Hard Edge:** This determines how close the edge of the cloud comes to the boundary of the object in which it is confined.
• **Contrast:** This is the difference between high and low color intensity. This setting determines whether the transition between colors is slow and smooth (low contrast) or hard and abrupt (high contrast).
• **Resolution:** This setting determines the size of the features, or clumps, in the cloud, much like the scale setting for other textures. The higher this setting, the larger the clumps in the cloud. Higher numbers increase rendering time.

## Fog

The Fog Volumetric texture allows you to define areas of your model that contain fog. Alternately, you can apply Fog to your entire scene from the **Air panel** of the **Environment palette**. If you are applying Fog to your entire scene, the depth settings below apply to the camera, and not any object in your scene.

If you're applying fog to an object, the object must to be a one-sided object in order for the volumetric effect to be visible. The fog fills the entire volume of the object, but the object itself will not be visible unless another texture has been applied.




**Fog Controls**
The Fog texture dialog includes many of the typical settings and the same preview window found in most textures. In addition to the standard volumetric settings of Density and Color selectors, Fog also has very unique settings.
• **Color:** This is the color that is transmitted through the fog. Any color other than white will obscure objects seen through the fog. When the Link Colors checkbox is enabled, this is the color used in the Direct and Ambient fields as well.
• **Direct:** This is the color of the light reflected from the directional light sources.
• **Ambient:** This is the color of the ambient (background) light that is reflected from the individual particles of fog.
• **Logarithmic:** If Logarithmic is selected, a natural looking, even fog that trails off with distance is created.

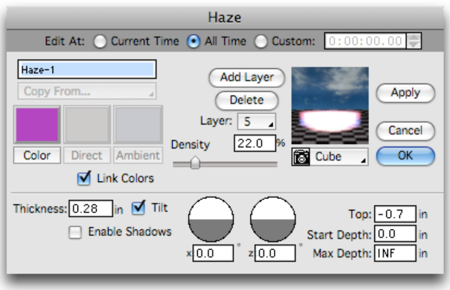
• **Linear:** When Linear is selected, a very simple fog that obscures evenly over distance is created.
• **Max. depth:** This sets the maximum depth of the fog and prevents it from completely obscuring the background.
• **Start depth:** This is the distance at which the fog begins.
• **Density:** This determines how dense the fog is, or how much the fog obscures with each unit of distance.
• **Enable shadows:** When this box is checked, shadows cast by other objects are visible within the volume.
• **Link colors:** When this box is checked, the color specified in the Color field is used in the Direct and Ambient fields as well.

## Haze

Use the Haze Volumetric texture to create layers of haze that sit in valleys or layers of smog that rest over a city as seen from a distance. Haze can either be applied globally (on the **Air panel** of the **Environment palette**), or to individual objects within your model.

To be visible in an object, Haze must be applied to one-sided objects only. The haze fills the entire volume of the object, but the object itself will not be visible unless another texture has also been applied to the object.

You can create a Haze that has multiple layers using the Add, Delete, and layer selector, with each layer having its own settings. The number of layers cannot vary over time, but you can change the characteristics of each layer over time.




### Haze Controls

The Haze texture dialog includes many of the typical settings and the same preview window found in most textures. In addition to the standard volumetric density settings and color selectors, Haze also has very unique settings, which are outlined below.

• **Color:** This is the color that is transmitted through the selected layer of Haze. Any color other than white will obscure objects seen through the Haze/ When the Link colors box is checked, this is the color used in the Direct and Ambient fields as well.

• **Direct:** This is the color of the light reflected from directional light sources on the selected layer of Haze.

• **Ambient:** This is the color of the ambient (background) light that reflects from the individual particles within the selected layer of Haze.

• **Link colors:** When this box is checked, the color specified in the Color field is used in the Direct and Ambient fields as well.

• **Add layer:** Click this button to add an additional layer of Haze. You can add multiple layers to the Haze, each layer with its own settings.

• **Delete:** Click this button to delete the selected layer of Haze.

• **Density:** Use this slider to determine how tightly packed the individual particles of Haze are. The denser the Haze, the more opaque it appears.

• **Thickness:** This setting represents the thickness of the selected layer of Haze.

These controls apply to the entire Haze effect, not just individual layers:

• **Enable shadows:** When this option is enabled, shadows cast by other objects are visible within the volume of all Haze layers.

• **Tilt:** Checking the Tilt checkbox enables the Tilt controls. Normally, Haze is oriented horizontally, but you can tilt the Haze, if desired, with these controls.

• **Top:** This setting specifies the top of the Haze effect.

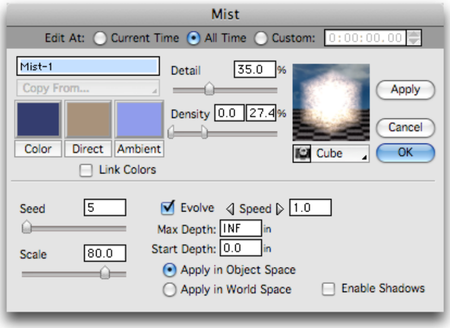
• **Start depth:** The value in this field sets the initial depth of the Haze.

• **Max depth:** The value in this field sets the maximum depth of the Haze and prevents it from completely obscuring the background in all Haze layers.

## Mist

Use the Mist Volumetric texture to create a smooth mist or patchy, fog-like clouds. Mist can either be applied globally (on the **Air panel** of the **Environment palette**), or to individual objects within your model.

To be visible in an object, Mist must be applied to one-sided objects only. The Mist fills the entire volume of the object, but the object itself will not be visible unless another texture has also been applied to the object.




**Mist Controls**

The Mist texture dialog includes many of the typical settings and the same preview window found in most textures. In addition to the standard volumetric settings of Density , Detail and Color selectors, Mist also has very unique settings, outlined below.

• **Color:** This is the color that is transmitted through the Mist.

• **Direct:** This is the color that is reflected from any directional light sources in your model.

• **Ambient:** This is the color of the ambient light that reflects from individual particles within the Mist.

• **Link colors:** When this box is checked, the color specified in the Color field is used in the Direct and Ambient fields as well.

• **Detail:** This setting controls the amount of detail in the Mist. A value of 100 produces a very smooth Mist, a value close to zero produces a lot of detail, or variation, in the Mist.

• **Density:** This slider and the Minimum and Maximum Density numeric fields define the level of the least and most opaque areas of the Mist.

• **Seed:** Enter any value in this field to ensure that your Mist will look different from all other Mist textures, even when all of the other settings are the same.

• **Scale:** This setting determines the size of the individual patches of Mist.

• **Evolve:** When this box is checked, the Mist will grow and change over time; otherwise, the Mist is similar to the appearance of the inside of an ice cube where the mist is frozen.

• **Speed:** This setting determines the speed at which the Mist evolves over time. A setting of one means that patches of Mist will live for about one second; a value of two means that, on average, a patch of Mist will live for about one half second. If Evolve is OFF, this field is dimmed.

• **Maximum depth:** This sets the maximum depth of the Mist and prevents it from completely obscuring the background.

• **Start depth:** This sets the depth at which the Mist begins.

• **Apply in Object Space:** The object is filled with Mist, and when the object moves, the Mist moves with it, as you would expect.

• **Apply in World Space:** When this button is selected, it's as though Mist exists everywhere in space, but it is only visible within the boundaries of the object to which it's applied. When you move the object, the appearance of the Mist changes.
• **Enable Shadows:** When this option is selected, shadows cast by other objects are visible within the volume.

# Special Effects

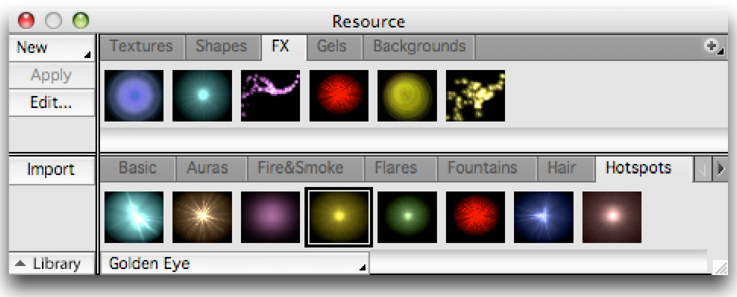
There are three types of special effects you can apply to objects in your scene: Resource-based FX, Geometry effects and ScriptFX.
Resource effects are applied from the FX panel of the Resource palette. These include Aura, Fire&Smoke, Flares, Fountains, Hair, Hotspots and PixieDust. Geometry effects include Explode and Shatter.

Geometry effects make changes to an object's surface over time. These effects can be seen from within the Modeling window, unlike Resource based effects. These effects also can fundamentally change the geometry you apply them to, while a Resource based FX can be applied and removed.

There is also a type of Special Effect that is applied like a Resource based FX, but contains scripted elements and functions that are the equivalent to creating your own effects. This is a ScriptFX resource.

## Using Resource Effects

Resource based effects are very similar to textures in how they are created, applied and edited. All resource effects are created when the scene is rendered, and are not visible in the Modeling window like Texture colors. Resource effects can be found in the **FX panel** of the **Resource Palette.**




### FX Panel

The top portion of the FX panel contains the effects that are loaded in the active model. When expanded, the palette also displays all of the effects available for use in your model. Effects can be loaded even though they aren't being used in the current model. A command is provided in the Plus menu that allows you to remove any unused effects from your model.

Design 3D contains different types of effects. You can create particle effects, such as Fountains, which are comprised of individual particles; and post-rendering effects, such as Lens Flare and Aura, that are applied after the image completes rendering. Each effect has its own dialog that allows you to customize the effect.

## Creating Effects

To create a new effect, hold down the **New** button in the upper left corner of the Resource palette. A list of available effects is displayed. When you select one from this list, the appropriate dialog appears. Several of the fields are common to all of the dialogs, and are identical to those in the Texture dialogs. These include the Animation controls at the top of each dialog, as well as the Name, Copy From, and Preview areas.

## Editing Effects

You can edit any of the effects on the Resource palette, whether in the scene or in the Library. Click the **Edit** button in the upper left corner of the Resources palette to edit the selected effect. If the effect is not already loaded in the active model, it will load, and the appropriate dialog appears. Any edited effect from the Library becomes part of the current scene. If you want to access this effect for use in other models, select the **Save** command from the **Plus menu**.

You can also edit an effect so it appears to change over time. When you edit any of the special effects in their dialogs, you can specify the time at which the changes occur. Remember, however, changes to any effect occur on ALL of the objects to which that particular effect is applied. You should duplicate the effect and reapply it if you want to animate it separately on multiple objects.

## Applying Effects

To apply an FX shader to objects, select an effect on the Resource palette and click the **Apply** button. You can also apply an effect with the drag-and-drop method. Select the effect on the Resource palette, then **drag** it to the desired object. When the object highlights, release the mouse button.

To apply effects to light sources, use the **Apply** button on the Resource palette, or select it from the **FX pop-up** on the light source's **Object Properties** palette. Drag-and-drop does not work with lights.

### Positioning Effects on Objects

Effects are applied to the geometric center of the selected object. If you want the starting point to be somewhere other than the geometric center, you can apply the effect to construction geometry, then place the center of the construction geometry at the precise location where you want the effect to begin.

To ensure the effect remains with the object at all times, you may also want to use the Joint Tool to link the construction object to the intended object. Then, if you animate the object, the effect remains with it.

**NOTE:** Auras behave differently, however. They affect the entire object to which they are applied and do not render when applied to construction geometry.

### Managing Effects

When you create a new effect, it becomes part of, and is saved with, the scene file. However, if you want to be able to access the effect for use in another model, you must save the effect to disk. A **Save** command is provided in the **Plus menu** in the upper right hand corner of the Resources palette.

If you wish to import a Saved effect from elsewhere, click the **Import** button to import the effect selected in the FX library into the active model. If you wish to clear all of the unused effects in your Scene Resources under the FX panel, go to the **Plus Menu** and select **Delete Unused**. This will delete all of the unused effects from the active model, thus decreasing the amount of memory required for the model. If the unused effects haven't been saved yet and are not part of the effects library, you will not be able to access them again.

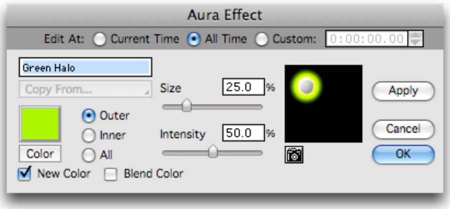
## Resource FX

There are many different types of FX you can apply to objects in your scene. Each is created and applied very much like a Texture resource. In fact, each type of FX can be compared to the different types of Procedural Textures in the Texture panel. While they share some basic similarities, they have different dialog boxes, applications, and can even be layered upon each other.

### Aura Effect

Aura is the haze of light that appears around an object. You can create a variety of interesting effects with this feature by varying the values in the Aura dialog. This can include the corona of a star, the glow of flames on an object, or just a boundary-following highlight for an object.

Aura is a post-rendering effect, so it is added to the image when it finishes rendering. If you do not allow the rendering to finish, no Aura will be displayed. Also, some types of rendering do not include rendering an Aura effect at all.




### Aura Controls

The Aura Effect dialog includes all of the typical settings and previews for most textures, along with some unique settings for an Aura. You can set the color, intensity, and size of the Aura from these controls, but there are a few key settings that effect the overall look of the Aura Effect. These are outlined below.

- **Outer:** When this button is selected, the Aura effect begins just beyond the edge of the object.
- **Inner:** When this option is selected, the Aura effect overlaps the boundaries between the object and the background.
- **All:** When this option is selected, the Aura effect will appear over the entire surface of the object, as well as extending beyond the edges.
- **Blend color:** When this box is checked, the color of the aura and color of the object are averaged together. When this box is unchecked, the colors of the aura and the object are added together, often resulting in overexposure.

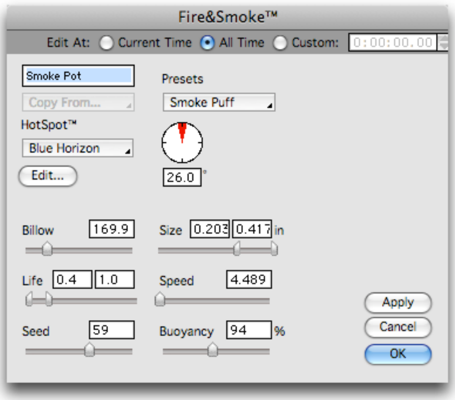
## Fire & Smoke

This special effect lets you create fire and smoke-like particle effects to add to your modeling projects. You can choose from a variety of preset effects, or create your own custom look by using the controls provided in the Fire & Smoke dialog. This effect also uses presets from other types of FX in the Resource palette, such as Hotspots.

Fire & Smoke is a post-rendering effect that works best in animated scenes, so it is added to the image when it finishes rendering and changes over time. If you do not allow the rendering to finish, no effect will be displayed. Also, some types of rendering do not include rendering a Fire & Smoke effect at all.

Depending on your needs, you may want to create separate effects: one for fire and another effect for the smoke. Or, you may be able to create a single effect to achieve the result you want. Also, the Fire & Smoke effect dialog contains two separate preset pop-ups: one for the physical structure and behavior of the fire or smoke; and one for the texture which is applied to the effect.

**NOTE:** When Fire & Smoke is applied to an object, it is placed at that object's geometric center. This is the location where the particles emerge. In many cases, you may want the effect to emerge from a different location. To accomplish this, create another object, make the object construction geometry, then apply the fire or smoke to that object.




### Fire & Smoke Controls

The Fire & Smoke Effect dialog includes all of the typical settings and previews for most textures, along with some unique settings for Fire & Smoke. You can set the Speed and Angle of the effect, choose a Preset effect, and even choose or create Hotspot FX from these controls, but there are a few key settings that effect the overall look of the Fire & Smoke Effect over time. These are outlined below.

• **HotSpot:** This is a list of various pre-made HotSpots available for your fire or smoke special effect. Select one from the list, then edit it, if necessary, to achieve the desired results.

• **Billow:** This setting determines the total amount of fire or smoke particles present in the effect.

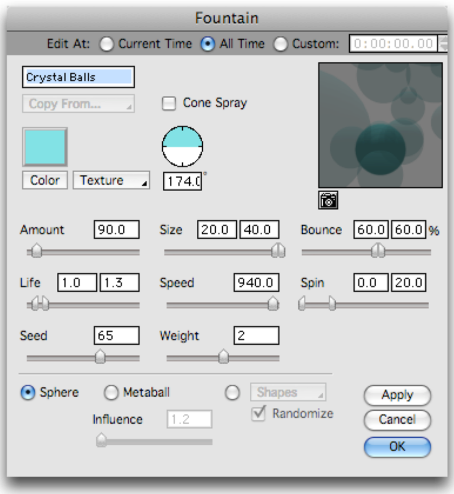
• **Life:** This control allows you to specify the lifespan of the fire or smoke particles. The slider on the left represents the lifespan of the smallest particles; the slider on the right represents the lifespan of the largest particles. The sliders allow you to select values from 0 to 20 seconds. Using the numerical field, however, allows you to enter any value from 0 to INF (infinity).

• **Size:** This setting controls the size of the individual fire or smoke particles. The left slider determines the size of the smallest particles; the right slider sets the size of the largest particles.

• **Buoyancy:** This setting determines how light, or buoyant, the individual particles are. The higher the setting, the more buoyant the particles, and the faster they rise.

## Fountain

The Fountain effect emits particles which can be set to bounce off of the ground plane or other objects. You can create a fountain that emits spheres, to resemble water droplets or bubbles, or a fountain that emits any variety of other shapes. These particles bounce off objects that have been designated Collision objects in the Project window.




All particles emitted from a fountain are detected by the ground plane, if your model contains one. The collision detection is done from the center of each Fountain particle, so larger particles may appear to be halfway through an object before they collide. You can also control how much "bounce" the particles have when they collide with other objects or the ground plane. They can strike the ground plane and lose all their energy, like mud; or they can spring back like a rubber ball.

If the fountain emits spheres, you can "metaball" them to simulate a flowing stream of water. You control the amount of influence the spheres have on one another.'

**NOTE:** When Fountain is applied to an object, it is placed at that object's geometric center. This is the location where the particles emerge. In many cases, you may want the Fountain to emerge from a different location. To accomplish this, create another object, make the object construction geometry, then apply the Fountain effect to that object. **Fountain controls**

The Fountain dialog includes all of the typical settings and previews for most textures, along with some unique settings for a Fountain. You can set the Speed and Angle of the effect, choose a Preset effect, create your own, and even choose another texture to apply to the Fountain from these controls, but there are a few key settings that effect the overall look of the Fountain over time. These are outlined below.

• **Textures/FX:** If the particles are spheres, you can apply a texture or effect to them. All available textures and effects appear in the Textures/FX pop-up list. If the fountain is emitting shapes instead of spheres, this pop-up is not available.

• **Cone Spray:** If this box is checked, the particles spray out of the fountain around the perimeter of the cone only. If unchecked, particles spray from the center randomly in all directions within the cone.

• **Life:** This control sets the lifespan of the particles. Smaller particles normally have a shorter lifespan than larger particles. The slider on the left represents the lifespan, in seconds, of the smallest particles, and the slider on the right represents the lifespan of the largest particles.

• **Weight:** This control lets you make the droplets heavier or lighter. The weight of the particles determines how they are affected by wind and gravity. By entering a negative value in this field, you can add buoyancy to the droplets, causing them to float upwards.

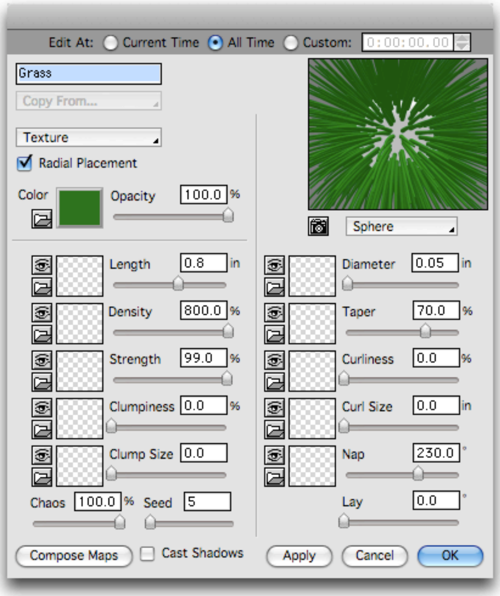
• **Particle type:** Select the type of particles that you want to use:

- Spheres: Click this button if you want the fountain to emit spheres.
- Metaballs: A Metaball is similar to MetaSurfaces. This option also emits spheres, but when Metaballs is enabled, the Influence slider becomes available. This slider allows you to control the amount of influence the spheres have on one another, and determines at what point the spheres merge together.
- Shapes: When this option is enabled, you can select one or more shapes from the pop-up list. If you select more than one shape from this list, the Randomize checkbox becomes available. Check this box if you want Design 3D to emit the shapes in random order.

## Hair

This special effect allows you to create a wide variety of interesting and unusual objects to use in your models. You can add hair to the surface of objects; individual hair fibers can be pulled down by gravity and blown by the wind. Once Hair has been applied to an object, it lives forever. You can adjust its length over time, giving the appearance that the hair is actually growing. In fact, you can script any of the properties of the hair to change over time.

Many settings in the Hair effect can be determined by an Image Map, just like any channel of an Image Map Texture, which the dialog resembles. These are loaded bitmaps that are mapped according to the overall FX mapping style and can change the Hair effect across the surface of an object. Typically these are grayscale images where white means full application and black means no effect.




**Hair Controls**

The Hair dialog includes all of the typical settings and previews for most textures, along with some unique settings for a Hair. You can set the Color, Opacity, Speed and Angle of the effect, choose a Preset effect, create your own, and even choose another texture to apply to the Hair from these controls, but there are a few key settings that effect the overall look of the Hair over time. These are outlined below.

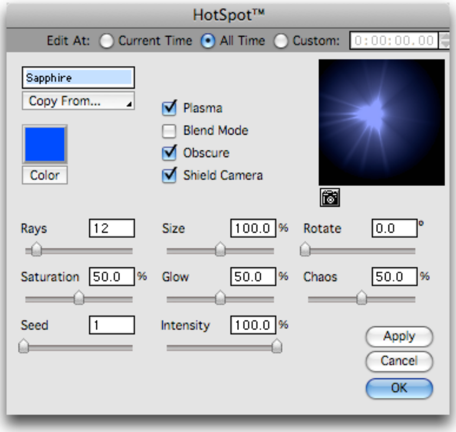
• **Texture/FX:** Select any existing texture or effect from the pop-up menu, or create a new one. This texture or effect is applied to all of the hair particles. If you select an item from this pop-up, or create a new one, the Color and Opacity controls are dimmed and unavailable. By applying a surface texture with an image of many hair fibers, you can simulate a much denser, thicker hair. When the texture is applied to the hair effect, each hair fiber appears to be many, many fibers instead of just one.

• **Length** value: This setting scales the Length map and determines the longest hair fibers. The slider represents values from 1 to 100 units. By adjusting this slider over time, you can vary the length so that the hair appears to grow.

• **Density** value: This setting determines the number of fibers over the surface of the object. The slider represents values from zero to 100 percent, but you can enter an even higher value in the entry field above the slider.
• **Strength:** This field determines the body of the hair fibers. The higher this value, the more the hair resists gravity and wind.
• **Clumpiness:** Clumpiness defines how matted the hair appears. This control varies the direction the hair points, creating a matted, clumpy appearance.
• **Chaos:** This field determines the placement of the hairs on the surface of the object. Acceptable values range from zero to 100%. A value of zero means all of the hair fibers line up in neat rows; a value of 100 places the hairs randomly.
• **Diameter:** The setting in this field determines the diameter of each hair fiber, in the units specified in the Set Units dialog.
• **Taper:** This field lets you decrease the diameter of the hair fiber so it becomes gradually thinner toward the end.
• **Curliness:** This setting determines the tightness of the curls. The value in this field represents the diameter of the curls, and is expressed as a percentage of the total curl size.
• **Nap:** This is the direction the hair fibers emerge from the surface. This field is used in conjunction with Lay and Curl. Nap determines the direction the hair fibers lay. It also determines the direction the hair fibers first bend to begin the curl.
• **Lay value:** This value controls the maximum angle that the hair fibers lay. Enter a value from zero to 90 degrees. If a map is present in the Nap field, this value scales the saturation level of pixels within the map. If no map is present, all fibers lay according to the value specified here.
• **Compose Maps:** Clicking this button displays a window that allows you to align the individual maps to the orientation necessary to achieve the look you want. You can position, rotate, or scale any of the maps present in this hair effect. This is identical to the Compose Maps function in the Image Texture.

## HotSpot

The HotSpot effect allows you to generate glowing spheres of light which can be applied to any object in your model. These hotspots can also be used inside other FX elements such as Fire & Smoke. You can change the properties of the HotSpot to vary over time, so there are also a wide variety of interesting animated effects possible. A Hotspot is a post-rendering effect, so it is added to the image when it finishes rendering.



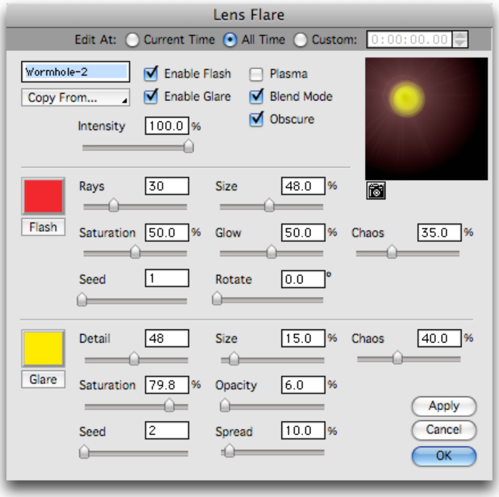

**Hotspot Controls**

The Hotspot Effect dialog includes all of the typical settings and previews for most textures, along with some unique settings for an Hotspot. You can set the Color, Intensity, and Glow of the Hotspot from these controls, but there are a few key settings that effect the overall look of the Hotspot Effect. These are outlined below.

- **Plasma:** Checking this box makes the HotSpot appear more harsh.
- **Blend mode:** When this box is checked, the color of the HotSpot and the color of the object are averaged together. When this box is unchecked, the HotSpot and object colors are added together, often resulting in overexposure.
- **Obscure:** When this box is unchecked, HotSpots are visible even when placed on objects that are behind other opaque objects in your model. The proximity of the objects to the camera determines the extent to which the HotSpot is obscured when this box is checked.
- **Shield Camera:** When this box is checked, the camera is shielded from the HotSpot as it comes in contact with the view plane. Depending on the size of the HotSpot and its proximity to the camera, you may need this feature to avoid over-exposing several frames of your rendering.
- **Rays:** This setting determines the number of rays or spokes of light that radiate from the HotSpot.
- **Chaos:** This field controls how randomly the rays are scattered around the light. The lower the setting, the more even the distribution of rays.

## Lens Flare

Lens Flare simulates what happens when a camera lens is pointed toward a bright light source. You can apply a Lens Flare effect to any object or light source in the model. Any Flare cast fro mthe object will be visible to the camera view that is rendered, and will always "point" toward the center of the rendered region, similar to a camera flare. This is a post-rendering effect, so it is added after the image completes rendering.




**Lens Flare Controls**

The Lens Flare Effect dialog includes all of the typical settings and previews for most textures, along with some unique settings for an Lens Flare. You can set various characteristics like Color, Intensity, Size, Opacity and Glow of the Lens Flare from these controls, but there are a few key settings that effect the overall look of the Lens Flare Effect. Some of these are outlined below.

The Lens Flare effect consists of two different parts, the Flash and the Glare. You can use one or both, depending on your needs.

The upper setting contains controls for the Flash.
• **Enable Flash:** The Flash is the bright area directly over the light source. It simulates lens astigmatism. This checkbox turns the Flash on or off.
• **Enable Glare:** The Glare element creates rings, halos, rainbows, or disks of light which may be offset from the light source. These effects simulate reflections and refractions within the lens of the camera. This checkbox turns Glare on or off.
• **Plasma:** This checkbox turns Plasma on or off. Plasma makes the flash appear more harsh by adjusting the profile to look less like an optical effect.
• **Obscure:** When this box is unchecked, lens flares are visible even when placed on objects that are behind other opaque objects in your model. Results can vary widely, depending on the proximity of the objects to the camera.
• **Rays:** This field determines the number of rays or spokes of light that radiate from the light. Enter any number in this field.

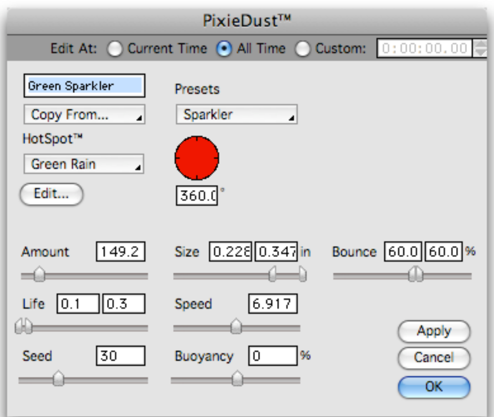
• **Chaos:** This field controls how disorderly the rays appear around the light.

The lower section of the dialog contains settings for the Glare.
• **Glare Color:** The color specified here determines the tint given to the glare elements. However, if the value in the Chaos setting is high, the variation of colors increases.
• **Detail:** This setting determines the total number of Glare elements in the Lens Flare.
• **Spread:** This value represents the percentage of the maximum possible spread allowed, as determined by the position of the object to which the lens flare effect is applied, relative to the camera's position.
• **Chaos:** This setting controls how much disorder occurs with the placement, color, and size of the glare elements. Enter a value from 0 to 100 percent.

## Pixie Dust

The Pixie Dust effect lets you create particles that resist gravity and are blown by the wind. The particles are emitted, then die out gradually, according to the lifespan you specify in the dialog. These particles bounce off objects that have been designated as Collision Objects in the Project window. They also bounce off the ground plane, if your model contains one.

**NOTE:** When Pixie Dust is applied to an object, it is placed at that object's geometric center. This is the location where the particles emerge. In many cases, you may want the Pixie Dust to emerge from a different location. To accomplish this, create another object, make the object construction geometry, then apply the Pixie Dust effect to that object.



**Pixie Dust Controls**

The Pixie Dust Effect dialog includes all of the typical settings and previews for most textures, along with some unique settings for an Pixie Dust. You can set various characteristics like Color, Intensity, Size, Opacity, Speed and Angle of the effect, choose a Preset effect of the Pixie Dust from these controls, but there are a few key settings that effect the overall look of the Pixie Dust Effect. Some of these are outlined below.

• **Presets:** This pop-up list contains several preset Pixie Dust effects. However, you can edit any of the preset effect's controls to customize it to achieve the desired results.

• **HotSpot:** Select a HotSpot from the pop-up list. If you can't find one you want to use, you can customize one of the presets. Select the hotspot that's closest to the one you want, then click the Edit button. The appropriate editing dialog appears.

• **Life:** This control allows you to specify the minimum and maximum life span of the individual particles. The maximum value determines the life span of the largest particles; the minimum value determines the life span of the smallest particles.

• **Buoyancy:** This setting determines how fast the particles rise. The higher the value in this field, the faster the particles rise. Buoyancy causes Pixie Dust particles to travel in a direction opposite to the direction gravity is pulling. Therefore, if you want the Pixie Dust particles to be pulled down by gravity, give the Buoyancy setting a negative value. You can enter any negative or positive number in this field.

• **Bounce:** This field allows you to control the minimum and maximum amount of energy the Pixie Dust particles have when they collide with other particles or with objects. (An object can only detect particles if it has been designated as a Collision Object in the Project window.)

## Geometry Effects

Geometry effects make changes to an object's surface over time. These effects can be seen from within the Modeling window, unlike Resource based effects. These effects also can fundamentally change the geometry you apply them to, while a Resource based FX can be applied and removed, like a Texture.

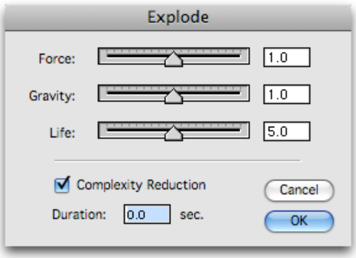
### Explode

Explode explodes an object into a cloud of triangular polygons that move outward and then fall in a flurry of random motion. This effect is adjustable for duration, force, gravity, and the life span of the exploded pieces before they disappear. There is also a Complexity Reduction feature, which can significantly reduce the number of polygons produced by Explode.

The Explode extension works by first breaking the surface of the object into a group of triangle-shaped polygons. These polygons are all about the same size. They explode outward in a spherical pattern away from the object origin point. The Force of the explosion determines how far and how fast the pieces move outward. After the initial exploding impact, the pieces begin to tumble and fall. How fast the pieces fall is determined by the Gravity setting.

**Using Explode**

To use Explode, first select the object to Explode by clicking on it with one of the Object Manipulation tools, then select the Modeling menu item **Explode**. The Explode dialog appears, with slider controls for the three main characteristics: Force, Gravity, and Life. These items are explained below.




Once you click OK in the dialog, the Explode extension begins calculating the animation script. A progress bar may appear. When this process is finished, you may want to save your model with a different name to preserve the version you saved before using Explode. This is recommended any unwanted changes to the original object.

**Explode Controls**

There are three main effect sliders for the Explode Tool, as well as some object-specific settings. All options are outlined here:
• **Force:** This sets the force of the explosion. The force of the explosion moves outward from the object's origin point. The range of the Force slider is 0 to 2, but you can enter higher or lower numbers. A negative number will make your object implode.
• **Gravity:** This determines the pull of gravity on the exploded pieces. With low gravity, the pull is slight and the exploded polygons will have an extended arc and travel farther before starting to fall slowly. The range of the Gravity slider is 0 to 2, but you can enter higher or lower numbers.
• **Life:** This sets the time the exploding pieces remain visible after the explosion. The range of the Life slider is 0.01 to 10, but you can enter a larger number in the numeric field. You cannot use a negative number in this field.

• **Complexity Reduction:** The default setting for this checkbox is enabled, with good reason. A Primitive Rounded Cube has nearly 4,000 polygons to start with. While exploding this object doesn't add any polygons, it does add an animation path to each polygon. Complexity Reduction has no effect on polygonal meshes. Instead of converting an object to polygons, it simply animates the polygons that the object is already made of.
• **Duration:** This field sets the time it takes for the object to explode completely. It is measured from the point on the time line when the Explode extension is applied. It does not include the life of the exploded pieces, which is measured after the object is fully consumed.

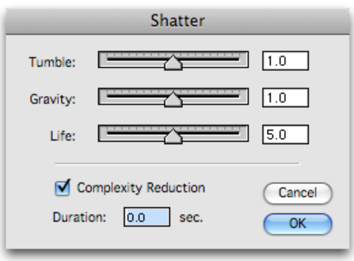
## Shatter

The Shatter command breaks an object or group into polygons, which then tumble and fall; and eventually disappear. You can adjust the duration of the process, the tumble energy and life span of the pieces, and the pull of gravity. The polygons always fall in the **- Y** direction (negative Y axis), according to the absolute coordinates of the model space. This is not view-relative. You can make objects appear to fall up or sideways by setting up your model relative to the Y axis, and then rendering through a camera that is tilted. Enter a negative number in the gravity field to have the shattered pieces float in your scene.

### Using Shatter

To use Shatter, first select the object to Shatter by clicking on it with one of the Object Manipulation tools, then select the Modeling menu item **Shatter**. The Shatter dialog appears, with slider controls for the three main characteristics.

Once you click OK in the dialog, the Shatter extension begins calculating the animation script. A progress bar may appear. When this process is finished, you may want to save your model with a different name to preserve the version you saved before using Shatter.



#### Shatter Controls

There are three main effect sliders for the Shatter Tool, as well as some object-specific settings. All options are outlined here:

• **Tumble:** This control sets the rate of motion for the pieces of your object. When set to zero, they have no motion and simply fall from the object. With a high setting, the polygons tumble rapidly as they fall. The range of the Tumble slider is 0 to 2, but you can enter higher or lower numbers.

• **Gravity:** This determines the pull of gravity on the shattered pieces. With low gravity, the pull is slight and the polygons will fall slowly. With more gravity, the pull is strong and the pieces fall rapidly. The range of the Gravity slider is 0 to 2, but you can enter higher or lower numbers. A negative number will cause the shattered pieces to rise.

• **Life:** This control sets the length of time in seconds that the pieces remain visible after the object is fully shattered. With a short life, the pieces disappear immediately. The range of the Life slider is zero to 10, but you can enter a larger number in the numeric field. You cannot use a negative number in this field.

• **Complexity Reduction:** The default setting for this checkbox is enabled, with good reason. A Primitive Rounded Cube has nearly 4,000 polygons to start with. While shattering this object doesn't add any polygons, it does add an animation path to each polygon. Complexity Reduction has no effect on polygonal meshes. Instead of converting an object to polygons, it simply animates the polygons that the object is already made of.

• **Duration:** This field sets the time it takes for the object to shatter completely. It is measured from the point on the time line when the Shatter extension is applied. It does not include the life of the shattered pieces, which is measured after the object is fully consumed.

## ScriptFX

The ScriptFX item can be thought of as a "create-your-own" FX tool. In fact, a ScriptFX item can be a Rendering effect (like an Aura), a Geometry effect (like Twist), or even a Texture (like any of the Solid or Surface textures). With ScriptFX, the only requirement is that you enter your script in the provided dialog and apply the ScriptFX resource to an object in your scene. The results of the script on the object are either seen immediately or in the rendered view, depending on the effect.

More information about Lua in general can be found at the Lua website (www.lua.org), and more information specific to Lua in Design 3D can be found at the Strata website (www.strata.com) and the Stratacafe (www.stratacafe.com).

See **Scripting Documentation** in the **Help** menu for additional Lua documentation.

**NOTE:** Although the scripting environment in Design 3D is very powerful and integrated into the application, it is generally a safe place to experiment, and ScriptFX in particular can be applied and removed like Textures or other FX, making them very convenient. In addition to this, every attempt has been made to make scripting in Design 3D easy to use. However, using the scripting environment effectively still does require a familiarity with scripting and how 3D applications can function.

Using the power of Design 3D's scripting environment (and the Lua scripting language) you can create anything from simple to complex effects in Lua scripts and apply them to either individual objects or your entire scene through the ScriptFX item, just like any Resource-based FX. These scripts can even reference external, pre-loaded scripts with special functions. Because ScriptFX are also "self-contained" items, they can be evaluated, modified and removed just like other Textures or FX.

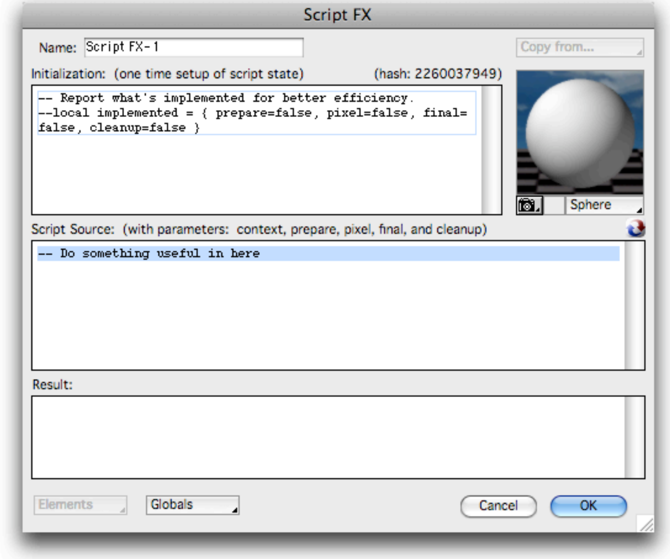
### Using ScriptFX

To begin with ScriptFX, make the **FX panel** of the **Resources** palette active, and press the **New** button to get the FX pop-up menu. Select **ScriptFX** from the list and it will present the ScriptFX dialog. Any scripts added or created in this dialog will be saved within the particular ScriptFX item you create. You can then apply this FX to an object in your scene, or the entire scene itself. Remember, though, that all of your script information is only stored inside the ScriptFX resource, and will only be saved with the current scene, unless you Save it to your drive or Library for use later, like any other FX element.

If you have ScriptFX resources in your Library already, or have imported them from other sources (such as the Stratacafe.com community site), then you can load, apply and edit these resources just like any other FX or Texture item. The big difference is that the editing can be much more complicated than just moving sliders and testing the effect on your rendered scene. Depending on the type of ScriptFX, it may require other elements to be in your scene, or other scripts or plugins installed in your Strata Design 3D CX program folders.

### Scriptfx Dialog

The dialog presented when creating a ScriptFX element contains only a few familiar elements. There is a Name entry box, a Preview (with additions), and the usual Cancel and OK buttons to finish creating or editing the ScriptFX. The rest of the dialog is oriented for script editing and creation.




There are two, large, scrollable text-entry areas and a large feedback area at the bottom. The text-entry areas function as a text editor window for your scripts, and if you run out of visual space while typing or examining, you can resize the entire ScriptFX dialog to expand the middle space.

• **Preview:** Similar to the preview windows in other FX dialogs, this shows the effect of your ScriptFX as applied to the default preview scene. The object displayed can be either a Sphere, Tile, or Cube.
The Preview Camera for ScriptFX has three ways of functioning, unlike the simple "update" function of other Previews. Click and hold on the Camera icon to change the function of the Preview from the drop-down list.
- Manual: Similar to the function of all other dialogs. Press the Camera button to refresh the display of the Preview render.
- Automatic: The Preview render refreshes whenever the current script is evaluated with the Enter button on the numeric keypad. The render progress wheel next to the Camera button will spin with every refresh.
- Continuous: The Preview window will force a refresh after a very brief pause, resulting in an almost continuous, animated Preview render. This is useful when your script is changing key parameters very quickly or often.
• **Initialization:** This is a text-entry area for writing and establishing an initialization script. This can include local values, functions, and even calls to external scripts that are needed for your main script to function properly. This is also a good place to compute anything that doesn't change after the script is parsed.

• **Script Source:** This is the text-entry area for writing your main ScriptFX source. This source should follow a logical progression for a script that effects the object it is attached to in the scene. The suggested parameters, defining each phase of the evaluation and function, are Context, Prepare, Final, and Cleanup. Press the Enter key on the numeric keypad to Evaluate your script.
• **Swap button:** The small button with the red and blue arrows on it, on the right side of the ScriptFX dialog, switches the location of the Initialization and Script Source editor windows. This is useful because only the lower of the two windows will resize with the full dialog, so it can be used to examine larger amounts of script at once.
• **Result:** This is the error reporting area of the ScriptFX dialog. When you press the the Enter key on the numeric keypad to Evaluate your script, either a "Success" report, or information on errors in the script will be presented here.
• **Elements:** A drop-down menu of pre-made or preloaded script "chunks." These can either be a few lines of script, or an entire function, but they can be quickly inserted into your script wherever your text cursor is, by selecting the Script Element from this menu.
• **Globals:** A drop-down menu of many of the LuaBind Globals available as prepared text strings, with arguments and elements highlighted after insertion into your script.

# The Environment

Strata Design 3D CX provides many options that allow you to define the world surrounding your objects, including atmospheric effects, Backgrounds and a surface to anchor your objects to. To control these elements of the scene Design 3D provides the **Environment palette**. In addition to the Lights panel controlling global lights, the Environment palette has three panels that give you access to environmental effects. These additional panels are: Air, Background and Ground.

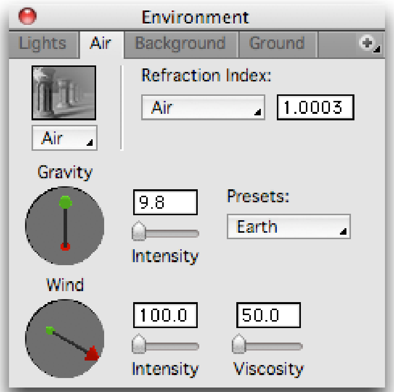
## Atmosphere

The Air panel of the Environment palette is where you can quickly add atmospheric effects, such as Fog or Mist, to your models. This panel also allows you to control the global forces present in your model: Wind and gravity.

### Using Atmospheric Effects

Atmospheric effects are added by using standard Volumetric textures, such as Fog and Mist, but the textures are applied to the entire model. Volumetric textures are otherwise applied to just one object and are confined to the space occupied by the single-sided objects to which they are applied.

To add atmosphere, click on the **Air panel** of the **Environment** palette to bring it to the front. The following controls are available:
• **Air**: This pop-up menu allows you add atmospheric effects, such as Fog or Mist, to your model. These are volumetric textures that are applied globally to your model.
• **Refraction index:** This field lets you set a global index of refraction for your model. This setting is independent of the atmospheric effect selected from the Air pop-up. You can select an index of refraction from one of the presets in the pop-up list or enter a value directly in the numeric field next to the list of presets. For example, air bubbles look differently under water than they do in the air. If your scene is under water, set the refraction index to Water. The air bubbles will then appear correctly when rendered.




**Adding Atmospheric Effects**
To create a new effect, hold down the Air pop-up menu, then select the New submenu. From there you can select the type of effect you want to create. When you finish making a Volumetric texture from this pop-up it's automatically applied to the model. You can also create Volumetric textures from the Textures panel of the Resource palette for use in the Air pop-up. Volumetric textures from the Library are also available for selection from the Air pop-up menu.

Selected Volumetric textures appear in the center section of the Air pop-up menu with a bullet (•) or check mark beside their name. You can have more than one Volumetric texture applied but it is not recommended.

**Editing Atmospheric Effects**
All atmospheres currently loaded in the active model appear in the Edit sub-menu of the Air pop-up. Select the effect you want to edit. The appropriate dialog appears, allowing you to modify the current settings.
You can also go directly to the Resource palette to access and edit these Volumetric textures.

**Removing Air**
To remove an applied atmosphere from the model, select it again to remove the mark from beside its name. Select None to remove all Volumetric textures. This will not remove the effect from your resource palette, but it will no longer be applied to the model.

## Global Forces

The lower section of the Air panel provides controls for global forces. These forces - Gravity and Wind - affect any **particle effects** present in your model, such as fountains. These settings can change over time, allowing you to add realistic effects, such as gusts of wind, to your model. You can also specify the viscosity, or heaviness, of the Air. For information about particle effects see **Chapter 11 - Special Effects**.

**Gravity**

• **Direction:** This control indicates the direction of gravitational pull on **particle effects** in your model. Grab the control and drag it into the desired position. Use **Command** (Mac) or **Control** (Win) to toggle between front and back hemispheres.

• **Intensity:** This setting determines how powerful the force of gravity is in your model. You can select one of the settings from the Presets pop-up list, or specify the relative intensity with the slider. Or, you can enter a value directly in the entry field above the slider. The slider allows you to select intensity values from 0 to 20, but you can enter any negative or positive number in the entry field provided above the slider. A negative value in this field causes particles to fall in an "upward" direction.

**Wind**

• **Direction:** This control indicates the direction the Wind is blowing. The intensity of the Wind ranges from 0 to 400. Use the slider or enter a value directly into the entry field above the slider. To switch between the front and back hemispheres, use the Command key (Mac) or Control key (Win) while dragging the control into the desired position.

• **Intensity:** This value determines the speed of the Wind.

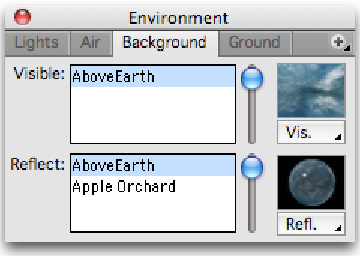
• **Viscosity:** The value in this field determines how heavy, or thick, the Air is. The higher this value is, the more influence the Air will have on the particles. Acceptable values range from 0 to 100 percent. Don't confuse Viscosity with Refraction. Refraction determines how light is affected; Viscosity determines how particles are affected.

## Backgrounds

**Visible** and **Reflected Backgrounds** are applied in the Background panel of the **Environment** palette, although they can be loaded and edited in the Resource palette. These environments add a surrounding reflection and/or Background to the scene. By using a Background instead of additional modeling, you can minimize the number of objects being used. You can use one Background for the visible Background and another for the reflections that appear in shiny surfaces.

The Background is not visible in the Modeling window. The Visible and Reflected Backgrounds are visible only when rendered. Backgrounds are always placed an infinite distance away from your model. The Background panel lets you customize Backgrounds to suit your needs. You can choose from a number of pre-designed Backgrounds, or create your own. The default visible Background for new models is black, but you can change the Background at any time. You can also specify what type of reflective environment, if any, you want to use.

**NOTE:** You must render the image with Perspective for the Background to render properly. If you render in Orthographic projection, the entire Background will consist of color information from only one pixel, so the Background will appear as one solid color.

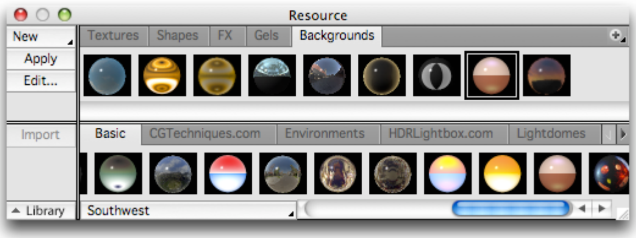



The upper section of the Background panel deals with the **Visible** Background, and the lower section deals with the **Reflected** Background. The Background at the bottom of each list will be the one that is visible. You can reposition any of the applied Backgrounds, either visible or reflected, by simply grabbing the name of the Background and dragging it up or down to the desired position in the list.

In addition to simple **Color** and **Horizon** Backgrounds, Design 3D also offers **Spherical, Cubic** and **Starfield** Background types. An important difference between Spherical and Cubic Backgrounds is how the reflections appear. If your model consists of extruded text with a shiny surface applied, for example, you might want to use a Cubic Background to take advantage of the increased reflectivity it allows. The end result of your rendering may appear quite different, depending on the type of Background you choose.

## Creating New Backgrounds

You can create new Backgrounds from the Background panel of the Environment palette, or you can use existing backgrounds or create new ones from the Backgrounds panel of the **Resource** palette.




To create a new Background from the Environment palette, select New from either the **Vis.** (visible) or the **Refl**. (reflected) pop-up menu, then choose the type of Background you want to create from the submenu. You can create a Cubic, Horizon, Color, Spherical or Starfield Background.

Once you've created a new Background, it appears on the Environment palette and on the upper portion of the Resource palette. If you want to use this Background in other models, you'll need to save it to disk. A special Save command is provided in the Plus menu on the Resource palette.

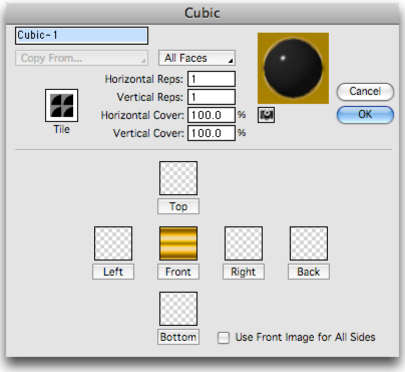
The Cubic and Spherical Background types use images for their effects. Because Design 3D can load and utilize High Dynamic Range Images (HDRI), combining this very powerful image format with these image-based Backgrounds can produce very realistic effects when used as Lightdomes or Reflection maps.

## Color

The Color Background is the simplest texture or effect available. It simply places a flat Color, chosen from the color picker, into the Background channel. The Color will fill the view in any areas of your scene that do not have an object in them.

## Cubic

The Cubic Background creates a cubic-mapped environment for your model. A cubic environment consists of six different image planes: top, bottom, front, back, left, and right.

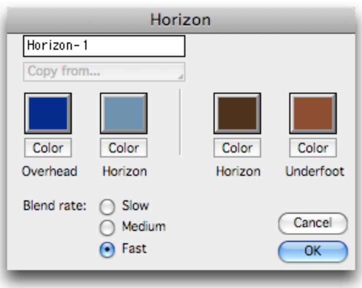



The **Cubic dialog** allows you to load up to six different images or animations, with a different map on each face. If you want to use the same map on each plane of the Background, load the map into the **Front** field and check the **Use Front image for all sides** checkbox. A default black Background will be used for any face that does not contain a map.

This dialog also allows you to change the Scale and Mapping parameters for each map individually. If you want to use the same scale and mapping parameters for all maps, select **All Faces** from the pop-up list.

## Horizon

The Horizon Background lets you create a gradation of colors that blend together. Select Horizon to create a new sky Background and the Horizon Background dialog will appear. This dialog allows you to specify colors for the upper and lower areas of the Background, as well as colors that appear just above and just below the horizon. An adjustable blend rate allows you to blend the colors with the proper gradation to match the lens angle of the view.



**Slow** blending uses a linear gradation from the horizon color to the overhead and underfoot colors. The transition from horizon color to sky color is complete within 45° of the horizon line. This is useful for wide angle lens settings.

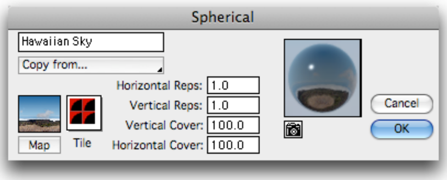
**Medium** uses an accelerated linear gradation to complete the horizon color's transition by 33° above or below the horizon line. This is useful for normal lens settings.

**Fast** uses a logarithmic gradation to complete the color transition by 20° above or below the horizon line. This is useful for semi-telephoto lens settings.
Color

Select **Color** to define a single color to use as a Background. The Color dialog appears. Click the Color button to display the color picker. This dialog allows you to specify a color to use for the visible or reflective Background.

## Spherical

Select Spherical to specify a single image or animation to use as a Background. A spherical Background consists of a single image, wrapped around the model on an imaginary sphere, and bunched up at the top and bottom to fit on that sphere. This is similar to the Spherical mapping style of a texture on an object.




The typical projection of the flat source image is known as Equirectangular (also Latitude-Longitude) and is similar to the way a world map is displayed, with the polar regions stretched out along the top and bottom. When mapped to a sphere (either inside our outside your scene) a realistic environment can be visualized. Most equirectangular images are twice as wide as they are tall (2:1 ratio), to cover 180 degrees from pole to pole, and 360 degrees around.

The Spherical dialog lets you load an image or animation, and also allows you to specify the scale and tiling method used.

## Starfield BG

The Starfield BG (Background) is applied and edited like the other Backgrounds in this palette. The Background itself is just like the **Starfield texture**, except that it is applied to the Background at an infinite distance. When you select Starfield BG from the list of Background types, the standard Starfield texture editing dialog will appear with the same options as in the texture version. For information about the Starfield texture see **Chapter 10 - Special Texture Types.**

**NOTE:** The Starfield BG, because it uses the Starfield texture dialog, includes the standard animation controls at the top of the Window. You can use these to animate your Starfield over time, just as you would the texture version.

## Editing Backgrounds

To edit any Background currently applied to your model, select **Edit** from the **Visible** or **Reflected** pop-up menus. When you select a Background to edit, the appropriate dialog appears.

### Applying Backgrounds

To apply a Background to your model, select one from the pop-up list. When you select any item from either the center section (loaded Backgrounds) or the lower section (Backgrounds contained in the library), that Background is loaded, if necessary, and a mark is placed beside the name of the Background, indicating that it is currently applied.

### Removing Backgrounds

Backgrounds that are currently applied to the model appear with a mark beside the Background name. To remove a Background, select it again; the mark is removed, indicating that the Background is no longer applied. You can remove all Backgrounds that are applied by selecting None. The Background still remains loaded, however. To remove the Background from the model, a Delete Unused command is provided in Plus menu on the Resource palette.

### Using Backgrounds in Image Textures

Design 3D allows you to insert a reflective Background directly into an Image Texture. This allows you to set up different reflections for different objects. Using this feature, you can set the texture to reflect both the Environment's Reflective Background and the Background that is internal to the texture. You can also specify that only the internal Background is reflected.

### Saving Backgrounds

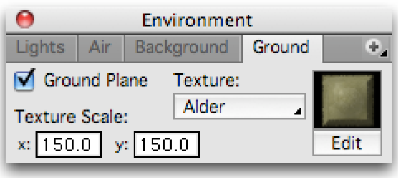
When you create a new Background, it becomes part of, and is saved with, the model. However, if you want to be able to access this Background later to use in other models, you must save it to disk. A Save command is provided in the Plus menu.

**Importing Backgrounds**
Click the Import button to import Backgrounds from the Backgrounds library into the active model. Just open the library by clicking on the Library button, select the Background you want to import and then click on the Import button.

## Ground Planes

It's often a good idea to have a surface for your objects to be visually anchored to. You can easily create a ground plane by simply drawing in a rectangle using the Rectangle Tool. The disadvantage that a rectangle has, however, is that it is not infinite in size and so any rendering that has a low angle of view will reveal that the surface is more of a table top, rather than an infinite expanse. This is where the **Ground** plane comes in.

A Ground plane is infinite in size, and it cannot be moved. Particles, such as those generated by Fountain effects, will bounce from the ground plane if they come in contact with it, or simply gather on the surface, depending on the amount of energy the particles have.




The **Ground panel** of the **Environment palette** lets you set up a ground plane for your model. It also lets you apply a texture to the ground plane.
• **Ground plane**: Place a check in this box if you want to use a ground plane in your model. When this box is checked, the ground plane coincides with the Y grid in your model.
• **Texture:** You can apply any surface texture to the ground plane. All of the textures that are available appear in the Texture pop-up list. Select one to apply to the ground plane, or create a new texture by selecting New from the pop-up. Design 3D will render the ground plane with a white texture if no other texture is applied.
**TIP:** It's always a good idea to utilize MIP mapping for textures that will be used on the ground plane. MIP mapping will ensure that the texture converges smoothly as it decreases in perspective. MIP mapping can be set in the Image Map dialog, which is accessed through the Image Texture dialog.

• **Texture Scale:** If the texture used on the ground plane contains a map, you can specify its scale. All textures are applied to the ground plane using normal tiling with infinite repetitions.
• **Edit:** Click this button to edit a texture that you've applied to the ground plane. The Texture Editing dialog for the selected texture is displayed, and you can modify it as desired.

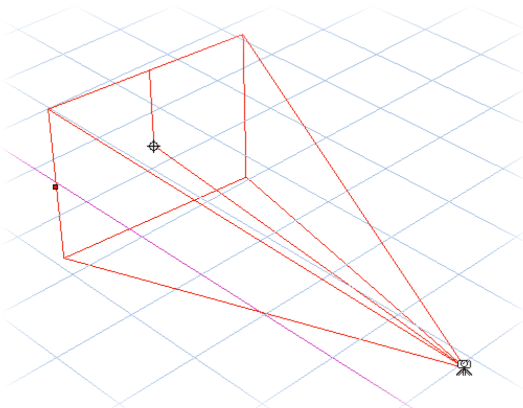
# Using Cameras

Modeling windows are typically used to get the best view to create an object, apply textures and set up lighting. To set up a view that you have artistic control over, and that you won't have to change just to perform a modeling task, Strata Design 3D CX allows you to create one or more **Cameras.**

## Camera Object Tool

There are two ways you can insert a camera into your model. You can clone an existing Modeling window view by using the **New Camera from View** command in the Modeling window's **Plus** menu. You can also use the **Camera Object Tool** to insert a Camera into your scene.

When the Camera Object Tool is selected, the cursor changes its appearance to look like the tool icon. To add a camera object to a model, click in the Modeling window. A camera marker is placed on the active grid and is initially aimed in a direction parallel to the grid. Camera markers are visible in modeling views, but they don't appear in renderings.

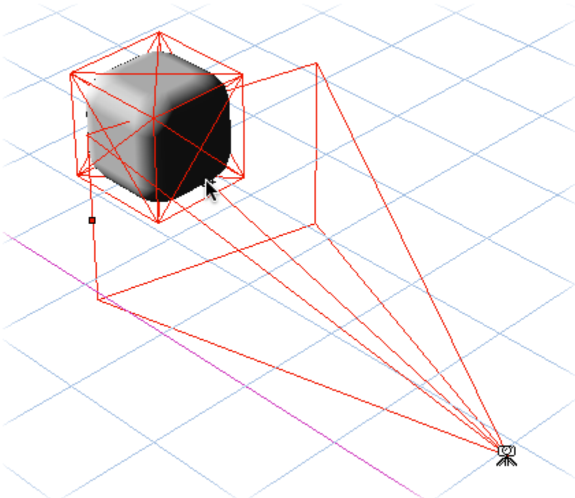


The direction the camera is aimed and its initial viewing angle are indicated by the rectangular cone projecting from the marker. The camera marker itself does not indicate the direction the camera is actually facing; it merely marks the location of the camera in the model.

When you select the camera, the direction the camera is facing, as well as the portion of the model visible through the camera, is indicated. To point the camera, grab the Look At point and position it to point in the desired direction. To increase or decrease the area visible through the camera's viewfinder, grab the handle on the rectangular bounding box and drag to the desired size.

#### Look At

If you want the camera to always look at a particular object, drag the Look At point to that object. As the Look At point passes over an object, that object becomes highlighted in red; then release the mouse button. The camera is now associated with the object; regardless of whether you move the camera or the object, the camera will always remain pointed at that object.



If you hold down **Option** (Mac) or **Alt** (Win) while dragging the Look At point, all objects are ignored, allowing you to aim the camera at a position in space, rather than aiming at a particular object. As the Look At point passes over an object, it highlights in green, indicating that the camera is aimed at that object, but not attached to it. If you move the object, the camera is no longer aimed at the object.

**NOTE:** Be sure to select the Look At point **before** holding down the Option key (Mac) or Alt key (Win) to avoid creating an unwanted copy of the camera.

#### View Angle/ Focal Length

To adjust the view angle of the camera, grab the View Adjustment handle and drag it to the desired position. The size of the Camera window does not change; only the focal length changes.

## Moving Cameras

You can move the camera object in the **Modeling** window with the **Move Tool**. The camera always remains pointed at the **Look At** point. If you grab the camera, the camera moves, but the Look At point remains fixed. If you grab the

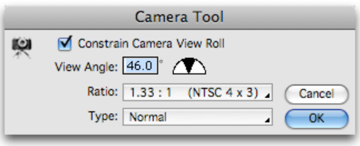
Look At point, that point moves, but the camera remains in place. If you grab the red line between the camera and the Look At point, both the camera and the Look At point move together.

Unless you're working in an orthographic view, moving the camera toward or away from a Look At point works just as it does with a real camera. When you move the camera farther away from the Look At point, the area of the model that's visible through the camera's viewfinder increases; if you move the camera closer to its Look At point, the visible area decreases.

You can move a camera freely anywhere on the active grid. To move the camera perpendicular to the active grid, hold down **Command-Shift** (Mac) or **Ctrl-Shift** (Win). To move the camera closer to or away from the Look At point (along a straight line connecting the two), hold down only **Command** (Mac) or **Ctrl** (Win).

## Camera Tool Settings

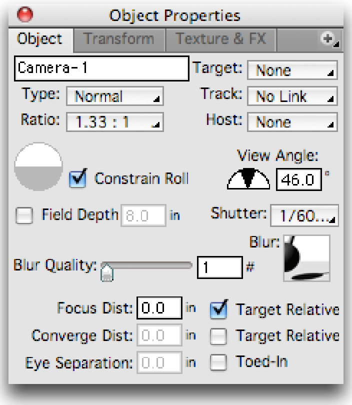
You can specify the default settings for the camera objects you insert into your model. To access the Tool Settings dialog, double-click on the Camera Object Tool icon. These settings are an abbreviated set of the controls available in the Object Properties palette.




## Adjusting a Camera's Settings

A camera object has several settings that control the way it operates in a model. To access these settings first select the camera you want to modify. You can select the camera object by clicking on its marker using the Move Tool. You can also select a camera - or any object - by clicking on its name in the Project window.

Once you have the camera selected the settings can be changed on the Object panel of the Object Properties palette.




The various settings in this palette control common aspects of the Camera Object such as Name, Type, Aspect Ratio, Targeting, Tracking, and Host settings. Also included in the Camera Object Properties are many other settings such as Roll, View Angle, Blur Quality, and options for Depth-of-field, Motion Blur, and Stereoscopic rendering.

These settings are outlined here:

• **Name:** When you insert a camera object into a model, it is given a default name. The name of the camera also appears in the Camera Window submenu in the Windows menu, as well as in the Project window.

• **Type:** This setting determines the type of the selected camera. When you choose Panorama, 3.25:1 appears in the Aspect Ratio field, and some of the other fields may not apply. When a camera is set to Stereo, the Convergence Distance, the Convergence Distance Target Relative checkbox, Eye Separation and Toed-in become available.

• **Ratio:** The setting in this field indicates the ratio of the width of the camera window to its height. This ratio is not time variable. When changed, the new setting becomes a global setting which affects all frames of a rendering.

• **Target:** You can select any object in the active model that has been previously named (in the Name field on the Object Properties palette or in the Project window) to associate with the selected camera. Only named objects appear in the Target pop-up list, but you can lock the Look At point onto any object in your model.

If an unnamed object is the target, the Target pop-up is blank. If a named object is locked on to the camera, its name appears on the pop-up. If **no object** is locked on to the camera's Look At point, the Target pop-up says "None." To remove a target from the camera, select None from the Target pop-up.

• **Track:** Select a tracking style. This field is set to Swivel and grayed out if a Host is selected.
- No Link: This option removes the existing target from the selected camera.
- Hard Link: If the target moves, the camera moves as though attached to it.
- Swivel: The camera swivels to follow the target object.
- Chase: The camera chases a moving object.

• **Host:** You can attach the selected camera to a host. Then, when the host object moves, the camera moves with it. This setting defaults to None. Only named objects appear in the pop-up list.

• **Roll:** You can rotate the camera interactively by dragging the Roll indicator with the Steady Camera feature disabled. To disable Steady Camera, uncheck the **Constrain Roll** checkbox. This feature can also be disabled from the Camera window.
When the Roll control is in its unlocked position, a rotation handle becomes available in the Modeling window.

• **View Angle:** This setting determines the amount of perspective. A value can be entered directly in this field, or you can specify the view angle interactively with the View Angle Control. You can also adjust the view angle by adjusting the Perspective slider in the Camera window.

• **Field Depth:** When the Field Depth box is checked, the value entered in the field next to it determines the total distance in front of and behind the Look At point where objects will remain relatively focused. If the Field Depth checkbox is unchecked, the Focus distance field, and the Target relative checkbox are disabled.
- Field Depth and Focus Distance. With the Field Depth checkbox off, the camera behaves like a pin hole, and everything is in focus. With Field Depth checked, objects close to the Focus Distance are in focus. How close the objects need to be is specified by range or Depth of Field.

• **Blur:** Motion blur occurs when objects move while the camera's shutter is open. You can control the softness of the blur behind an object, creating an especially realistic effect. Select a blur effect from the Blur pop-up list.
These are the Blur options from top to bottom:
- None: No blurring occurs.
- Even: Blurring occurs evenly in front of and behind the image. This option produces the most realistic blur effect and is the normal result of a slow shutter speed.
- Trailing: Motion is blurred in both directions. The shutter opens more slowly than it closes, causing more blurring to occur behind the image than in front of it.
- Heavy trailing: Almost all blurring occurs behind the image. This occurs when the shutter opens slowly and closes very rapidly.

- Forward: Almost all blurring occurs in front, causing the image to look as though it is moving backward. This occurs when the shutter opens very rapidly and closes slowly.
• **Shutter:** This field determines the speed of the shutter, in fractions of a second. Increasing this value will cause blurred frames to be further apart in time.
• **Blur Quality:** Higher quality settings may require significantly longer rendering times. Design 3D must render additional images, and then composite the intermediate renderings to create a blur effect.
• **Focus Distance:** If Target Relative is disabled, this value represents the distance from the camera that the camera is focused at. If the Target Relative checkbox is enabled, this value is the distance from the Look At point that the camera is focused. This value may be a negative or positive number.
• **Target Relative:** If this field is checked, the number entered in the Focus Distance field is measured from the Look At point rather than the camera.

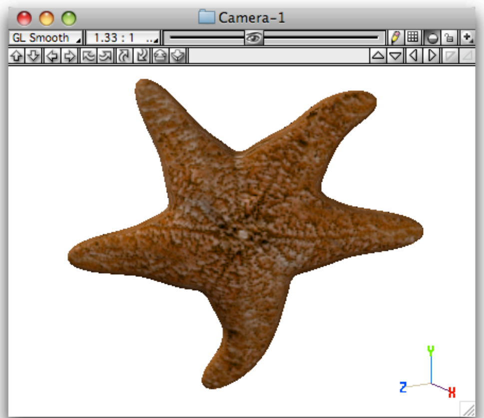
**Stereoscopic Settings**
The following fields become available when you select Stereo in the Camera type pop-up:
• **Convergence Distance:** This is the distance between the convergence point and the camera. If the Target relative checkbox is enabled, this value is the distance between the convergence point and the Look At point of the camera. In Target Relative mode, a negative value should be used in the convergence distance field in order to place the convergence point between the Look At point and the camera. When viewed with liquid crystal stereoscopic glasses, all objects between the camera and the convergence point will appear to pop out of the screen, while all objects that are behind the convergence point will appear to sink into the screen. If an object is on the convergence point, it will be on the surface of the screen.
• **Target Relative:** This second Target Relative checkbox applies only to Stereoscopic cameras. This control works with the Convergence Distance field. If this field is checked, the number entered in the Convergence Distance field is measured from the Look At point rather than from the camera.
• **Eye Separation:** This is the distance between the two cameras from which the left and right eye images are rendered. Making this value larger has the effect (on the human brain) of making the objects that you are viewing seem to be smaller. This setting should be in proportion to the objects you are viewing. If you model to scale, a realistic eye separation would be 2.5 inches. It is best to use a fairly large ratio (approximately 15:1) of distance from the camera and eye separation.
• **Toed-In:** There are two ways that a stereoscopic image can be rendered. The normal way is to render the image with the cameras parallel to each other. This produces an image that is a little easier on the eyes than the toed-in approach, because it allows the eyes to do the toeing in themselves.

With the toed-in method, the two cameras are pointed directly at the convergence point. This can be useful if you want to match existing footage that was produced using the toed-in method.

**NOTE:** All Camera properties in the Object panel of the Object Properties palette can also be controlled in the Project window. In addition, **Lens Thickness** is only available in the Project window. To access Lens Thickness, open the Camera's properties list, then open Base Properties > Camera Properties.
• **Lens Thickness:** To help simulate a real camera, Lens Thickness compensates for the small distance an actual lens system takes up. For example, even though your camera may be 1.2 meters from the object, a Lens Thickness of .05 will change the Focus Distance you want to 1.15 meters.

## Camera Window

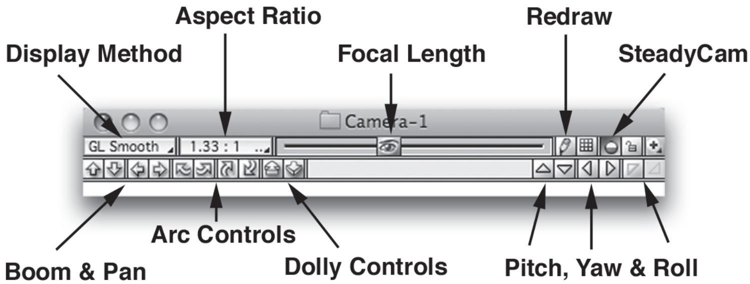
Each camera object you insert in your model has its own **Camera window**. When you look at your model from a Camera window, it's as though you are actually looking at it through the camera's viewfinder.




To view the model through the Camera window, **double-click** on the camera object's icon in the Modeling window, or select the camera object by name from the **Camera Window** pop-up menu in the **Windows** menu.
Camera windows are similar to Modeling windows, but they are linked to the camera objects. Each camera can contain only one view, Camera windows cannot be split.

## Camera Window Controls

The Camera Window controls, found at the top of the Camera window, allow you to manipulate the position, orientation, and behavior of the camera just as if it were a real camera on a very controlled rig.




• **Display method:** All available display methods appear in this pop-up menu. Select the one you want to use from the list. The Display method used in the Camera window will have no effect on the final rendering.
• **Aspect ratio:** This pop-up menu indicates the ratio of the width of the Camera window to its height. You can select any aspect ratio listed in the pop-up menu. Selecting an aspect ratio will alter the width of the camera window so that it matches the height of the window relative to the aspect ratio chosen. The Custom menu entry allows you to set a specific window size in pixels. Once you have selected a size using Custom you can then maintain that aspect ratio when resizing the window. To do this hold down the Shift key while resizing, or click on the Lock/Unlock aspect ratio button.
• **Focal Length/ Perspective:** The perspective slider on the Camera window is fully variable, instead of the three-position perspective selector on the Modeling window. The slider control is located horizontally across the top of the window frame.
When positioned to the far left, the Camera window view is at maximum telephoto, which translates into essentially no perspective at all. When positioned to the far right, the Camera window is at ultra-wide angle. The view angle is so extreme in perspective that objects appear distorted.
• **Redraw:** This button shows the redraw status. If the button is gray, the window is finished redrawing. If the button is colored, the window is in the process of being redrawn. If the button is clicked, it forces Design 3D to redraw the Camera window.
If the redraw icon (pencil) appears in color, and no progress seems to be being made, chances are good that the window needs to be refreshed.
• **View grid:** Each Camera window contains a View grid. Unlike other grids, these grids are view-relative, so they track whenever you move in the window.

They are drawn relative to the view plane with a coordinate system of 0,0,0 and appear gray in the Camera window.
• **Steady Camera:** When this option is enabled, the camera's "up" vector always remains in the "up" position. Click the button again to disable this option.
• **Lock/Unlock:** You can lock the aspect ration so that resizing the window prevents the ratio from changing.

**Control Buttons**
Use these buttons to control the position of the camera. The longer you hold down the button, the faster the motion of the camera - in other words, the motion accelerates as you hold down the button. You can also use the Speed Modifier keys mentioned below. These controls are listed from left to right in the camera window. The Boom, Pan, Arc and Dolly controls are on the left side of the window.
• **Boom:** The Boom controls move the camera up or down.
• **Pan:** The Pan controls move the camera left or right. If the camera's Look At point is not locked onto a target, the Look At point also moves left or right.
• **Arc:** These controls move the camera in an arc around the Look At point.
• **Dolly:** The Dolly controls move the camera toward or away from the Look At point. If the camera's Look At point is not locked onto a target object, the distance between the camera and the Look At point is maintained.

The Pitch, Yaw and Roll controls are located on the right side of the camera window.
• **Pitch:** Use these controls to tilt the camera along its X axis.
• **Yaw:** These controls tilt the camera along its Y axis.
• **Roll:** These controls tilt the camera along its Z axis. If Steady Camera is enabled, the Roll controls are unavailable.

Modifier keys for Camera control speed:
**Shift** = while clicking on a camera control button moves the camera object at a **faster** rate. The amount that the camera will move is dependent on the nudge sub-divisions value.
**Option** (Mac), **Alt** (Win) = while clicking on a camera control button moves the camera object at a **slower** rate. The speed deceleration factor is 4 or 1/4 the default speed.

## Resizing the Camera Window

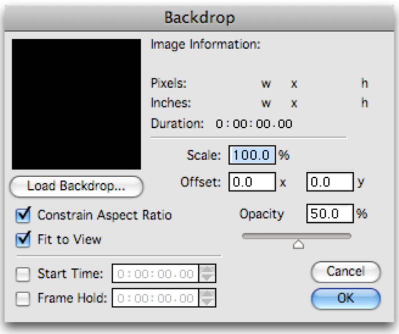
If the aspect ratio is locked, the Camera window maintains the selected aspect ratio when you resize the window. If the aspect ratio is unlocked, then you can resize the window to any size. Holding down the Shift key while resizing will toggle between locked and unlocked - free resize and proportional resize.

When you resize the Camera window, Design 3D checks to see if the new size matches any of the preset aspect ratios. If it matches any of the presets, it displays that aspect ratio on the pop-up. If it doesn't match any of the presets, Custom appears as the selected size on the Aspect Ratio pop-up.

## Backdrops

Design 3D allows you to place an image or animation in the Camera window to assist you in the modeling process. To add a backdrop to a Camera window, select the **Set Backdrop** command from the Camera window's **Plus menu**. You can add a different backdrop to each Camera window. The backdrop is provided for modeling purposes only, as it does not appear in rendered images.

**NOTE:** If you want the image to also appear in the final images, you can use a backdrop to properly align objects against it, then render your model with the Alpha channel. (Make sure the **Render Alpha Channel** checkbox in the Render dialog is enabled when you render your model.) You can then composite the images together in an image processing application, such as Adobe Photoshop® or Apple Shake®.




When you select the Set Backdrop command from the Camera window's Plus menu, the **Backdrop** dialog appears. Click the **Load Backdrop** button to locate and load an image or animation file to use as your backdrop.

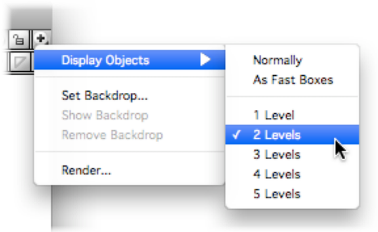
The top of the dialog contains information about the image. The Duration field shows the total number of frames contained in the file.
You can scale the image larger or smaller. You can also change its position in the view by indicating the total number of pixels to offset it from center.

The Opacity slider lets you adjust the transparency of the image. If opacity is less than 100%, the background color used in the Modeling window blends with the backdrop image.

If both the Constrain Aspect Ratio and Fit To View boxes are checked, the Camera window resizes according to the aspect ratio of the backdrop image, and the aspect ratio of the window becomes locked.
If you're using an animation file, you can specify the start time of the first frame you want to use. For example, to ignore the first three seconds, select 00:00:03.00 as the Start Time.

## Camera Plus Menu

This menu provides easy access to commonly used commands that relate to the Camera window. The Plus menu is always located at the top right corner of the window or palette.




• **Display Objects:** Select the level of detail displayed in the Camera window from the submenu. The higher the level, the less detail displayed in the window. A check mark next to the menu entry indicates the current display detail.

If your model is so complex that the redraw times get too lengthy, you can choose to display the objects as **fast boxes**. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This greatly reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose 1 Level, objects in the model appear normal, but shapes in the model appear as fast boxes, etc. This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the Modeling windows, they will still render in full detail.

• **Set Backdrop:** This command allows you to place an image or animation in the Camera window to use for modeling purposes. It won't appear in rendered images.

• **Show/Hide Backdrop:** Use this command to show or hide the backdrop in the Camera window. The command name toggles between Show and Hide, depending on the backdrop's current hide/show status. Hiding the backdrop doesn't remove it from memory; it merely hides it so it's not visible in the Camera window.
• **Remove Backdrop:** Use this command to remove the backdrop from the window.
• **Render:** Use this command to open the Render dialog and begin the rendering process. This is the same as the Render command in the Rendering menu.

# Lighting the Scene

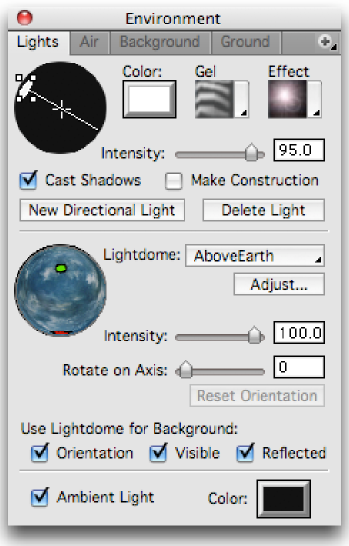
How you light your scene can be just as important to creating a great image or animation as the objects and textures in your scene. For many photographers this is considered the essence of their craft. There are many options you can consider when setting up your lighting in our "virtual studio."

You can light your scene using global illumination, local light sources, glowing surfaces or any combination of the three. You can color your lights, add light gels, or apply special light effects. In a 3D lighting situation, you can even decide whether a light source casts shadows, and with some light sources, how soft those shadows will be (depending on the renderer).

## Global Illumination: The Lights Panel

In Strata Design 3D CX there are three kinds of Global illumination: Directional Lights, Lightdomes and Ambient Light. To add or adjust any of these **Global lights**, open the **Lights** panel of the **Environment palette**.

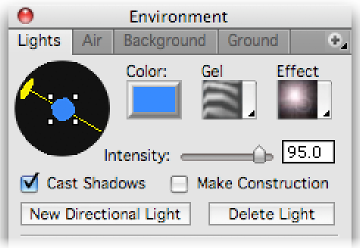
The Lights panel is organized into three sections: the top section contains controls for Directional Lights, the middle section controls Lightdomes, and the lower section has controls for Ambient Light.



## Directional Lights

These lights simulate an infinitely distant light source, so they illuminate a model with parallel rays of light, similar to the way sunlight strikes the earth. Because the light rays are parallel to each other, a **Directional Light** casts an even amount of light on all surfaces that face it, and any shadows cast will always be hard-edged.

By default, each new file will include a Directional Light coming from above and to the left of the center of the scene. This **initial light source** provides a way to immediately see the objects in your scene before you even set up any custom lights. This is helpful when building models or textures at the beginning of a project.




• **Directional Lighting Sphere:** Each Directional Light in your scene (including the default light) is represented by a disk attached to a directional line that rotates around the center of the sphere. The disk position is the location of your directional light relative to the currently active view.
You can adjust the position of the light by grabbing the disk and rotating it to the desired position. Any interactive shading in the Modeling window updates to reflect the new position of the light.

Because the Directional Lighting Sphere represents the space around your scene, and is displayed relative to your current view, in some cases you may be looking at a Directional Light that is pointing toward you (its disk is located on the "back" of the Lighting Sphere). You can use **Command** (Mac) or **Control** (Win) while clicking on the light in the Lighting Sphere to toggle the light between front and back sides of the Lighting Sphere.
• **Color:** You can apply a color to any Directional Light by clicking the Color button and choosing a new color from the color picker. This color will also be applied to the disk and line in the Lighting Sphere to aid in identifying which light is which.
• **Gels:** You can apply a gel to a light. When you apply a gel, the pattern or image of the gel is projected onto the objects illuminated by the Directional Light.

To apply a gel, hold down the Gel button and select from the menu which appears. You can select, apply, remove, create and edit gels from this menu. For more information see **Light Gels** in this chapter.
• **Effects:** You can add special effects such as Lens Flares, Hotspots and Halos to a selected Directional Light. Lens Flares are visible on Directional Lights only when the light is facing towards the camera or rendered view window. To apply an effect, hold down the Effect button and select from the menu which appears. You can select, apply, remove, create and edit Effects from this menu. For more information about Lens Flares, see **Chapter - 11 Special Effects.** For more information about Fog, Haze and Mist effects, see **Chapter 10 - Special Texture Types.**
• **Intensity:** You can adjust the intensity of the selected Directional Light by using the slider or by entering a value directly. The slider has a range from 0 to 100% Intensity, but you can enter a value greater than 100 in the input box if you choose.
**TIP:** Design 3D also allows you to enter negative values in the Intensity field, which decreases the light intensity in areas of overlapping light. Because this is a global light that is evenly distributed in the scene, you can decrease the intensity of other lights present in your model by entering a negative intensity value for this light.
• **Cast Shadows:** Determines whether the selected Directional light casts shadows or not. These shadows will always be hard-edged due to the parallel rays of the Directional Light.
• **Make Construction:** Removes the light from software renderings. Sometimes it is helpful to make the light a Construction Object for viewing objects in the Modeling window, while using a different lighting method for rendering.
• **New Directional Light:** Use this button to add an additional light to the lighting sphere. Each light has its own Intensity, Color and other properties, but all Directional Lights are displayed within the same Lighting Sphere. You can tell which light you have selected by four small “dots” that surround the active Directional Light disk. If you change the Color of a Directional Light, its disk will reflect the new light color as well.
To select multiple Directional Lights in the Lighting Sphere at the same time, hold the **Shift** key down while clicking on each disk. When multiple Directional Lights are selected, most individual light options are disabled, and only their positions can be altered.
• **Delete Light:** The Delete Light button is used to delete the selected light. Multiple lights can be deleted at once by Shift-clicking to select them in series. Because this is done in the Environment palette, deleting Global Lights is not reversible or undo-able, nor is any modification to the Directional Lights.

Modifier keys that apply to directional light sources:
**Shift** = selects multiple light source icons.

**Command** (Mac), **Control** (Win) = toggles between the front and back hemispheres of the Lighting Sphere.
**Option** (Mac), **Alt** (Win) = copies the selected light source when dragging it to a new position. This copy retains the settings of the original light.

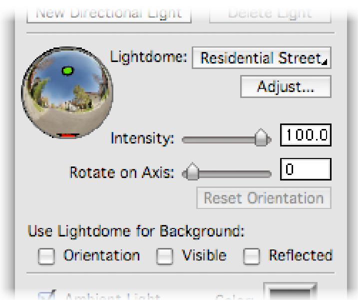
## Lightdomes

Lightdomes are best envisioned as giant spheres around your scene that have an image map, solid color, or gradient mapped onto them. The surface of this dome casts illumination inward onto your scene from all points on the dome. The intensity, color and direction of the light is effected by the composition of the Background texture assigned to the dome. However, only the illumination from this dome is visible in your scene, not the dome itself.

Lightdomes can illuminate a scene regardless of which renderer you use, but to cast shadows, the Raydiosity renderer must be used. High Dynamic Range images (HDRI) are often used as image maps in the Lightdome because of the realistic range of brightness they impart. The intensity and orientation of the Lightdome can be easily adjusted from the Lights panel of the Environment palette.

Images, colors, or gradients must be placed into a Background resource before they can be used as a Lightdome. You can create a Background from the Lightdome pop-up menu or by using the Backgrounds panel of the Resource palette. Unlike Directional Lights, you can only have one Lightdome active in the model at one time.

The controls for Lightdomes are located in the middle section of the **Lights panel** of the **Environment palette**. The Lightdome section of the Lights panel contains the following controls:



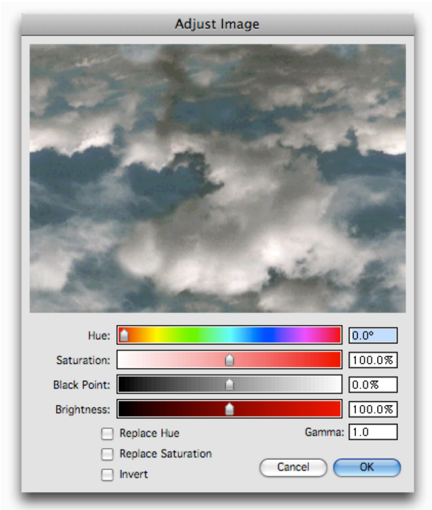

• **Lightdome Direction Sphere:** This textured sphere represents the Lightdome's orientation around your scene, and is relative to the current view. If you change the active view, the position of the Lightdome shifts on the palette to correspond with the new view.

**NOTE:** Lightdome illumination is not displayed in the Modeling window or any of the interactive (OpenGL) renderers, so any changes you make are not displayed until you create a rendering using either Raytrace or Raydiosity.

You can adjust the tilt or roll of the Lightdome by grabbing and rotating the preview sphere to the desired position. The Green and Red dots on the surface of the Sphere represent the polar directions of your Lightdome Map. Rotation is handled separately.

• **Lightdome pop-up menu:** You can add, remove, create and edit a Background for use as a Lightdome from this menu. Only one Background texture can be used for the Lightdome at any given time. The top section of the menu contains commands for creating or editing Backgrounds. The center section of the menu contains Backgrounds that are currently loaded in the active model. The bottom section of the menu contains all of the Backgrounds in your Libraries.

• **Adjust button:** Clicking this button summons the Adjust Image dialog. In this dialog you can set the image map's Hue, Saturation, Brightness, Black Point and Gamma. Adjustments you make in this dialog affect only the image as used in the Design 3D model, not the original image file.




Saturation, Brightness and Black Point can be set above 100%. This is especially useful with HDR images, which often have values that are very high.

- Hue. Color reflected from or transmitted through an object, measured by degrees as located on the standard color wheel.

- Saturation. This is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue. It is usually measured from 0% (gray) to 100% (fully saturated), although you can use higher values.
- Black Point. Use the slider or numeric field to determine which value in the image will be considered black. Every other value will become darker or lighter, depending on whether you use a positive or negative value.
- Brightness. This is the relative lightness or darkness of the color, generally measured as a percentage from 0% (black) to 100%(white), although you can use higher values.
- Gamma. Changing the gamma value allows you to compensate for differences in the presentation or perception of light intensity changes. In some situations, you may want to adjust the gamma value of images due to the way they were captured, or to pull out details in the scene. The default setting is 2.2.
- Replace Hue. Enabling this checkbox replaces all of the colors in the image with the value selected in the Hue setting.
- Replace Saturation. Normally, saturation values are scaled throughout the image. Enabling this checkbox causes the current saturation setting to replace all existing saturation values in the image.
- Invert. This checkbox inverts the image values, resulting in an image that looks like a film negative. It works by taking the existing image and subtracting the pixel values from 100%. If you have an HDR image with values above 100%, the invert function stops at zero to avoid unexpected negative light results.

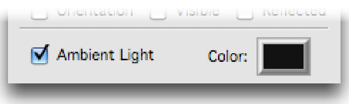
• **Intensity:** You can adjust the intensity of the Lightdome by using the slider or by entering a value directly. The slider has a range from 0 to 100% Intensity, but you can enter a value greater than 100 in the input box if you choose. Design 3D also allows you to enter a negative value in this field, which decreases the light intensity in areas of overlapping light. Because this is a global light, you can decrease the intensity of other lights present in your model by entering a negative intensity value for this light. Then, the intensity of the other lights will be uniformly decreased by this negative value.
• **Rotate on Axis:** In addition to being able to rotate the Lightdome by clicking directly on the Directional Sphere, the Rotation slider and field allow you to rotate the Background image relative to the sphere itself.
• **Reset Orientation:** This button simply resets the Lightdome to its original orientation, but retains any other changes made.
• **Use Lightdome for Background:** These three checkboxes allow you to use the selected Lightdome, including its orientation, as a visible and/or reflected background. For more information about Backgrounds, see **Chapter 12 - The Environment.**
- Orientation. This checkbox synchronizes the orientation of the Lightdome and the Background maps, even if you are using different maps. For example, if you have rotated the Lightdome map 30 degrees, the Background map will also be rotated 30 degrees.

- Visible. This places the Lightdome image into your model as a visible background. Visible backgrounds are only visible when rendered, and are placed an infinite distance away from your model.
- Reflected. This places the Lightdome image into your model as a surrounding, reflected background. This background image will appear reflected in any shiny surfaces in your model.

### Ambient Light

Ambient light is a non-directional, global general illumination that fills shaded or shadow areas of a model so that details not directly illuminated by light sources are still visible. Adding too much ambient light can make your rendering appear to be flat and lifeless, so use this feature with caution.

The Ambient controls are in the lower section of the **Lights panel** of the **Environment palette**.




The following options are available to control Ambient Light:
• **Ambient Light:** This checkbox allows you to either enable or disable Ambient light altogether, depending on your scene. By default, a small amount of Ambient light (in the form of a not-quite-black Ambient Color) is used in each new scene, so this is a quick way of simply turning it off.
• **Color:** This button summons a color picker where you can choose a color for the Ambient Light. The level of ambient light is controlled through the color picker - the brighter the color you select, the brighter the ambient lighting. The color you select for Ambient light automatically becomes the background color for the Directional Lighting Sphere.

## Local Light Sources

Unlike global lights, which are designed to illuminate the entire model, Local lights are designed to illuminate regions of the scene. There's no limit to the number of Local lights you can insert into your model.

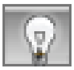
Local lights are added to a model by "drawing" them in, using the appropriate tool from the Tool palette. Unlike the drawing of 2D and 3D objects, drawing a Local light only requires a single click. When you insert the light it is placed directly onto the surface of the active grid.

Local lights can be moved and animated just like other objects, however they do not require special handles to move them. To move a Local light source just use any of the object Manipulation tools (Move, Rotate or Scale). All three tools act the same on the light - they simply move the light. Orienting a Spotlight is done with a special control and setting the size is done in the Object Properties palette (light source size is not visible from the Modeling window and is only relevant for rendering purposes).

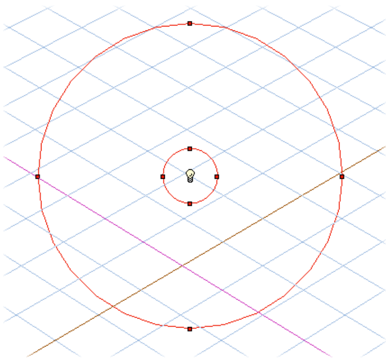
Local lights do provide special controls in the Modeling window that allow you to change the full intensity and the total area of influence for the light. Spotlights can also be moved and aimed using a window that gives you the view from the light source. There are two kinds of Local lights: **Point Lights**, and **Spotlights**.

## Point Lights

Point Lights always send illumination outward in all directions from their location in space, similar to a real-world light bulb. Point Lights can also cast shadows, utilize Gels and FX, and even have a negative intensity to “remove” light from a region.



To insert a Point Light, select the Point Light Tool (Hotkey: **Q**) and click in the Modeling window. A Point Light marker (in the shape of a **light bulb**) is placed on the active grid at the position the cursor is clicked. Light markers appear in the Modeling windows for reference, but they don’t show in the rendered image.

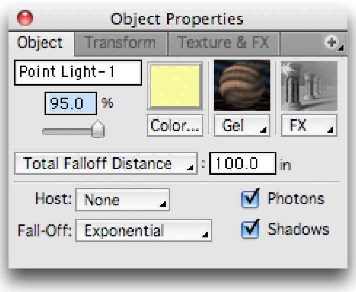


When you release the mouse button, a Point Light will be created, and a small red circle appears around it to indicate the default radius of its **Full Intensity**. The circle remains facing your active view because it actually represents a sphere of Intensity. The four handles around this circle allow you to interactively resize the Full Intensity region when they are visible. The handles become visible when you select the Point Light.

There is also a second, larger red circle to indicate the **Total Falloff Distance**, which controls the extent that the Point Light will cast any light. Sometimes this circle is well beyond the active view. In between these two circles, the Falloff type determines how much light is cast from the Point Light.

Modifier keys for moving Point Lights with the Move Tool:
**Command-Shift** (Mac), **Control-Shift** (Win) = moves the Point Light perpendicular to the active grid.
**Option** (Mac), **Alt** (Win) = copies the selected light source when dragging it to a new position. This copy retains the settings of the original light.

**Point Light Object Properties**
Once you've inserted a Point Light into your model, you can edit its parameters in the **Object panel** of the **Object Properties** palette.




• **Name**: This field contains the name of the selected light, if a name has been specified. You can add a name to this field, or change the existing name at any time.
• **Intensity**: Use the slider to adjust the quantity of light being emitted from the point light, or enter a value in the numeric entry field.
• **Color**: To specify the color of the light, click the Color button to display the color picker dialog.
• **Gels:** Gels allow you to project a pattern or image onto the surface of objects illuminated by a light.
• **FX:** You can apply a lens flare or atmospheric effect to a light. To make the light visible, apply an atmosphere to it/ Any Volumetric texture (Fog, Haze, Mist or Clouds) can be used as an atmosphere. When attached to a Point Light, the atmosphere is visible in the area illuminated by that light.

The Gel and FX pop-up menus function in the same way. They allow you to add, edit, apply or remove gels or effects from the light.

The top section lets you create new gels or effects, edit those that are already applied and remove existing gels or effects from the light.The center section contains gels or effects that are currently loaded in the active model. The lower section gives you access to all of the gels or effects in the library.

• **Settings pop-up menu**
- Total falloff distance. This numeric field defines the total distance the light travels away from the Point Light before it disappears.
- Full intensity distance. This field defines the distance of full intensity illumination for the Point Light.
- Light source radius. This setting defines the radius of the light source. This influences the degree to which soft shadows are calculated. The larger the light source, the softer the shadows appear.

• **Host**: You can attach the point light to an object in the model. This pop-up menu allows you to select from any **named** object in your model. When you move the host, the light will move with it.

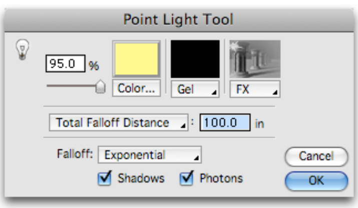
• **Fall-off**: You can specify the method used for calculating the rate of fall-off:
- Linear - light diminishes at an even rate.
- Exponential - the rate of fall-off increases with distance.

• **Photons**: Use this checkbox to enable or disable Photons for the Point Light. This only affects renderings in which photons are set to have an effect.

• **Shadows:** This checkbox determines whether or not objects illuminated by the light cast shadows.

**Point Light Tool Settings**

You can change the default settings of the Point Light Tool in the Tool Settings dialog by double-clicking on the tool icon. This way, your choices are set in advance to be those that you'll use most often. The Tool Settings dialog and the Object panel of the Object Properties palette contain many of the same fields.



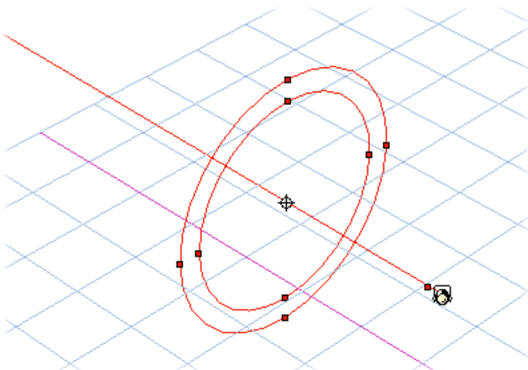
## Spotlights

Spotlights work as you would expect - they project a cone of light that illuminates a local area of the scene.

To insert a Spotlight, select the Spotlight Tool (Hotkey: **W**) and click in the Modeling window. A Spotlight marker (in the shape of a can light) is placed on the active grid at the position the cursor is clicked. Light markers appear in the Modeling windows for reference, but they don't show in the rendered image.

There are two ways to interactively place a Spotlight:
With a **single-click**, a Spotlight is created at that location with a red line projecting from it to indicate the direction of the light, as well as the **Full Intensity** and **Total Falloff Distances**. This line passes through a small black "target" with red circles around it, which indicates the default **Look At** point and the Spotlight **Cone Angle** and **Penumbra**. The Look At point can be manipulated separate from the Spotlight marker to "aim" the Spotlight wherever it goes, while the four handles around the circles allow you to interactively resize the Cone Angle (or Spread) and Penumbra regions when they are visible.

Alternately, with a **click-and-drag** the Spotlight is created with the fixed Look At point, but the Spotlight can be dragged in the workspace to select the angle that the Spotlight will aim toward the Look At point. The same red lines and circles appear to visually show the parameters of the Spotlight.



**Aiming Spotlights**
To aim the Spotlight just grab the Look At point and drag it so the Spotlight points in the desired direction. If you want the Spotlight to always point at a particular object, drag the Look At target to that object. When the target point passes over an object, the object highlights in red. If you release the mouse button while the object is highlighted in red, the Spotlight Look At point becomes

attached to the object. Then, if you move either the object or the Spotlight, the Spotlight remains pointed at the target object.

To avoid targeting any objects, select the Look At point, then hold down **Option** (Mac) or **Alt** (Win) while dragging the Look At point. As the Look At point passes over objects, the objects highlight in green, indicating that the Spotlight is aimed at the object, but not attached to it.

**Moving Spotlights**

To move the Spotlight in the Modeling window, use the Move Tool. The Spotlight always remains pointed at the Look At point. If you grab the Spotlight, the Spotlight moves, but the Look At point remains in place. If you grab the Look At point instead, the Look At point moves, but the Spotlight remains in place. However, if you grab the line connecting the Look At point and the Spotlight, both the Look At point and the Spotlight move together in unison.

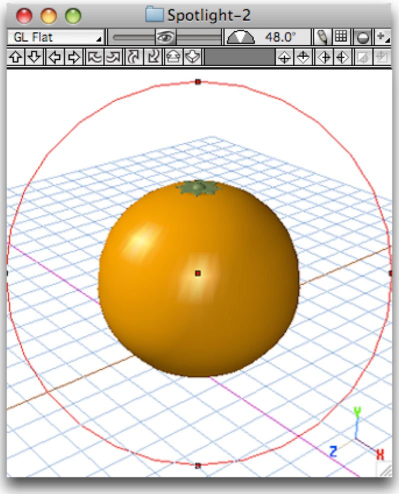
Modifier keys for moving Spotlights with the Move Tool:
**Shift** = constrains the motion of the light to 45-degree increments
**Command-Shift** (Mac), **Control-Shift** (Win) = moves the light perpendicular to the active grid.
**Option** (Mac), **Alt** (Win) = copies the selected light source when dragging it to a new position. This copy retains the settings of the original light.

**Spotlight Window**

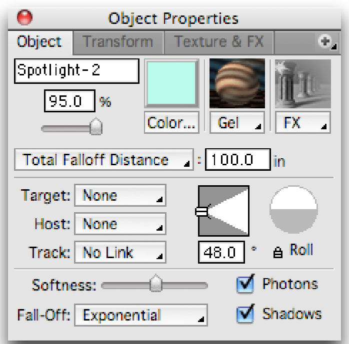
The Spotlight Window acts as a “virtual camera” inside your Spotlight that helps you accurately position and point Spotlights in your model. It actually functions very much like the standard Camera window in Design 3D. See **Chapter 13 - Cameras** for a description of the window’s movement control buttons.

To display the Spotlight Window, double-click the Spotlight marker you wish to “look through” in the Modeling window. You can also access this window by selecting the Spotlight from the **Spotlight Windows** command pop-up list in the **Windows** menu.

Controls are provided at the top of the Spotlight window to assist in precise positioning of the Spotlight. Use the **Shift** key to accelerate movement within the Spotlight window.




**Spotlight Object Properties**
Once you've inserted a Spotlight into your model, you can edit its parameters in the **Object panel** of the **Object Properties** palette.
The basic settings include the ability to **Name** the light, adjust its **Intensity**, set the **Color**, or apply a **Gel** or **FX** to the light. All of these settings are common to most light sources.




• **Settings pop-up menu**:
Total falloff distance - This numeric field defines the total distance the illumination travels away from the Spotlight before it disappears.
- Full intensity distance. This field defines the distance of full intensity illumination for the Spotlight.

- Light source radius - This setting defines the radius of the light source. This setting influences the degree to which soft shadows are calculated. The larger the light source, the softer the shadows appear.

• **Target:** You can point the Spotlight at an object in your model. This pop-up lets you select any named object. This is the same as dragging the Look At point to an object. When the target object moves, the Spotlight will point in its direction.

• **Host**: You can attach the Spotlight to an object in the model. This pop-up menu allows you to select from any named object in your model. When you move the host, the light will move with it.

• **Track**: You can select a Tracking style. This field is set to Swivel and grayed out if a Host is selected.

- Hard Link - If the target moves, the Spotlight moves as though welded to it.
- Swivel - the Spotlight swivels to follow the movement of the target object.
- Chase - The Spotlight chases a moving object.

• **Cone Angle:** This area represents the size of the cone of full illumination, in degrees. Grab the control to adjust it interactively, or enter a value in the numeric field below the cone angle preview.

• **Roll:** Rotating a Spotlight has no apparent effect unless a gel has been applied to it. You can rotate a gel by rotating the Spotlight when the Steady Spotlight feature is disabled. To disable Steady Spotlight, click the lock icon beneath the Roll control.

• **Softness:** This slider lets you set the softness of the edges around the cone of light. Move the slider to the right to soften the edges.

• **Fall-off:** You can specify the method used for calculating the rate off fall-off:

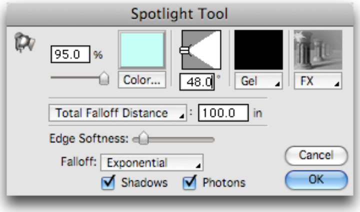
- Linear. Light diminishes at an even rate.
- Exponential. The rate of fall-off increases with distance.

• **Photons:** This checkbox can be set to have Photons on or off. This only affects renderings in which photons are set to have an effect.

• **Shadows:** This checkbox determines whether or not objects illuminated by the light cast shadows.

### Spotlight Tool Settings

You can change the default settings of the Spotlight Tool in the Tool Settings dialog by selecting the tool in the Tool palette, then double-clicking the tool icon. This way, your choices are set in advance to be those that you'll use most often. The Tool Settings dialog and the Object panel of the Object Properties palette contain many of the same fields.




## Creating Visible Light

Design 3D allows you to create a visible light effect for Local lights (Spotlights and Point Lights). This effect is similar to how street lights appear on a foggy night, for example. This effect is not available for Global lights.

To make the light from a Point or Spotlight visible, simply apply a Volumetric texture (Fog, Mist, Haze or Clouds) to the light through either the **FX** menu in the Object Properties palette of the selected light, or by **Applying** the Volumetric texture directly to the selected light from the Textures panel of the Resource palette.

You can enable the visible light to actually cast shadows within the Volumetric effect itself if you are using Fog, Mist or Haze. To enable this effect, open the editing dialog for the Volumetric texture and click on the **Enable Shadows** checkbox. Once you've enabled shadows, when an object enters the light region it will cast a streaming shadow in the volume.

## Photons

Design 3D can calculate light based on simulated photon particles to achieve highly realistic effects such as transmissive and reflective caustics. Caustics are a type of effect created when light passes through a refractive object or is reflected off of an object. An example of this is the way light is affected as it passes through a lens. With a light on one side, the lens will create a pattern of focused light on the opposite side.

**NOTE:** The caustics created by Photons and local light sources are fundamentally different from the Shadow Cast Map in the Image Texture dialog. Photons actually focus and distribute light rays, brightening up other surfaces, while a Shadow Cast Map only modifies the shadow being cast by an object.

To use photons and to create caustics you must use Spotlights and Point Lights. Directional lights, Lightdomes and glowing objects will not generate photon based caustics. You also must use a rendering setting that will utilize the photons. For information see **Chapter 19 - Rendering Methods**.

**Enabling Photons for Local lights**
To generate photons, enable the Photons checkbox in the Object Properties palette when the Spot or Point Light is selected. When using photons the Total Falloff and Full Intensity Distance settings play a major role.

**Total Fall-off**
When using photons with your light source, Total Falloff Distance is very important. The photon is given sufficient power to provide a minimal level of illumination with the assumption that light intensity drops off as the inverse square of the distance traveled. Setting a short distance will result in low power photons, while setting a very high distance will result in very high power photons. These photons should result in illumination levels similar to that of normal surface lighting given the same conditions. The default Falloff Distance for Point and Spotlights should be sufficient when beginning to work with photon effects.

**Full Intensity Distance**
The Full Intensity Distance is the distance at which the full brightness of light will be maintained before the light begins to fall off. In the real world light immediately begins to fall off. With this in mind, you might choose to set Full Intensity Distance to a very small value and increase the fall off distance to a very large value for a more realistic effect. The default Intensity Distance for Point and Spotlights should be sufficient when beginning to work with photon effects.

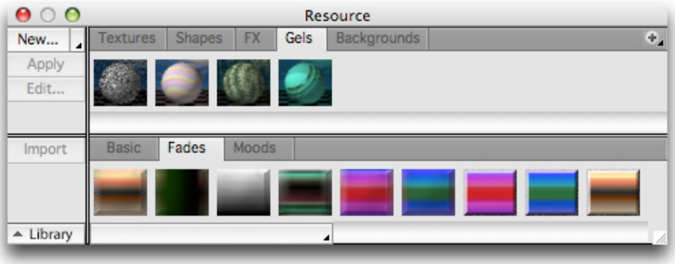
**Caustics Settings**
The Caustics effects are controlled in the Render Image dialog. There are several Photon Rendering Presets available in the Rendering Dialog. In addition, there are Caustics Photons settings available in the Lighting section of the dialog. To access the Render Image dialog, select Rendering Menu > Render Image Dialog.

For more information see **Chapter 19 -The Render Image Dialog**.

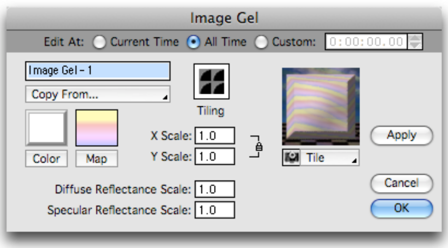
## Light Gels

Gels are special textures which are applied to light sources. When gels are applied, the light source projects the pattern or image present in the gel onto the objects the light source is illuminating.

Click on the **Gels panel** in the **Resources** palette to make it the active panel. When this panel is active, you can make new gels or edit existing ones. All of the currently loaded gels appear in the upper portion on the Gels panel. Several built-in gels are included with Design 3D, and are stored in the Gels folder of the **Resource Library.** All gels contained in this folder are available for use in your model.




**Creating Gels**
To create a new gel, click the **New** button while the **Gels panel** of the **Resource palette** is active. The Image Gel dialog is displayed.




This dialog is similar to many surface texture dialogs and includes settings for the Name, Color, Animation controls, and a Preview window. The Image Gel also includes a Map function to load the image, and Tiling and Scaling parameters so that the Map is positioned the way you desire.

**Editing Gels**
You can edit any of the gels in the Resource palette. With the Gels panel active, click the **Edit** button to edit the selected gel. If the gel is not already loaded in the active model, it will load, and the appropriate Gel dialog appears. It is a good idea to change the name of any gel that you edit. Then you can use both the original and the edited versions of the gel in your model. Once you edit the gel, it becomes part of the current model.

You can also edit any gel so it appears to change over time. Specify the time at which the changes occur by entering a time in the Edit At field in the Animation controls at the top of the dialog. But remember that any changes you make to a gel occur on **all** of the lights to which that particular gel is applied.

#### Applying Gels

For Spotlights or Point Lights: Gels can be applied from the Object Properties palette of the selected Spotlight or Point Light.

For Global lights: Apply Gels to global lights from the Lights panel of the Environment palette.

#### Saving Gels

When you create a new gel, it becomes part of, and is saved with, the model. However, if you want to be able to access the gel to use in other models, you must save it to disk. A **Save** command is provided in the Plus menu.

#### Importing Gels

To import a gel from the library into the active model, select the gel in the Gels library, then click the **Import** button.

## Light-specific Render Settings

Design 3D allows you to override the global render settings for objects and local lights. You can make render settings for objects, Point Lights and Spotlights that are different from those you make in the Render Image dialog. Using these per-object and per-light render options "forces" new settings which override those made in the Render Image dialog.

While the rest of the model or animation will render according to the Render Image dialog settings, the specific light will render with its own settings. This can be very useful when trying to optimize render speed vs. image quality. Consider using these overrides when you encounter a scene that has problem objects, illumination, or shadows in an otherwise acceptable render.

You can make light-specific render settings for local lights using the Project window. This allows you to individually control how light from a particular Point Light or Spotlight is rendered.

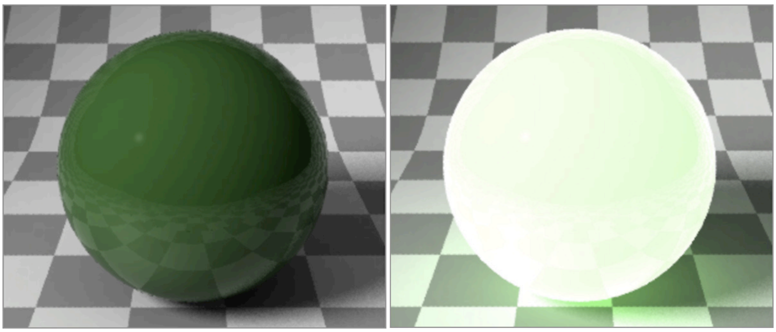
This is useful because settings made in the Render Image dialog apply to all lights in your model or scene. With the per-light settings, you can individually control the way light from a particular source is rendered.

For more information about making forcing render settings for individual Point and Spotlights, see **Chapter 20 - Special Renderers**.

## Glowing Surfaces

Design 3D allows you to use virtually any object in the scene as a light source by applying a texture with a high **Glow Factor** amount to the surface and rendering at the appropriate level. Glowing surfaces can be used to create neon sign effects, floor lights, etc. This type of lighting can take more time to render, but the results can be worth the effort.

The Glow Factor channel in the Image Texture dialog allows you to enter a percentage to set how bright the surface will appear. A setting of zero means the object will be normal; it will not emit any light. Although the setting is a percentage, you can set it as high as is needed, depending on how far you want the illumination to travel and how bright you want the texture to appear.



No Glow Factor    Glow Factor = 500%

The Image Texture provides a Glow map option to use a grayscale image in addition to the Glow Factor. In this case, the levels of gray in each pixel attenuate the brightness set in the Glow field, between Black (no Glow) and White (full Glow). No amount in the Glow field will make a black pixel in a Glow Map emit light.

## Creating Soft Shadows

Using the **Raydiosity** renderer, or one of the Soft Shadow rendering presets, you can create soft shadows in your images. To create soft shadows you need a light source that provides a diffused point of origin. A small Light Source Radius or physical size creates a harder shadow. (Think of the different shadows cast by a fluorescent light and a camera flash.)

You can create these types of soft, diffused light sources using several methods:
• **Bounced light:** The Raydiosity renderer can actually calculate light bouncing from one object to another. This effectively creates a diffused light source.
• **Lightdome:** A Lightdome will typically provide a very soft and diffused source of light, depending on the image used in the Background applied to the Lightdome.
• **Local lights:** Local lights have a special control specifically designed to determine the size of the light source. Use the Light Source Radius field on the Object Properties palette to set the size. The larger the radius of the light source, the softer the shadows. Make sure you also enable the **Shadows** checkbox to create soft shadows.
• **Glowing objects:** In the Image Texture dialog, you can use the Glow Factor channel to cause the surface of an object to emit light. When using the Raydiosity renderer, glowing objects will act as diffused light sources which will cast very soft shadows.

**TIP:** Shadows created by Directional lights themselves will never be soft. This is because rays of light from a Directional light are always parallel, and so the shadows cast by the objects it illuminates have sharp edges where the parallel rays uniformly trace an object's edge. If you're using Local lights to achieve soft shadows, you may want to decrease or eliminate any Directional lights and also set the Ambient light to black.

### Soft Shadow Rendering Presets

There are also presets in the Load Saved Settings pop-up list for making your soft shadows visible with the least amount of rendering time. There are various quality levels, and tuned presets for scenes with Global Lights or Local Lights casting the soft shadows.

## Adjusting Lighting With Debug

Design 3D provides a technique to help you determine if you have over-illuminated your scene. This technique, called **Debug** light handling, places a special debug-color wherever the light exceeds 100% of intensity.

To use this feature, initiate a rendering by using the Rendering Tool while holding down the **Shift** key, or by choosing the **Render Image** command from the **Rendering** menu. This way you will see the **Render Image dialog** before any rendering begins.

In the Render Image dialog, you can select a Light Overflow Handling method and a Debug color. When you render your image, it will display any over-illuminated areas with the Debug color. You can then use this information to adjust one or more lights in your scene to vary the lighting.

For more information see **Light Overflow Handling** in **Chapter 18 - The Render Image Dialog.**

# Adding Animation

In Strata Design 3D CX virtually anything can be animated, including lights, textures, the environment, and of course any objects in your scene. Normally, we think of animation as the motion of an object, but animation can be anything that changes over time. This includes the shape of an object, its texture, scale, rotation, or even the lights, camera and environment of a scene.

There are also specialized tools for animating objects, including Deform, Jiggle, and Edit mode. You can animate objects relative to each other by using Joints or Bones, or by targeting lights and cameras in your scene.

Animation in Design 3D is keyframe animation. This means that you set attributes of each element of your scene at chosen points in time, or frames. When an attribute changes from one frame to another that is many frames away, Design 3D will create the values of those attributes in the intermediate frames. This way, you only have to specify the "key" frames in your scene, and all of the other frames are handled for you. It is much faster and easier to animate things this way, and typically this results in smooth changes.

The key to adding animation to your scene is using the **Project window**. By default, the Project window is set to time zero with an animation length of zero. This means that any changes you make to objects, lights, cameras, textures, etc. will not animate.

**To animate any of these properties** you must create an animation length and move the time marker to a new point in time. After you've moved the time pointer you can edit these parameters and they will automatically animate.

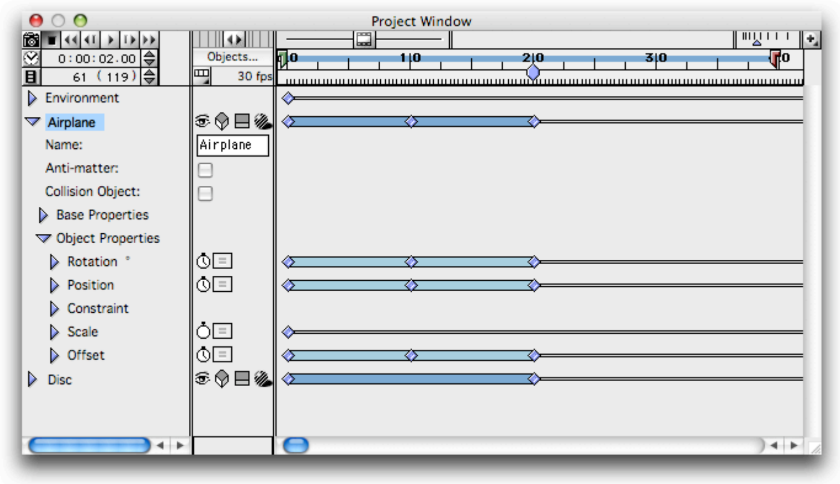
**NOTE:** If you use this method and keyframes are not being generated in the Project window, make sure that the Disable Automatic Keyframing checkbox in the General panel of the Preferences dialog is **disabled**.

## The Project Window

The Project window provides animation controls: Timelines, Event Markers, controls to play or preview your animation, etc. It also contains a hierarchical list of all of your objects and all of their attributes. All of the attributes can be controlled here, as well as elsewhere in the software. You can do many of the same things in the Project window that can be done in the Modeling window, often with greater precision.

You can edit, select, position and scale objects, control animations, etc. Most importantly, there are a few controls in the Project window that are located nowhere else.

The Project window is also another way to **filter data** in a large project: only information about the active window is shown. If a Shape window is active, the Project window contains only information about the contents of that Shape window. If the Modeling window is active, the contents of that window are reflected in the Project window.




## Opening the Project Window

The **Show Project Window** command is available from the **Windows** menu, or you can press the "**P**" hotkey while in the main Modeling window. Alternately, the Project window can be hidden or shown using the Palette Management icons at the right side of the Button Bar. If the Project window was visible when you quit the application after the last session, it will be visible when a model is opened in the current session. If it was hidden when you quit last time, it will be hidden on start up this time.

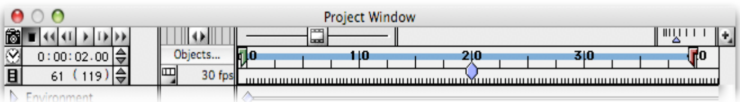
Only one Project window is displayed at a time, even if you have more than one model open. However, when you change the active model, the Project window redraws to reflect the current model.

## Project Window Controls

All of the controls you need to create an animation are located in the Project window. This includes animating nearly every element of a scene. The window itself contains the standard controls found on all desktop windows, including a title bar, close box, resize control, scroll bars, etc., but it can also be made to "float" permanently above all other windows by using the Float command in the Project window Plus menu.

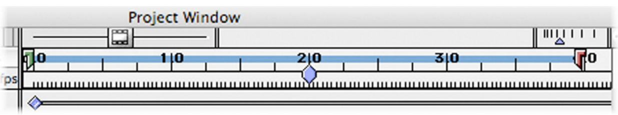
You can size and position the Project window any way you like, and even collapse the palette partially or fully, depending on your needs. There are two separate scroll bars at the bottom of the window, and you can scroll horizontally through each section separately. You can also change the size of the three sections, by grabbing and dragging the divider bars. This can give you more room to work. For example, if you need to open all the levels in the Object properties list, you can make that section longer.

The upper section of the window contains controls for creating and previewing your animations.




**Rendering Button**
The Rendering Tool icon lets you render your animation directly from the Project window. When you click this button, the Render Image dialog appears. This is the same as selecting the Render Image command from the Rendering menu.

**Timeline Controls**
Timeline controls allow you to move around in your animation, or preview any part of the animation. When you click one of these buttons, the Current Time pointer repositions itself to the location indicated by the button. Some of these navigation tools are outlined below.

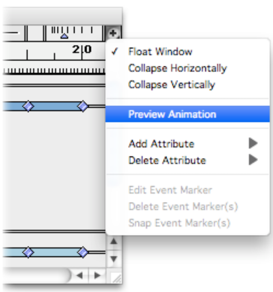



• **Jog shuttle:** this moves the animation forward or backward from your current position.
• **Animation slider:** this allows you to move to a specific position relative to the Cut-in and Cut-out points.
•**Cut-in point:** The Cut-in point is green and marks the position on the timeline where you want the rendered animation to begin. There can be animation occurring before this point, but portions of the animation that occur before the Cut-in point do not render.

• **Cut-out point:** Like the Cut-in point, this point marks the position on the timeline where you want the rendered animation to end. There can be animation after the cut-out point, but any part of the animation that occurs after the Cut-out point does not render. The Cut-out point is red.
•**Current Time:** The Current Time pointer marks the position of the current time. Notice that the Modeling window also updates to display the model as it appears at this point in time. Drag the pointer to the desired position with the cursor or adjust it with the Timeline controls.
• **Current frame:** This displays the frame number at the position of the current time marker. There are several ways to move to a different frame:
- Use the Timeline control buttons to move forward or back any number of frames.
- Manually drag the Current Time pointer to another frame.
- Enter the number of the frame you want to move to in the Current Frame field.
- Hold down the **Command** key (Mac) or **Control** key (Win) and click on a timeline. The Current Time pointer moves to the position where you click.
- Use the spinner controls to move forward or backwards to other frames.

## Plus Menu

The Plus menu contains commands that apply specifically to the Project window. This includes the ability to Collapse the window in various ways, preview any animation, add and manage attributes and Event Markers, and control how the window is displayed.

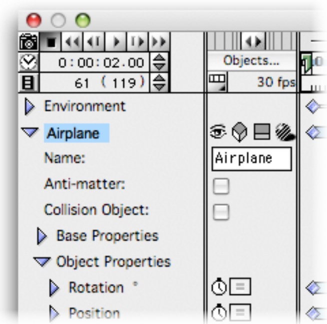



• **Float Window:** This command makes the Project window float above the Modeling window, even when the Modeling window is the active window. The Project window also floats above the palettes when it's the active window.
• **Add Attribute:** This command allows you to add an additional attribute to the selected object in the Project window. Select an attribute from the command's pop-up menu.

- Complexity. This option allows you to add a complexity field and absolute checkbox to objects that do not have them. This is useful for Bézier-based objects such as extrude and lathe objects.
- Cycle. This option allows you to repeat an animation sequence or instantaneously jump forward in time.
- Life. This option adds a Life attribute to the object. It appears in the Project window hierarchy, under Object Properties of the selected object. You can then specify whether or not the object exists at that moment in time on the animation timeline.
- Lighting Control Attribute. This allows you to make renderings settings for a Point Light or Spotlight which override the settings made in the Render Image dialog. For more information see **Chapter 20 - Special Renderers**.
- Surface Control Attribute. This attribute allows you to make render settings for an object which override the settings made in the Render Image dialog. For more information see **Chapter 20 - Special Renderers**.
- URL. This option adds a URL address field to the selected object in the Project window. The address appears as a property of the object in the Project window.
• **Delete Attribute:** To delete an existing attribute of any of the above types from the selected object, select it from this command's submenu.
• **Edit Event Marker:** This command lets you precisely position the selected marker on the timeline. If the marker also represents an object's motion, it allows you to control the motion on the animation path.

## Objects & Properties

The first two sections on the left side of the Project window contain a list of all the objects in your model, as well as editable fields that allow you to change any of these objects' properties. When you select an object in the Modeling window, it automatically becomes selected in the Project window, and vice versa. Also, the Object list will automatically scroll to display the selected object.



## Object List

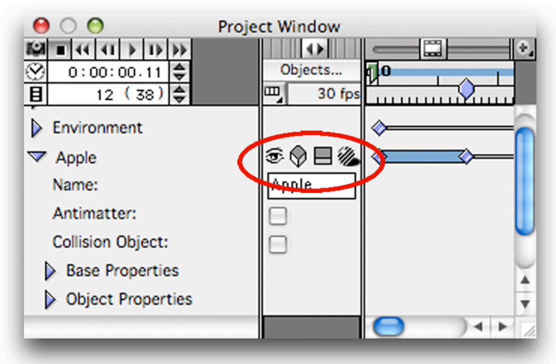
All of the objects in your model appear in this hierarchical list, including cameras and light sources. You can select objects in your model from this section of the Project window. When you select an object here, it becomes selected in the Modeling window, and vice versa. To select multiple objects, hold down the Shift key as you click the objects.

**Edit Fields**

Any of the data in the entry fields can be edited. You can also change the status of any of the checkboxes in the Project window. These changes will effect your object at the current point in the timeline, and some can be animated by keyframing the values over time.

**Object State Icons**

These icons appear in the middle section of the Project window, directly across from each object. They allow you to control the way the object is displayed in either the Modeling window or in the rendered image.

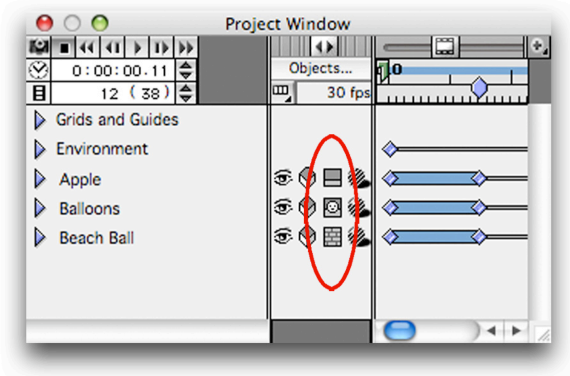



**The Object State Icons, From Left to Right, :**

• **Hide/Show** (eye) icon is used to hide or show the object in BOTH the Modeling window and the rendering. Click the eye icon to toggle between states.

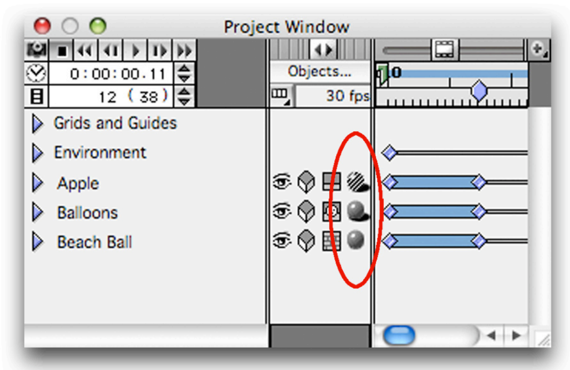
• **Display method** icon determines how the object appears in the Modeling window: either normally (based on the selected Display method) or as a wireframe bounding box. Displaying an object as a bounding box speeds up screen redraws in the Modeling window.

• **Shy/construction** icon determines whether or not the object appears in the Modeling window and/or in the rendering. Each time you click the icon, it cycles through the three states.




- Normal - the split gray icon. Objects appear in the Modeling window and in renderings.
- Shy - the small face icon. Objects do not appear in the Modeling window, but do appear in renderings. This is useful with models that contain many objects, and speeds up screen redraws.
- Construction - the brick wall icon. Objects appear in the Modeling window, but do not render. Construction objects can be used as targets or hosts for lights or cameras, for example.

• **Shadow** icon determines whether or not the object renders with shadows. The Force Shadows and Suppress Shadows icons override any other settings. The Shadow icon has three states:




- Normal. Shadows are processed normally during rendering. Whether or not shadows are cast depends on the settings of the lights in your scene.
- Force Shadows. Shadows are cast by the object regardless of other settings in your model.

- Suppress Shadows. The object will not cast shadows, regardless of any other settings.

## Object Information

A right arrow (triangle) next to the object name (or object type, if unnamed) indicates that more information is available. Click the triangle to open it; information about the object is displayed.

#### Naming an Object

If the object has not been named, its object type appears in the Object list. If it has been named, it appears in the Object list by that name. You can add a name or change the existing name in the Project window or the Object Properties palette. This includes shapes, groups, cameras, lights, etc.

#### Anti-Matter

Anti-matter checkbox lets you perform a Boolean rendering when using either the Raytracer or the Raydiosity renderers.
A Boolean rendering is not the same as an actual Boolean operation. When performing a Boolean rendering, Design 3D does not create the geometry which accompanies Boolean operations; it only calculates which portions of the object appear when rendered.

**NOTE:** To use this feature, the anti-matter object MUST be created as a one-sided object. Otherwise, the anti-matter object won't affect any other object, and it will not render.

#### Collision Detection of Particles

This feature enables the object to detect particles such as those generated by a Fountain effect. Then, whenever a particle encounters this object, the particle bounces off its surface. If this box is not checked, particles pass through the object.

#### Base Properties

Items appearing in this list include properties specific to the object type such as One-sided, End caps, or Filled checkboxes, Corner radius or Inner Radius (2D objects), Radius of Influence (Metaballs), etc.

**NOTE:** It is important to note that if the Base Properties of a group or shape is "open" (turned down), the individual components of the group or shape can be individually selected and manipulated. This can be an extremely useful feature and makes editing much easier, without the necessity of ungrouping first. But be sure to close the Base Properties when you're finished editing, or you may end up editing the components of the group unintentionally.

#### Object Properties

You can also edit any of the Object Properties of an object. These include attributes such as: Scale, Rotation, Position, Offset, Link nodes, Cycle attributes, Complexity, etc. The Object Properties list for an object includes all of the editable properties of an object, although most of the properties can be controlled through other windows, dialogs and palettes.

## Automatic Keyframing

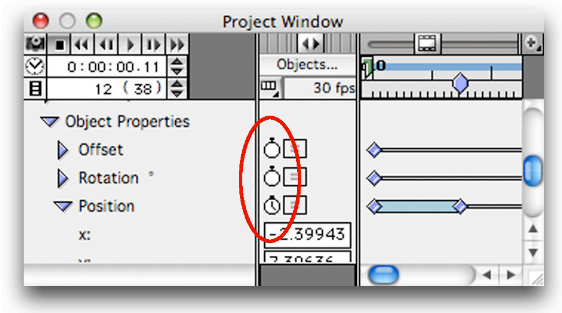
Automatic keyframing is a Design 3D preference to automatically add a keyframe whenever you edit any object attribute at different places in time. This also adds a keyframe at the zero point for each element, so the effect is that Design 3D will add a keyframe at the new time and transition the attribute between the zero point and the new time whenever you edit an attribute. When you move the time slider to a new point, any edits you make at that location will also be keyframed into all channels.

**NOTE:** Automatic keyframing can save a lot of time when animating a scene, however it can also create some confusion if you have some scene elements that you do not wish to animate and you change attributes on these elements at a time other than the zero point. Therefore this Preference is set to Disabled by default, which is the way previous versions of Design 3D traditionally functioned.

You can turn Automatic Keyframing on from the default by going to the **General panel** of the **Preferences** dialog and unchecking the **Disable Automatic Keyframing** option. You can also use the **Scripting Menu** command to quickly toggle this setting on or off.

## The Stopwatch

The Stopwatch icon next to the object properties entries controls whether keyframing is active for that particular attribute or not. Related to the global Automatic Keyframing preference, this turns Automatic Keyframing on for each particular animatable attribute or channel.




Click on the Stopwatch icon to toggle it **on** (it will display "hands" on the otherwise blank watch face). After this, each edit you make to the object at a new point in time will automatically be keyframed. Any existing keyframes will be overwritten by new edits at the same time as well.

Click on the Stopwatch again to toggle it **off** (displaying a blank face). When you do this to an animated attribute, **all keyframes** for that attribute **will be deleted** from the scene! A warning dialog will ask you if this is what you want to do. This effects scenes with global or local Automatic Keyframing equally.

**NOTE:** This is an easy way to "clear" animation keyframes from an individual attribute of any object regardless of how the keyframe were created, but this can also cause confusion if you do not understand that this is fundamentally different from simply turning off automatic keyframing.

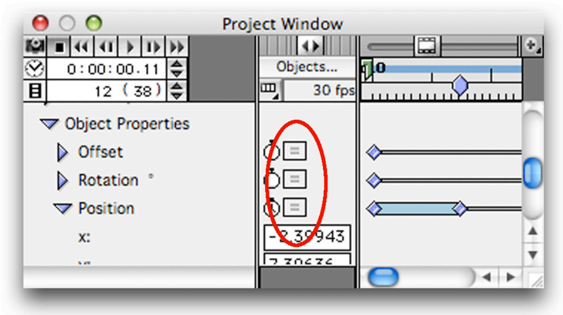
## Script Editor

With the Lua scripting environment in Design 3D, animations and object attributes can be handled in more complex ways than simply keyframing changes over time. Attaching scripts directly to each attribute can be done with each attribute's **Script Editor**.

More information about Lua in general can be found at the Lua website (www.lua.org), and more information specific to Lua in Design 3D can be found at the Strata website (www.strata.com) and the Stratacafe (www.stratacafe.com).

See **Scripting Documentation** in the **Help menu** for additional Lua scripting information.

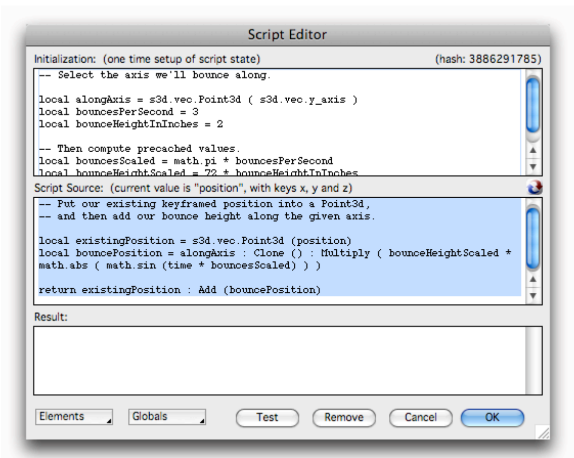
The Script Editor window for each object attribute can be opened by pressing the Editor button next to the Stopwatch.




**Script Editor Dialog**

When you press the Script Editor button in the Project window, the scripting evaluation for that attribute is turned on, and a Script Editor dialog is opened up that is linked to that particular attribute.

The Script Editor window for each attribute is basically text editing fields with built in testing and applicable values. There are two, large, scrollable text-entry areas and a large feedback area at the bottom. The text-entry areas function as a text editor window for your scripts, and if you run out of visual space while typing or examining, you can resize the entire Script Editor dialog to expand the middle space.




• **Initialization:** This is a text-entry area for writing and establishing an initialization script. This can include local values, functions, and even calls to external scripts that are needed for your main script to function properly. This is also a good place to compute anything that doesn't change after the script is parsed.

• **Script Source:** This is the text-entry area for writing your script. This source should follow a logical progression for a script that amffects the object it is attached to in the scene. The suggested parameters, defining each phase of the evaluation and function, are Context, Prepare, Final, and Cleanup. Press the Enter key on the numeric keypad to Evaluate your script.

• **Swap button:** The small button with the red and blue arrows, located on the right side of the Script Editor dialog, switches the location of the Initialization and Script Source editor windows. This is useful because only the lower of the two windows will resize with the full dialog, so it can be used to examine larger amounts of script at once.

• **Result:** This is the error reporting area of the Script Editor dialog. When you click the Test button or press the Enter key on the numeric keypad to Evaluate your script, either a "Success" report, or information on errors in the script will be presented here.

• **Elements:** A drop-down menu of pre-made or preloaded script "chunks." These can either be a few lines of script, or an entire function, but they can be quickly inserted into your script wherever your text cursor is, by selecting the Script Element from this menu.

• **Globals:** A drop-down menu of many of the Lua Globals available as prepared text strings, with arguments and elements highlighted after insertion into your script.

• **Test:** This button is the same as pressing the Enter key on the numeric keyboard. It evaluates the script for syntax and function and writes any errors to the Result field.

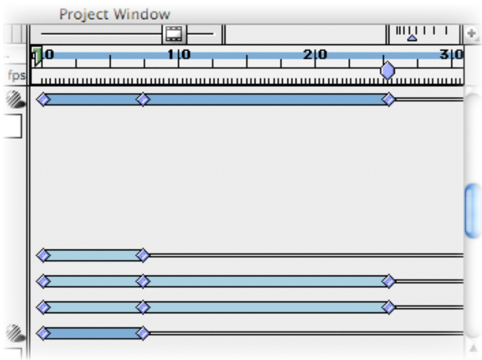
• **Remove:** Press this button to clear all of the scripts contained in this Editor window and reset the scripting evaluation for that attribute. This is different from Cancel because it erases all scripting.

## Animation & Timelines

Remember, the Project window is divided into three parts. The Timeline section of the Project window, on the right side, is used for defining animations. Animations are simply actions that are set to take place over time.

### The Timeline

Animation Timeline represents any animation that is associated with the object. If any of the properties of an object are capable of changing over time, an associated timeline appears next to the property name in the Animation section of the window. The timeline can be different shades of blue to indicate its animated states, and can represent far more than a single attribute animation.




Event markers (shown as small diamonds on the colored timelines) are used to define the changes in the values of object attributes in a model. They are created as elements in your scene are positioned, rotated, scaled, or edited when you either explicitly set a keyframe for those changes or with automatic keyframing.

## Working with Event Markers

Design 3D uses "keyframes" for generating a series of frames to make an animation. An Event Marker is a visual representation of the keyframed value along the timeline Then, based on the spacing of the Event Markers and the number of frames per second, Design 3D calculates how each in-between frame should render to achieve a fluid motion. Calculating the in-between frames is called "tweening." The more frames per second, the smoother the animation, but the longer it takes to render.

### Creating Event Markers

You can control an object's position, size, texture, etc. at different times during the animation sequence by adjusting the position of the Current Time pointer in the Project window, then changing the object's position, scale, texture, etc., in either the Modeling window or the Project window, as desired. An Event Marker appears on the timeline, indicating that a change has taken place.
At least two Event Markers at different points along the timeline are required for animation. There is no limit to the number of Event Markers you may use, as long as there is sufficient memory available.

### Adding Event Markers

You can add a new Event Marker by simply Option-clicking (Mac) or Alt-clicking (Win) the position on the specific timeline where you want an Event Marker placed.

For example, if you want to ensure that the object maintains its position at the current time, hold down the Option key (Mac) or Alt key (Win), then click on the Position timeline. An Event Marker is placed at the exact location on the Position timeline where you click, marking the object's current position.
This feature allows you to generate an "anchor" Event Marker, allowing the object to make a sudden change later in time. Anchor-type Event Markers are used to keep later Event Markers from causing the object to change before you want it to.

**Selecting Event Markers**
Event markers are selected by clicking them. Selected Event Markers appear with a red dot in them. You can select multiple Event Markers by holding down the Shift key while clicking each marker icon. However, multiple selections must be from only one timeline.

When you select an Event Marker, it does not automatically move the Current Time pointer to that position on the timeline. If you hold down the **Command** key (Mac) or the **Control** key (Win) while clicking an Event Marker, the time pointer moves to that position, and all modeling views redraw to show the model at that point in time.

**Deleting Event Markers**
To delete an Event Marker, select it, then select the Delete Event Marker from the Plus menu on the Project window. You can also delete a selected marker with the Backspace key.

**NOTE:** Do **not** press the Delete key to delete an Event Marker. This will result in the deletion of your selected object. Make sure it is the backspace key (labeled as delete on many Macs) that you are pressing.

**Adjusting the Spacing Between Event Markers**
You can proportionally increase or decrease the spacing between Event Markers. Just select the Event Markers you want to adjust, then hold down the **Control and Option key** (Mac), or the **Alt key and RMB** (right mouse button) (Win) and drag any of the selected markers. All of the selected Event Markers maintain their relative distances between each other as they are spread out or compressed along the timeline.

**Editing Event Markers**
You can grab an Event Marker on the timeline in the Project window and drag it to a new position anywhere along its timeline. Or, you can change its position in the Event Options dialog.

**Modifier Keys**
Modifier keys that apply to Event Markers on the timeline:
**Option-click** (Mac), **Alt-click** (Win) = on a timeline in the Project window adds a new Event Marker at the exact position on the timeline where the click occurs.
**Shift** = extends the selection of Event Markers on the timeline. Multiple Event Markers may be selected at one time for copying, deleting or moving in unison.
**Command** (Mac), **Control** (Win) = moves the time pointer to the position of the Event Marker when you click to select it.
**Option** (Mac), **Alt** (Win) = leaves original Event Marker in the original location and creates a copy of that Event Marker as you drag it to a new location.

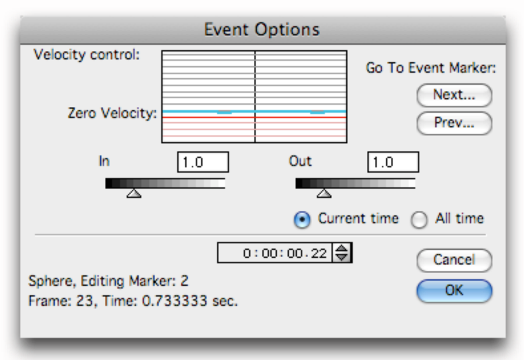
## The Event Options Dialog

You can move an Event Marker to a precise position on the timeline in the Event Options dialog. **Double-click** the Event Marker on the timeline, or select the Event Marker, then select the **Edit Event Marker** command from the Plus menu of the Project window. This opens the Event Options dialog and allows you to move the Event Marker, along with all its associated data, to any location on the timeline. Enter the time in the entry field, or use the arrows to scroll to the time where you want the Event Marker placed.

**Velocity Control**
If an Event Marker represents the motion of an object, the Event Options dialog also allows you to control the velocity of the object as it approaches and leaves each Event Marker. This is graphically displayed in the Event Options dialog as a Velocity graph for that particular Event Marker.

The blue line in the graph represents the velocity of the object as it approaches and leaves the Event Marker. An object's velocity doesn't change the path of the object in any manner, but only the speed that the object travels along the path.

The vertical line in the center of the window represents the current Event Marker. The left side of the window represents the OUT velocity of the previous Event Marker, and the right side represents the IN velocity of the next Event Marker.



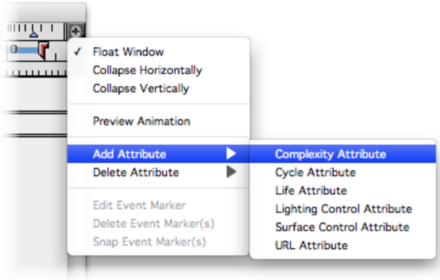

The values you specify for the IN and OUT velocities define the blue line that runs across the width of the graph. You can use the sliders to select a value for the velocity, or you can enter larger values than those allowed by the sliders, if necessary, directly in the fields above the sliders.

**Negative Velocity**
Any portion of the line falling below zero velocity represents a negative velocity. A negative velocity on the Position timeline causes the object to actually reverse directions and travel backwards. A negative velocity on the Rotation timeline causes the object to rotate in the opposite direction.

Next and Previous buttons are also provided so you can continue to select and edit adjoining markers without leaving this dialog. Click the Current Time button to set the velocity of the current Event Marker only, or the All Time button to assign all Event Markers on this timeline the same IN and OUT velocity.

## Adding and Deleting Attributes

An Add Attribute command is provided in the **Plus menu** of the **Project window** that allows you to add various attributes to the selected object. Below this in the Plus menu are commands for deleting and managing attributes as well.




**Complexity**
This option allows you to add a complexity field and absolute checkbox to an object. This is useful for Bézier-based objects such as Extrude, Lathe, Bézier surface, etc. However, this does not effect the complexity of Subdivision polygonal objects.

To remove a Complexity attribute, select the object, then select **Complexity Attribute** from the **Delete Attribute** command in the Plus menu in the Project window.

**Life**
If you add an object to a model while the Current Time pointer is at a position other than zero on the timeline, that object is assumed to have existed in that same position from time zero. This is the default for each object. However, you can designate whether or not it exists at any point in time by adding a Life attribute to the object.

**NOTE:** The Life checkbox does not automatically appear as a property of an object unless you specifically add this attribute. To add a Life attribute to the selected object, select Add Attribute > Life Attribute command in the Plus menu. An entry is added to the Object Properties in the Project window.

**Lighting Control Attribute**
This attribute allows you to individually control how light from a particular Point Light or Spotlight is rendered. This is useful because settings made in the Render Image dialog apply to all lights in your model or scene. With the per-light settings, you can individually control the way light from a particular source is rendered.
For more information see **Chapter 20 - Special Renderers.**

**Surface Control Attribute**
This attribute allows you to make per-object render settings for a particular object or group which will **override** the render settings for the whole scene, which are made in the Render Image dialog.

This can be very useful in situations in which you have many objects in a model or scene. You may need certain objects to render with a lot of detail and precision, while other objects in your scene may be in the background, or simply need less detail and thus different render settings.
For more information see **Chapter 20 - Special Renderers.**

**URL Address**
This option adds a URL address field to the selected object. An Address field appears in the Project window in the hierarchy as a property of the selected object.

To remove the URL address from an object, then select **URL Attribute** from the **Delete Attribute** command in the Plus menu in the Project window.

**Cycle**
The Cycle attribute gives you the ability to repeat, or cycle, specified animation sequences over and over again. An object can repeat its motion a single time, or it can cycle endlessly through the entire animation. When you select this command, a cycle entry appears in the Project window below the Object Properties of the selected object.

You can specify the number of times to repeat an animation sequence in the entry field provided. Enter any value from zero to INF (infinity). A value of zero ignores the cycle attribute altogether. You can grab the basepoint or cycle-back marker and position it where desired. The region between the basepoint marker and the cycle-back marker is the region of the animation sequence that is repeated.

To remove cycle attributes from an object's animation sequence, select the object, then select **Cycle Attribute** from the **Delete Attribute** command in the Plus menu in the Project window.

## Working With Animation Paths

As you animate an object by moving it from one location to another at different points in time, an animation path appears in the Modeling window. (You must have the **Show Animation Paths** command in the **Selection** menu enabled in order for animation paths to show.) This path represents the Position of the object at different points in time.

Each time you move the object, an Event Marker is placed at the current time on the timeline in the Project window, and a control point appears along the path in the Modeling window.

Blue knots between the Event Markers represent frames. For example, if the frame rate is set at 15 frames per second, and the Event Markers are placed at precisely one-second intervals, then 15 knots are placed along the path between each Event Marker. The distance between these knots indicates the distance the object travels between frames.

You can move the Event Markers along the timeline in the Project window to change the object's pacing or its sequence in the animation. Just grab the marker on the timeline in the Project window and slide it to position it anywhere along its timeline.

The object's velocity is determined by the distance it travels during a specific period of time. (Velocity = distance/time.) So the greater the distance between markers (the more distance the object travels), the higher the velocity of the object. The closer together the Event Markers, the slower the speed of the object.

## Animation Path Types

You can specify what type of path you want your objects to follow. Design 3D offers five different types of paths to choose from: Bézier, TCB, Natural, Linear, or Spline.

You can change the path type of any object on the **Transform panel** of the **Object Properties** palette. Each of these path types has different characteristics which effect your animation along that path, and how the points on the path effect the motion. You can also convert the animation path to another type in the Project window under the object's Position entry.

## Animation Path Commands

Design 3D provides a series of commands to assist you in managing animation paths, aligning objects to paths and turning a path into a Bézier curve.

**Hide Animation Paths**
Macintosh: **Command-9**
Windows: **Control-9**

Use this command to hide all animation paths in the Modeling window. If this command is enabled, the path will be hidden, and it may not be apparent that you moved the object, so pay special attention to the position of the Current Time pointer when you move objects.

**Show Animation Paths**
Macintosh: **Command-0**
Windows: **Control-0**
Selecting this command displays the animation path of the object selected in the Modeling window, if that object has an animation path.

## Align to Path

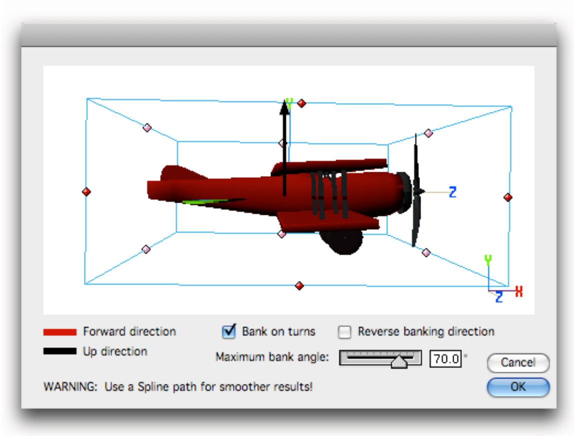
Select the **Align to Path** command from the Modeling menu or the Modeling Commands palette to align an object to any animation path that it may be associated with, either currently or at any time in the future.

To use this command, you must have an object selected in the Modeling window. When you select the Align to Path command from the Modeling menu, the **Align to Path dialog** appears, displaying a representation of the selected object with controls to orient it relative to its animation path.

Two directional pointers, one indicating the forward direction and one indicating the up direction, are overlaid on the selected object. You specify which parts of the object represent forward and up. The object's forward point will be rotated so it always points in the direction the object is moving.

The up point will always try to be aligned in an appropriate manner depending on the orientation and curve of the path it is on. Use the cursor to click on any of the selection handles, and then drag to rotate the object in the desired direction. When you release the mouse button, the object is redrawn to show its new alignment along any path that it's attached to.

This dialog also gives you the option of having the object "bank" on turns as the animation path changes direction. The slider allows you to specify the approximate maximum banking angle that may be used over the entire animation. When the Bank on turns option is disabled, the object's up point always remains pointing in the same direction. There is also an option to reverse the banking direction. This causes the object to bank outward instead of inward.




**NOTE:** Once an object is aligned to a path, it cannot be rotated with the Rotate Tool. However, you can change the rotation on the Transform panel of the Object Properties palette, although the new coordinates won't take effect unless you unalign the object with the UnAlign to Path command.

The forward and up alignment of an object is time varying. The settings in this dialog take effect at the current time (the time indicated by the position of the Current Time pointer on the timeline), and remain in effect unless changed again.

## UnAlign to Path

This command removes the Align to Path constraint from an object. Select the object, then select the UnAlign to Path command from the menu. The object will no longer automatically point forward as it travels along its path.

## Drop a Curve

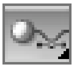
The Drop a Curve command allows you to easily duplicate the animation path of any object in your model by creating a Bézier curve that matches the path exactly.

The Drop a Curve command is located in the Modeling menu, and in the Modeling Commands palette. This command is only available if an object with an animation path is selected in the Modeling window.

Once you create a duplicate of an object's animation path, you can then select the new curve and position it anywhere in your model. This curve can then be converted into an animation path for another object with the **Convert to Path Tool**, creating identical paths.

## Convert to Path Tool

Hotkey: **J**

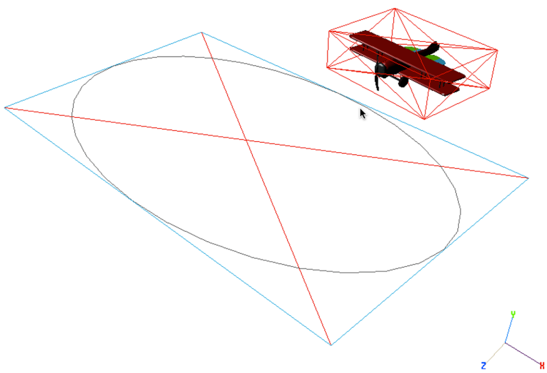


The Convert to Path Tool converts any 2D object into an animation path which can be used for any other object in your model. This tool is located in the **Joint and Bone Tool** pop-up of the **Tool palette**. The resulting animation path is a Bézier Curve type path, but you can change it to another path type on the Transform panel of the Object Properties palette, or in the Project window under the object's Position line.

### Convert to Path Tool Function

Any 2D object can be converted to an animation path. It can be an open or closed line or region. Select the Convert to Path Tool from the Tool palette, then select the object that you want to animate. When the object highlights, drag the cursor to the 2D line that you want to convert into an animation path. The path also highlights, indicating the selection is complete.

When you release the mouse button, the 2D object changes into a path for the first object you selected. If the Remove Curve checkbox is checked in the Tool Setting dialog, the 2D path object is removed from your model. If this box is unchecked, the 2D object converts to a path for the specified object, but the original remains as a 2D object in your model.



**NOTE:** When you convert a 2D object into a path, you move the object TO the path; therefore, you may want to position the path so that its beginning point is where you want the object to begin its travel before you convert the 2D object into a path.

#### Appending Additional Paths to an Object

You can convert additional 2D objects into animation paths and append them to the end of the existing path. The first point on the new path becomes the position of the object at the current time.

#### Convert to Path Tool Settings

You can change the default behavior of the Convert to Path Tool through the Tool Settings dialog. Double-click the tool icon to open the dialog. The options presented include the ability to Remove or Append a path, or set the time increments of the path.

## Animating Model Surfaces

Just as you can animate an object's position by moving the time marker and making changes, you can animate the surface through the same process.

#### Animating Templates

You can animate 2D and 3D template elements prior to constructing an object. For example, you can animate a Bézier curve and then use it as a Lathe template. The Lathe object's surface will animate according to the changes in the curve. Any object that can be produced via a template can use this technique. This includes Lathe, Extrude, Path Extrude, Skin and Hull.

#### Animating 3D Surfaces

Similar to animating templates to create an object, 3D spline surfaces and polygon meshes can be edited and animated directly. Just edit the object and move the animation time marker (in the Project window) to the position where you want to create a keyframe.

#### Animating Surface Parameters

In addition to animating the template that you use to create a Lathe or Extrude object, you can also animate the parameters of the object.

With Lathe you can animate the degrees of rotation, the angle of rotation (Tilt), the H and V scale, and the H and V sweep - as well as the Bézier line that makes up the template for the lathe. To edit the template (after you've created the object) select the Lathe object, choose the Edit Object command from the Modeling menu, set the time marker, and edit the Bézier curve. To edit all of the other parameters of a Lathe object, select the object with the Lathe Tool and modify the parameter either directly or through the Object panel of the Object properties palette.

With Extrude you can animate the depth of the extrude, as well as the shape of the Bevel. To animate the depth, position the time marker, then use the Extrude Tool to redefine the Extrude depth. To animate the bevel shape, select the Extrude object, choose the Edit Object command, position the time marker, then edit the Bézier line that defines the bevel.

## Animating Object Components

Some special object types are constructed from sub-objects or reference objects. These include Subdivision, Skin, Meld, Boolean and Hull. Each of these object types can also be animated over time, but the methods will differ depending on the structure of the object and how it was constructed.

### Subdivision Objects

Subdivision cage objects consist of polygon meshes. To animate a Subdivision surface simply animate the root polygon mesh that the cage is constructed from.

### Skin Ribs

In addition to being able to animate the two dimensional ribs before or after Skinning them together (using the Skin Tool) you can also animate the position, rotation and scale (transformation) of the individual ribs. This can be done in two ways:
1) Use the Edit Object command in the Modeling menu. Reshaping gives you access over the transformation of the individual ribs, but not the shape of the individual ribs.
2) Use the UnSkin Tool to separate out the individual ribs. Once you have separated the ribs you can transform each rib individually and you can change the shape of individual ribs. The UnSkin Tool is accessed by selecting the Skin Tool while holding down the Option/Alt key.

For more information about the Skin Tool, see **Chapter 5 - Working With Bézier Objects**.

### Meld Components

You can animate the individual objects that make up a Meld (MetaSurface) object. The motion will be incorporated in the final entity. For example, you can animate the process of two objects melding together and separating again.

To animate the member objects, simply animate their position, rotation and/or scale prior to apply the Meld command. You can also use the UnMeld command to separate the MetaSurface into its member objects, animate them, and then reapply the Meld command.

**Boolean and Anti-matter Objects**
Just as with other objects with component members, Booleaned objects can be animated prior to performing the Boolean operation. Only the Cut Tool result cannot be animated (or UnBooleaned for that matter). The results you achieve animating and then applying a Boolean tool can be unpredictable, however. More predictable results can be achieved using Anti-matter Boolean rendering.

**Hull**
You can animate a Hull object over time in two ways. You can animate one or more of the four Bézier curves that you start with, and you can change the U and V weight fields over time.

To edit the Bézier lines, first UnHull your surface by clicking the UnHull icon on the Modeling Commands palette, or by selecting UnHull from the Modeling menu. Then select the individual line, and use Edit mode. To animate the U and V weighting, simply enter a number in the field or change the slider at the point on the timeline that you want the change to take place.

## Using the Joint Tool

Hotkey: **J**.
The Joint Tool is located in the Joint and Bone Tools pop-up menu.
This tool can be used to create a joint between objects, light sources, or cameras. The Joint Tool is used primarily for constraining an object's movement during animation sequences.

The Joint Tool makes the joint connection between the child and parent. Select the child first, then drag the Joint cursor to the parent. Each object becomes highlighted in turn as the joint is made. Once the Joint is created, a line connecting the parent and child appears in the Modeling window.

The order of selection is very important. When you move a parent object, the child object also moves. However, you can move the child object without affecting the parent object. All child objects appear beneath the parent object in the hierarchical structure in the Project window. An object can only be joined to one parent.

## Joint Tool Settings

You can change the default settings by double-clicking the Joint Tool icon. The Tool Settings dialog opens.
• **Scale:** If this box is checked, joints created with the tool will cause all child objects to scale together with the parent when the parent object is scaled.
• **Offset:** Check this box if you want the child to inherit the distance that the parent's object origin point is offset from its geometric center.
• **Rotate:** When a parent object is rotated, all child objects joined to that parent will rotate around the parent object's origin point if this box is checked.
• **Move:** When a parent object is moved, all child objects joined to that parent will move with it.

When none of the boxes are checked, moving, rotating, or scaling the parent object has no effect on the child. However, if the parent object is deleted, all child objects joined to the parent will also be deleted.

## Break Joint Tool

Use the Break Joint Tool to select the objects from which you want the joints removed. The Break Joint Tool is accessed by selecting the Joint Tool while holding down the **Option/Alt** key. With the Break Joint Tool, select the object that you want to break the joint on, and then drag to the object that it's joined to. When both objects highlight in a red bounding box, release the mouse. You can break the joint to multiple objects by continuing to select objects with the Break Joint Tool.

*Chapter 16*

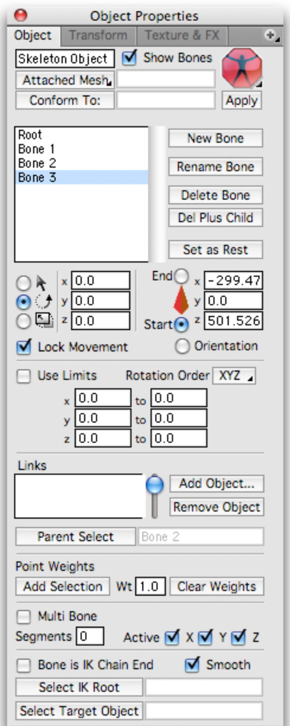
# Special Animation Tools

Strata Design 3D CX provides tools specifically designed for animation. These tools include the Skeleton System (inverse and forward kinematics) along with the Jiggle Tool. The Jiggle Deform Tool allows you to deform an object, which then rebounds repeatedly as it returns to its original shape over time.

## Using the Skeleton System

Strata Design 3D CX's skeleton feature gives users the ability to create complex structures that can then be animated to simulate realistic motion. With this feature you create a series of connected "bones" to form a hierarchical skeleton. This skeleton can then be used to manipulate, pose and animate an attached polygon mesh.

### The Skeleton Workflow




To create and use skeletons you will want to draw out your individual bones, set constraints and determine which, if any, of the bone chains will be **IK** (inverse kinematics) chains. Once you have your basic skeleton worked out, you then attach a mesh, skin the mesh to the skeleton and determine the weighting for the individual vertices of the mesh – among many other options.

Though the process of creating a skeleton is started using the **Bone Tool** from the Tool palette, the most important work in constructing and rigging a selected skeleton will be done using the **Object Properties** palette and the **Skeleton Edit mode** tools.

### Object Properties

When you select an IK skeleton, the Object panel of the Object Properties palette displays various controls and settings for the skeleton. The upper portion contains the **full skeleton functions**. The lower section contains controls for **individual bone functions**.

The skeleton Object Properties palette has two basic modes: **Rest Pose Mode on** and **Rest Pose Mode off**. Switching these modes is achieved by clicking on the "man" icon menu button in the upper right of the palette. When the palette is in edit mode the man icon button will show as a red octagon stop sign. When edit mode is off, the icon will show as a green circle.

All rigging for the "rest pose" of the skeleton are done in the Rest Pose Mode. To select this mode, click on the man icon menu button and select the Rest Pose Mode menu item. When turned on, this menu item will display a check mark. To turn the edit mode off, select the menu item again.

The rest pose does not exist in time. Think of it as the place where you construct your figure before it goes on stage. When you leave the Rest Pose Mode you are able to pose and position your skeleton for any point in time, including time zero on the Project window timeline.

## Skeleton Edit Mode of Tool Palette


To directly manipulate the skeleton, select it first, then click on the Edit button at the top of the main Tool palette. Don't confuse this Tool palette edit mode with the Rest Pose Mode discussed above.

The special tools provided in the Edit mode can be used to set the rest pose for the skeleton, or to manipulate the pose for any point in time.

These special tools allow you to draw new bones, move, rotate and scale bones, and specify which vertices are associated with individual bones.

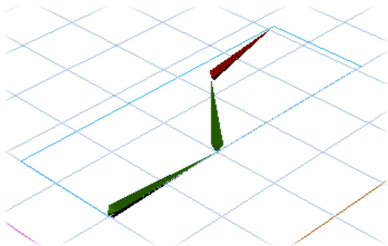
## Creating the Initial Skeleton

The first step in creating a skeleton is to draw a bone. This is done using the **Bone Tool** (Hotkey: **J**) from the main Tool palette. The Bone Tool is located in the Joint and Bone Tool pop-up menu. Bones, like everything else in Design 3D, are created on the active grid. You can change grids at any time during the creation process.

With the Bone Tool selected, click on the position where you want the first bone to begin (the start point), and drag to where you want the bone to end (the end point), then release the mouse button. This defines the position of the "Root" bone. The start point of any bone is its rotation point.

To add a bone to the end point of the previous bone, click anywhere on the previous bone and drag. The new bone will begin at the end point of its "parent" bone.

As you add bones to the structure, a hierarchy is created, and each new bone becomes the child of the previous bone (the parent). This hierarchy tells Design 3D how to calculate movement on each of the bones. You can add a new bone to the end of any existing bone. Each chain may branch off into many smaller chains.



With the Bone Tool selected, click anywhere on a selected bone to begin drawing a new bone. The new bone will begin at the **end** of the selected bone.

**Adding Bones**

You can add bones to an existing skeleton using three methods: Use the Bone Tool from the Tool palette; use the Bone Tool from the skeleton Edit mode tool palette, or use the **New Bone** button in the Object Properties palette. Each of these methods create a new bone at the end of the selected bone. The New Bone button creates a new bone of the same size and same direction as the duplicated parent bone.

You can also divide an existing bone into multiple bones by using the **Multi Bone** feature in the Object Properties palette. This feature makes it easy to create bones for pliable sections of a model, such as a tail. The selected bone will be divided by the number shown in the Segments field which is under the Multi Bone checkbox. You must enter the number of segments prior to checking Multi Bone. If field is set to zero, the bone will be split into two bones.

**Removing Bones**

You can remove bones recently created using the **Undo** command or the **History panel** of the **Details** palette. To delete a selected bone, use the Delete Bone button in the Object Properties palette. You can select a bone using the bone list in the Object Properties palette or you can use one of the bone transform tools in the skeleton Edit mode tool palette.

## Setting Up an IK Chain

The skeleton system can utilize **IK** (inverse kinematics) movement as well as **FK** (forward kinematics) movement. FK motion means that all bones forward of the bone you're manipulating (the bone's children) are moved relative to that bone. IK motion means that bones up the chain (the bone's parent and so on) are moved to meet the new position of the bone you're manipulating.

The Design 3D skeleton system allows you to have multiple IK chains within a single skeleton. To create an IK chain, select the bone that you would like to be the end of the chain. From the Object Properties palette, click on the **Select Root Bone** button. A dialog will appear with a list of all the bones in the skeleton. Choose a bone up the chain (the selected bone's parent or further up) and click **OK**. Next, select an object in the scene to use as the "target object". IK chains are manipulated by following a target object so you must choose a target.

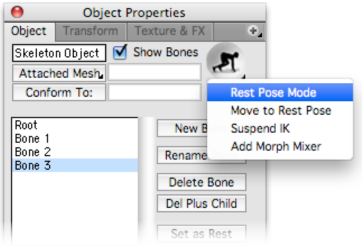
A target can be an object that is a visible part of the scene or you can create a construction object just for the purpose of manipulating the IK chain.

To create a construction object, draw a cube, select it and give it a name in the Object Properties palette (to be used as a target an object must have a name). Next, make it a construction object by choosing **Make Construction** from the **Selection** menu.

Once you've prepared your target object, select the bone again that represents the end of your IK chain, click on the **Select Target Object** button and choose the target from the list in the dialog. Now the chain is ready to be assigned as an IK chain. Click on the **Bone is IK Chain End** checkbox. You will be presented with a dialog telling you the process was successful, and how many bones are in the IK chain.

## Manipulating and Animating the Skeleton

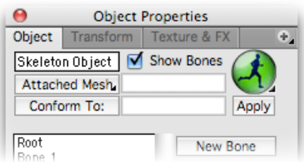
When in the **Rest Pose Mode** (red octagonal stop sign) any manipulations you do to the bones will be modifying the rest pose of the skeleton and will not change the attached mesh. To modify the mesh and to create any animations, you must take the skeleton out of Rest Pose Mode. To change this mode, click on the stop sign icon and uncheck the Rest Pose Mode command. You know the skeleton is out of edit mode when the red stop sign on the Object Properties palette is changed to a green light. This is a critical point to keep in mind as you manipulate the skeleton.




To animate a skeleton you need to move the time selector in the Project window to set Event Markers for the different positions – just as you do when animating any object.

**Moving an IK Skeleton**

When using an IK chain, you manipulate it by moving the target object. IK chains only follow the target object when Rest Pose Mode is off. Once you have the "green light" to manipulate the IK chain, just move the target object and you'll see the chain follow.




If you are planning on animating the IK motion there is one critical thing you must remember to do. You need to turn on the animation Stopwatch controller for the **target object**. The Stopwatch icon controls whether keyframing is active for that particular attribute or not. If the target object is not set up this way your chain will not animate.

To do this, open the target object in the Project window by clicking on the arrow to the left of the object's name. Next, click the arrow to the left of Object Properties. Find the Position entry and click on the Stopwatch to its right. Now the target object is ready to animate.

**Moving an FK Skeleton**

If your skeleton uses forward kinematics rather than IK, use the bone manipulation tools. To access these tools, select the skeleton and click on the

Edit button at the top of the main Tool palette. The Tool palette will be change to show the tools appropriate for editing Skeletons.

The edit tools include the bone manipulation tools: the Bone Move Tool, Bone Rotate Tool, and Bone Scale Tool; as well as the Add Bone Tool and Attach Vertex Tool.

## Attaching a Mesh

The skeleton system is designed to manipulate polygon mesh objects. In Design 3D any object can be converted into a polygon mesh.

When you're ready to attach the mesh, select the skeleton and click on the **Attached Mesh** menu button at the top of the Object Properties palette. Select the **Attach to Mesh...** command. A dialog will appear displaying all available polygon mesh objects. Select the object you want to attach and click **OK**. Once you've attached a mesh you need to "skin" the mesh to the bones. Skinning is the process of relating individual mesh vertices to individual bones in the skeleton. This is how the skeleton knows how to manipulate, bend and twist the mesh.

The best way to start is to use the **Auto Skin** command from the Attached Mesh menu button. This command "skins" the vertex points to the bones they are closest to. If the points are near a joint, this command calculates an appropriate "weighting" percentage for each bone. You can further adjust which vertex points are attached to a particular bone using the **Attach Vertex Tool**.

To use the Attach Vertex Tool first select the bone you wish to skin points to by using the list in the Object Properties palette, or use one of the bone manipulation tools. Next, using the Attach Vertex Tool, select the points you wish to skin to the selected bone. If you will be using these same vertex points on two or more bones, set the Weight field (to the right of the Add Selection button) to the relative weighting you desire. Weighting is used to determine how much influence each bone has on a particular vertex point. The next step is to click on the Add Selection button.

You can select points by simply clicking on them with the Attach Vertex Tool or you can drag a region to select multiple points. You can add to your selection by holding down the Shift key as you make additional selections. To remove points from your selection, hold down the Option key (Alt key on Win) as you click on points or drag a region.

### Conforming One Skeleton to Another

You can make one skeleton conform to, or follow, another skeleton by using the Conform To button at the top of the Object Properties palette for the selected skeleton. When you click on the button a dialog displays a list of all the available skeletons in your model. Select the skeleton you want the current skeleton to conform to then click OK. The name of the skeleton that is being conformed to will display to the right of the Conform To button.

In order for one skeleton to conform to another they both must have the Rest Pose Mode turned off. Once you set a skeleton to conform don't apply any animation to that skeleton. All of its motion will now be dictated by the skeleton it conforms to.

## Using the Jiggle Deform Tool

This tool has many possibilities. Using a Jiggle Object, you can deform an object at time zero. The entire object then rebounds repeatedly as it tries to return to its original shape, creating a motion that resembles a bowl of jelly
.
Jiggle can be used to give an object a subtle, life-like jiggle, or more substantial movement. You can make a flag flutter in the breeze, or stage an earthquake that shakes your object to pieces.

### About Jiggle

The Jiggle Deform Tool deforms objects just like the Deform Tool, however there is an important difference. Other Design 3D animation tools are keyframe-based and use interpolation to figure out where objects should be in between Event Markers. Jiggle is different - the user sets the initial position of the points, then lets it do its thing throughout the animation, following the laws of physics and the time-varying controls.

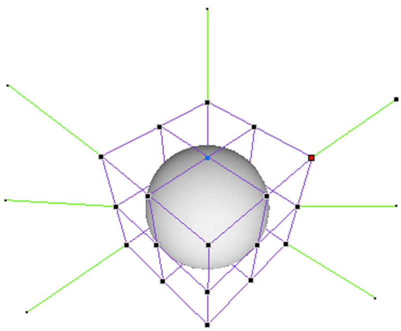
You can influence the motion after time zero using various controls, but you cannot directly move the Jiggle vertices. Any changes you make are from the current time forward. In other words, Jiggle does not go back in time and interpolate any changes you make in the settings - changes start working at the time you make them.

All of a Jiggle Object's edges act as springs. When you deform the Jiggle Object's points, the springs resist, and will bounce back to the original position, and then past the original point, and then rebound again. Jiggle is similar to a rubber band: the farther you pull it, the harder it snaps back. So you will probably want to use very small movements to start with. Large movements of the Jiggle Object can cause the object to bounce back through itself, and your results will be unpredictable.

## Creating a Jiggle Object

To create a Jiggle Object, just select the Jiggle Deform Tool (Hotkey: **L**), and then click in the Modeling window. If you click on an object, the Jiggle Object will size itself to fit, otherwise click and drag to the dimensions you want. If you create a free-standing Jiggle Object, don't forget to use the Attach Tool to associate it with the geometry you want to Jiggle.

The Attach Tool is located in the Joint and Bone Tools pop-up menu on the Tool palette. Detach is accessed by holding down **Option/Alt** while you click on the Attach Tool.



The purple Jiggle Object which is created with the Jiggle Tool can be sized or moved with the Object Manipulation tools or the Object Properties palette. Multiple Jiggle Objects can be applied to a single object, or a Jiggle Object can be applied to part of an object.

## Deforming the Jiggle Object

To make the Jiggle effect, you must deform the Jiggle Object. Working with the Jiggle Object is done in Edit mode. To access Edit Object, use the Modeling menu command or click on the Edit icon on the Tool palette. The Jiggle tools available are Move Point and Extra Force:

**Move Point**
The Move Point Tool allows you to drag points on the Jiggle Object. Select one or more points and pull them in or out from the base. This tool is only available at time zero. If you try to use this tool after time zero, you will be scolded by

an alert box. If you want to affect the Jiggle Object after time zero, use the Extra Forces Tool.

If you want your object to start its Jiggle after time zero, you can make your initial settings at time zero with the Move Point Tool, and then lock all the points on the Jiggle Object. You can also accomplish this with the Extra Forces Tool.

### Gravity

Double-clicking on the Move Point Tool summons the Tool settings dialog. Here you can set the Gravity to None, Low, Medium or High. With a Gravity setting of High, pulling one control point causes every other control point to follow.

### Extra Force Tool

Extra Force vectors interact over time with other forces to determine the motion of your object. In other words, they influence your object's jiggle, rather than changing it directly. Remember, the Jiggle is still operating under its own power, starting from time zero. The vectors can be dragged in any direction, and to any length. The longer the vector, the more force will be applied to that point.

## Locking Points

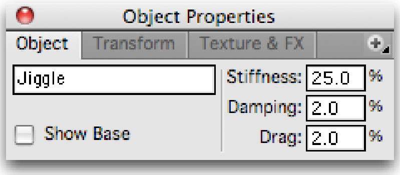
The control points on the Jiggle Object can be locked, which makes them unaffected by the Jiggle settings. This control is time varying: it can be done either at time zero, or at any time after that. Locking a point holds it, and the geometry it controls, in place. It is usually a good idea to lock at least two or three points on an object to anchor it in place. This depends, of course, on your desired effect.

You can lock individual points with the **Option key** (Mac) or the **Alt** key (Win) while dragging a selection marquee to lock multiple points. Locked points turn blue. Repeating this process toggles the point(s) back to unlocked.

If you want the Jiggle effect to start after time zero, set the Jiggle parameters at time zero, then lock all of the object's points. Move the Current Time pointer to where you want the effect to begin, and then unlock the points on your object.

## Jiggle Object Properties

The spring action of the edges of your object are set with the three controls: Stiffness, Damping and Drag. These controls become available on the Object panel of the Object Properties palette when a Jiggle Object is selected.




These controls are time varying: they can be changed at any point on your timeline. They apply from the current time forward, and stay at their set values until told otherwise.

• **Stiffness**: the tightness or strength of the springs. A low setting here causes the force of the Jiggle deformation to rebound gently throughout the object. A high setting increases the force with which the springs rebound. Use a value from 1 to 100.

• **Damping:** applies resistance to the springs. A low setting will give you motion that continues at the same intensity forever, while a high setting will cause the jiggle motion to wind down after a few bounces. Use a value from 1 to 100.

• **Drag** applies to the velocity of the Jiggle Object's points; with a higher setting, every point slows more over time. Use a value from 1 to 100.

**NOTE:** Drag and Damping work together to make the Jiggle motion slow down over time. There is an important difference, however. If you do not use Extra Forces, raising the Damping value provides a more natural effect. If you are using Extra Force vectors, and you want to slow down the effect quickly, increase the Drag setting.

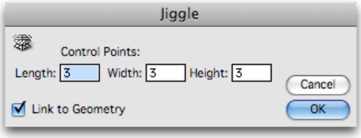
• **Show Base:** enable this checkbox to make the original Jiggle Object visible in your Modeling window.

## Jiggling Part of an Object

You can apply a Jiggle Object to make only part of your object jiggle. First apply the Jiggle Object to your object. Then resize and place your Jiggle Object on part of your object using the Object Manipulation tools or the Object Properties palette. Make sure you lock the first row of control points on the side where the Jiggle Object meets the object to prevent tearing. Then proceed normally setting the Jiggle effect.

## Jiggle Deform Tool settings

Double-clicking on the Jiggle Deform Tool summons the tool settings. Remember, Jiggle is similar to Deform, so the Joint and Attach tools work the same way.




• **Control points.** These fields let you enter the number of control points in the length, width and height for the Jiggle Object.
• **Link to geometry.** Enable this checkbox if you want the Jiggle Object linked to your object This means the Jiggle Object will move when the object moves. The Joint/Break Joint tools can also be used with a Jiggle Object.

The **Attach** and **Detach** tools determine whether or not the Jiggle Object will affect any particular object. An object can be passed through a Jiggle Object, causing the object to Jiggle while it is in the bounding box.

**NOTE:** You can also use Detach to speed up the redraw in your Modeling window. Once you have the Jiggle effect set up on a particular object, use the Detach Tool to disable the effect while you complete the rest of your model. Then use Attach to restore the Jiggle before you render.

The Attach Tool is located in the Joint and Bone Tools pop-up menu on the Tool palette. Detach is accessed by holding down **Option/Alt** while you click on the Attach Tool.

Chapter 17

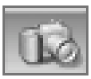
# Rendering Basics

Rendering is the process of creating 2D graphic images, or snapshots, of your 3D projects. Rendering produces pixel based images, also known as raster images. All of the work of modeling, texturing, lighting and animating comes down to this moment. Rendering is typically the final output of the 3D process.

## Starting a Rendering

You can start all types of renderings from the Rendering menu by using the Render Image command. This opens the **Render Image** dialog, which contains many options for controlling your final image.

A faster way to see your scene in a raster (pixel-based) image is to simply select the **Rendering Tool** at the bottom of the Tool palette, choose the renderer desired from the pop-up menu under the Rendering Tool, and click in the desired view. The icon looks like a camera, and the function is like snapping a photo of your 3D scene.



### The Rendering Tool

You can use the Rendering Tool to render a pixel-based image. Each image is rendered in a separate, floating Rendering window that appears directly over the window that you clicked in with the Rendering Tool. A rendering can be made from many different windows: the Modeling window, a Camera or Spotlight window, or even started from the Project window.

You can initiate a rendering with the Rendering Tool in one of two ways:
• **Single click:** The entire window renders. (The size and proportion of the rendering, as well as the viewing position, is determined by the size of the view where the camera cursor was clicked.)
• **Cursor drag:** The size and proportion of the rendering is determined by the marquee drawn with the cursor. The viewing position of the rendering is based on the view from where the cursor was dragged.
If you're using the cursor drag method, you can more accurately define the exact position of the cursor by turning on Caps Lock. When Caps Lock is on,

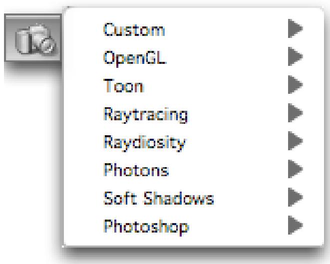
a cross-hair appears in the center of the tool icon, allowing you to more accurately position it in the window.

Modifier keys for initiating renderings with the Rendering Tool:
**Shift** = opens the Render Image dialog box.
Without the Shift key, clicking or dragging the Rendering Tool immediately begins a rendering.

You can also use the Render Image command from the Rendering menu to open up the **Render Image dialog**. This allows you to specify the complete set of rendering parameters, including image size, image quality, resolution, and animation frames, if applicable, before the rendering starts. For more information see **Chapter 18 - The Render Image Dialog.**

## Render Method Presets

The pop-up **Preset menu** accessed by holding down the Rendering Tool icon allows you to select the renderer and level of detail you want to use. These "presets" allow you to quickly switch from one rendering style to another, at varying quality levels, and even select special options for your renderings.




Design 3D provides a variety of rendering techniques or algorithms, commonly called "renderers." These include OpenGL, Toon, Scanline, Photon, Raytracing and Raydiosity. Each produces a pixel based image of your scene, but of very different appearances.

There are a number of "special presets" that use standard renderers, but include optimizations and settings that make their output unique. These include Soft Shadows, Photons, and Photoshop Layers.

## Custom Rendering Presets

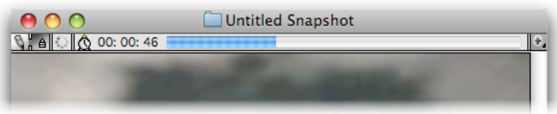
You can define a particular set of rendering options in the Render Image dialog that you can recall later, either in the current project or in another model. These saved settings will then appear in the **Custom** list of presets available in the Rendering Tool's pop-up menu.

You can delete an entry from the Custom rendering options list by holding down the **Option** (Mac) or **Alt** (Win) while selecting the name of the preset you want to delete. When you release the mouse button, the system beep sounds to confirm the deletion of that entry in the list. You cannot undo this action.

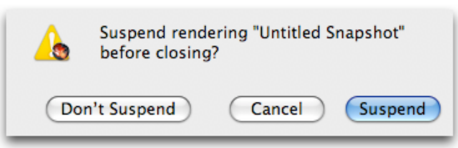
You can also create and save custom slider settings, or create your own model for the rendering preview. For more information, see **Saving Custom Settings** in **Chapter 18 - The Render Image Dialog.**

## The Rendering Window

When you begin a rendering, Design 3D opens a separate **Rendering window**. The Rendering window contains some specific controls that are unique to this type of window. These controls allow you to watch the rendering process as it occurs, cancel or suspend the rendering, check the elapsed render time, and even hide it to work on other projects. A Rendering window can be moved around the screen as it is rendering. It can also be moved to the background, even though the rendering continues.




Keep in mind that the Rendering Window is your rendered product, and closing the window without saving the image or suspending the rendering will delete the rendered pixels. You may get a prompt to **Save** or **Suspend** the rendering if the elapsed time is greater than 20 seconds.




**Feedback**
Because Design 3D is set up with rendering analogous to taking a photograph of your model, you may watch the image "develop" by toggling the **Continuous Rendering Feedback** button. The toggle looks like a lock in the upper

left of the Rendering window, next to the progress bar. Unlocking the continuous rendering feedback button may speed up the rendering process on slower computers.

**Zoom**
If the size of the image being rendered is larger than the screen, it will be shrunk to fit on the screen. You can then use the scroll bars, or the zoom in/zoom out options in the **Plus menu**.

During the rendering process, there are other indicators and buttons along the top of the Rendering Window:
• **Refresh button:** (Pencil icon) With the continuous rendering feedback turned off to speed up the rendering process, you can update the Rendering window by clicking the refresh button.
• **Progress bar:** The bar moves to the right as the rendering proceeds in the window. Design 3D makes a "best estimate" of the amount of work completed at any point during the rendering process. When the bar reaches the right edge of the window the rendering is complete.
• **Low memory:** If Design 3D encounters a low memory condition during rendering, it displays the low memory icon at the top of the Rendering window. If the rendering process is progressing slowly, the memory chip icon appears at the top of the Rendering window.
In most cases, a slow rendering process is caused by a low memory condition. However, certain Expert render settings can dramatically increase the time required for rendering. Volumetric textures, such as Fog or Mist, may also require additional rendering time. In most cases, the higher the quality of the image, the more time required to render.
• **Multi-processing:** Design 3D automatically supports multiple processors if the required hardware and software extensions are available. If multiple processors are being used to render the image, a small Strata logo appears at the top of the Rendering window with a number next to it indicating the number of processors being used.
If fewer processors are being used than the total number present in your system, the number appears in red. This condition may occur when the system is unable to allocate memory to additional processors, possibly due to a low memory condition.
• **Animations:** In addition to the progress bar (for the total animation), additional numbers appear between the time estimate and the progress bar. These numbers indicate the current frame being rendered and the total frames to render.
If the animation you're rendering is actually a sub-set of the total frames in the animation, two sets of numbers appear. The first set indicates how many frames have completed rendering, out of the total number of frames being rendered.

The second set (in parentheses) shows where the frames being rendered occur in the entire animation sequence.
When an animation has completed rendering, the animation will open in its native player. For example, if you choose to compress and save the animation file as a QuickTime movie, the finished animation will open with the QuickTime player.

## Rendering Animations

When rendering multiple frames, Design 3D saves each frame of the animation as soon as it completes rendering. If your model contains animation and you select either the **All** or **From** radio buttons, a dialog appears allowing you to specify a name and location for saving the animation.

When you click the Save button, a dialog appears that allows you to select a compression method and color depth, and set the quality of the rendering. If you terminate the rendering, the saved animation will be a fully-functional movie file containing those frames that were rendered and saved up to the point it was stopped.

### Saving Sequentially-numbered Files

You may use a single image format to save animation sequences. Design 3D will then sequentially number the individual files for you. If you specify a file name with a numeric part, such as myFile0001.tga, Design 3D will automatically increment the numeric part of the file name, and create myFile0002.tga, myFile0003.tga, etc. The numeric part of the file name can appear anywhere within the name. However, it MUST contain at least two digits in order to be recognized by Design 3D as a numeric part.

If you choose a file name such as myFileOnly, Design 3D will append a number to the end of the file name, and create individual files that are named myFileOnly0001, myFileOnly0002, etc. (Mac) or myFileOnly0001.tga, myFileOnly0002.tga, etc. (Win). Design 3D won’t add a numeric extension if it sees a usable numeric part (two or more digits) already present within the name; it will instead increment the number already present.

When you save an animation as sequentially-numbered files, make sure you **first** create a folder for the numerous files that will be generated.

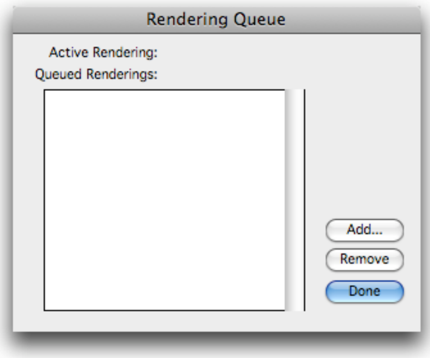
**NOTE:** If you specify a file name with a numeric part, be sure the numeric part includes enough digits to cover the total number of frames in the animation sequence. For example, if the animation contains 100 to 999 frames, the numeric part of the file name must contain at least three digits (001, 002...100). If the numeric part does not contain enough digits, the file name may be overwritten.

## Rendering in the Background

One of the most powerful features of Design 3D is its ability to render images in the background. The number of images that you can render at the same time is limited only by the available memory. However, rendering in the background splits available CPU time among the renderings in progress and any other activity. The only limitation to rendering in the background is that you can't make any changes to the model during the rendering process.

### Rendering Queue

The **Rendering Queue** command, found in the **Rendering** menu, lets you add suspended renderings to a rendering queue. A rendering queue is a line-up of suspended renderings waiting to be started. When one finishes and saves to disk, the next one in line begins, until the queue is finished.




You can add multiple suspended renderings to the job list in the **Rendering Queue dialog**. Only one rendering is active at a time. The order in which you add the jobs to the queue determines the order in which they are rendered. When you close a queued rendering, either because it has completed and been saved or it has been terminated by clicking the close box, the next rendering in the queue (if any) loads and begins rendering.

The rendering queue cannot support multiple renderings at one time. Remember, with more than one rendering in progress at a time, you must send them all to the background so they will share CPU time.

If you quit Design 3D while renderings are in the queue, they are deleted from the queue. The queuing of renderings between sessions is not retained. An alert is displayed informing you that renderings are still present in the queue, and asking if you are sure you want to quit.

## Suspend Rendering

Use the **Suspend Rendering** command, from either the **Render Image** dialog or the **Rendering** menu to save a rendering in progress. You can then restart it at a later time. The Suspend Rendering command is available when a rendering window is the active window, and the rendering is in progress.

The Suspend Rendering command creates a suspension file containing all of the information necessary for continuing the rendering process. This is the file that you need to restart when you're ready to continue rendering. Suspended rendering files can also be added to the rendering queue.

When you select this command, the Suspend Rendering dialog is displayed, allowing you to specify a name and location for saving the suspended rendering. When you save the file, Design 3D automatically adds an .rdf suffix to the end of the file name, indicating that it is a suspended Design 3D rendering. To restart a suspended rendering, open Design 3D and double-click on the .rdf file.

### Suspending Single Frames

If you suspend a still image (single frame), the dialog allows you to specify a name, location, and file format for the suspended rendering.

### Suspending Animations

To suspend an animation, simply select Suspend Rendering from the Rendering menu or from the Rendering window's Plus menu. The name, file format, and location of the file would have been specified when the rendering was initiated.

### Suspend and Continue

Use this command to save the rendering in its current state of completion, and then automatically continue on with the rendering process. This command is available from both the Rendering menu and the Rendering window's Plus menu.

# The Render Image Dialog

While the fastest way to render your scene is to use the Rendering Tool and simply click in a view, this only produces images limited to your window size and the preset rendering settings. To access the full power of Design 3D CX's rendering methods, open the Render Image dialog.

Use the **Render Image** command in the **Rendering menu** to open the Render Image dialog and begin the rendering process for raster/pixel based images. This command is available whenever a model, Shape, Spotlight, or Camera window is active. You can also use the **Rendering Tool** to bring up the Render Image dialog by holding down the **Shift** key when you click or drag with the Rendering Tool in any view.

The hotkey for summoning the Render Image dialog is **Command-R** (Mac) or **Control-R** (Win).

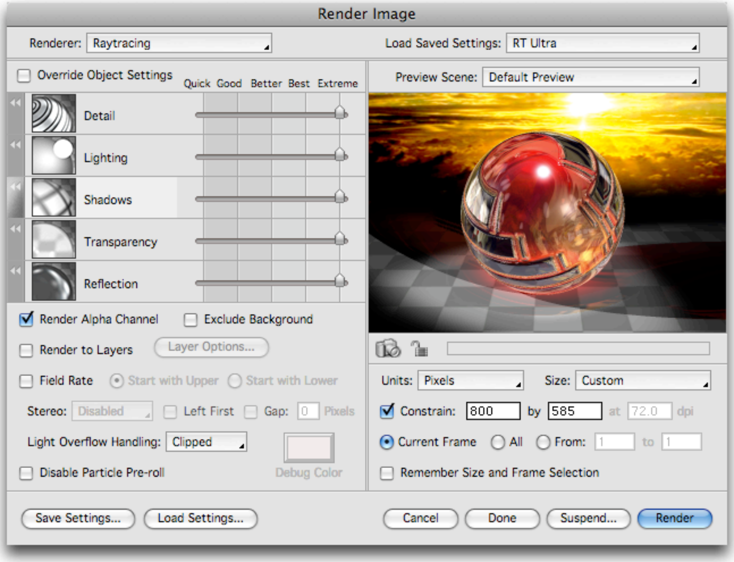
In the Render Image dialog, you can choose the rendering method and select custom settings for any aspect of your rendering. You can set the level of anti-aliasing, the number of frames to be rendered in an animation, the image size and other options.

## Dialog Organization

If you look at the overall organization of the Render Image dialog you will notice that the controls and settings are grouped by function.

At the top of the dialog, you can select a renderer or rendering preset. On the left side of the dialog are controls for fine-tuning your rendering settings. On the right is the Preview area, where you can check your settings to see if you are getting the results you want.

The lower third of the dialog contains controls for the size and type of rendering, and across the bottom are the dialog commands, where you make your final decisions before initiating a rendering.




**Renderer Selection Menus**
At the very top of the dialog, there are two menus which allow you to choose a rendering method: the Renderer menu and the Load Saved Settings menu.

The **Renderer menu** lets you choose from the main rendering categories. Once you choose a renderer, you can adjust different settings to suit the needs of your project. The renderers and all of their associated controls are described in **Chapter 19 - Rendering Methods.**

The **Load Saved Settings menu** lets you choose from a number of preset render settings, including any custom settings you have loaded or created yourself.

The preset rendering options in the Load Saved Settings dialog include different quality levels of the main renderers. You can also choose options for creating **Soft Shadows** and using **Photons** to create caustic effects. These presets are already highly optimized and a good choice in many situations. All of the renderers and presets are described in **Chapter 19 - Rendering Methods.**

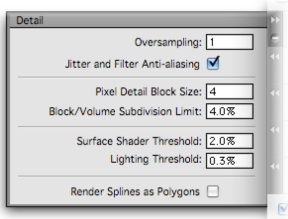
**Render Settings**
The left side of the dialog contains the controls for determining the quality and speed of your rendering, and also the **Override Object Settings** checkbox which allows you to override any per-object or per-light render settings you have made in the Project window.

For more information about making specific rendering settings for individual objects and lights, see **Chapter 20 - Special Renderers.**

If you select OpenGL, Toon or Scanline in the Renderer Menu, a Settings button appears just under the Renderer menu. Click the button to access the settings for these renderers.

If you select Raytracing or Raydiosity™, the control areas for these high-powered renderers are available. This part of the dialog contains settings sections for **Detail**, **Lighting**, **Shadows**, **Transparency**, and **Reflection**. Each of these sections includes quality **sliders** which can be used to quickly make custom settings for each control section.

Each section also contains a **drawer** where you can access more advanced settings. These advanced settings are accessed by clicking on the section itself, or on the arrow on the left side of the section. For complete information about these render settings see **Chapter 19 - Rendering Methods.**




Below the settings sections are the **Alpha Channel, Exclude Background**, **Render to Layers** checkboxes; **Light Overflow Handling** and the **Stereo/ Video** controls.

**Render Preview**
On the right side of the dialog you will find the Preview area and controls. You can use the Preview Scene menu to select the Default preview, the Active Modeling View, or a custom scene. Just click the camera icon to preview your rendering.

**Output Controls**
Below the Preview area is the grouping of controls to define the pixel characteristics of the image(s) you produce. This includes both the size of the image (in a variety of units), and whether to render multiple images (animation frames). You can enter your specific needs in real-world dimensions to make printing and other output easier to calculate. You can also use the **Remember Size and Frame Selection** checkbox to retain your output settings for the next time you use the Rendering Tool or the Render Image dialog.

**Dialog Commands**
The final, lowest section of the Render Image dialog contains the settings and commands you will usually use after you have chosen all of your rendering options. These controls include the **Save** and **Load Settings** buttons; **Cancel**, **Done**, **Suspend**, and **Render**.

## Dialog Navigation

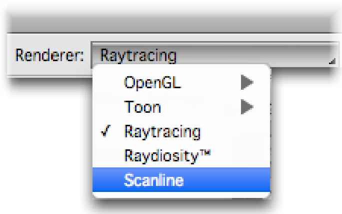
The Render Image dialog contains numerous settings, controls and numeric entry fields. However, navigating through the dialog is quick and easy using these modifier keys:
• **Tab:** Moves from one numeric field to another in the Render Image dialog. If you have a section drawer open, its numeric fields will be included when you tab from one field to field.
• **Shift-Tab:** Reverses the tabbing order.
• **Shift:** Holding down the Shift key while moving one of the sliders moves all the other sliders to the same quality setting.
• **Arrow keys:** Use the right/left arrow keys to move the active slider, and the up and down arrows to move from one section to another.
**With a numeric field highlighted**, use the up/down keys to increase or decrease the field's values. Using **Option** or **Alt** (Win) with the up/down arrow keys in numeric fields changes the value in small increments, while using **Command** or **Ctrl** (Win) changes the value in large increments.
• **Section name:** Clicking on a section name, such as Detail, Lighting, etc. makes that section active, and opens the section drawer. Clicking on the section name again closes the drawer.
• **Spacebar:** Opens or closes the active section drawer.
• **Scroll wheel:** Moves the focus (active area) up or down through the settings sections. With a section drawer open, the scroll wheel will move you to the next section drawer.

# Renderer Selection

At the top of the Render Image dialog, there are two menus which offer you a wide range of rendering options to choose from. The available rendering methods, also known as algorithms or simply "renderers," can greatly change the look of the image you produce when you render the scene.

## Renderer Menu

In the **Renderer menu**, you can choose one of the five main rendering methods: OpenGL, Toon, Raytracing, Raydiosity or Scanline. OpenGL and Toon have a submenu of choices.

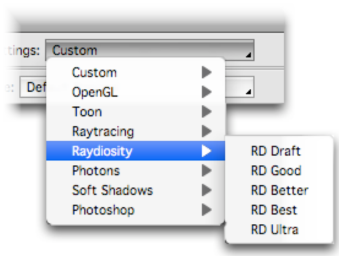



If you select Raytracing or Raydiosity, you can use the sliders to make quick adjustments, or you can use the drawer settings to make more complex adjustments.
If you choose Scanline or one of the OpenGL or Toon options as the renderer, a settings button will appear at the top of the dialog. Clicking the button summons a settings dialog.

For information about each of the renderers, their associated settings and the preset rendering options, see **Chapter 19 - Rendering Methods.**

## Load Saved Settings Menu

In the Load Saved Settings menu, you can choose from a number of preset options, including Photons, Soft Shadows, Photoshop Layers and any custom settings you have created or imported.




This menu is identical to the Rendering Tool Presets menu in the Tool palette. These presets allow you to quickly switch from one rendering style to another, at varying quality levels, and even select special options for your renderings.

Each category in the Settings menu has a sub-menu that contains the actual divisions of each preset. Except for OpenGL and Toon, these presets increase in quality from top to bottom. The lowest quality preset (and typically the fastest) is Draft, and this increases through Good, Better, Best, and in some cases Ultra. (The rendering equivalent of turning the amps up to "11")

For information about each of the renderers, their associated settings and the preset rendering options, see **Chapter 19 - Rendering Methods.**

## Saving Custom Settings

Design 3D allows you to customize the settings in the Render Image dialog in different ways: you can save custom render settings, custom slider settings and create your own model for the rendering preview. You can also create and save your own default render settings.

When you create custom settings or models, you must save them to a specific location. See the section **Save Locations for Custom Settings** below.

### Saving Default Render Settings

The Render Image dialog defaults to the Raytracing Better preset: each time you open the dialog, this option will be selected. You can change this default setting by creating and saving your own (customized) default render settings.

To change the default render settings, first create your own custom settings, and then click the **Save Settings** button at the bottom left of the Render Image dialog. Name the new default "Default.txt" and save it into the **Render Settings** folder. Your new default render setting will be used for each new model.

### Saving Custom Render Settings

Once you have fine-tuned a set of rendering options, you can save your settings as an editable text file.

After you have saved your custom render setting, it will appear in the list of presets available in the Rendering Tool's pop-up menu, as well as in the Load Saved Settings pop-up list in the Render dialog.

While the presets you create stay with the model, the text file containing your rendering settings can be stored independently. Like any text file, it can be edited, shared and reused. The file can be opened and edited in any basic text editing application.

To save your render settings and create a new rendering preset, use the **Save Settings** button at the bottom of the Render Image dialog. When you click this button, a save dialog appears, prompting you for a name and location for the new settings. This dialog opens by default to the user-level folder. See the section **Save Locations for Custom Settings** below.

**Setting Family and Sort Order**

To determine where a custom render preset appears in the Render Image dialog's preset menu, you can set the **Family name** and the **Family sort order**. You can also change the **Setting name** and **Sort order.**

The **Family name** determines the menu group where the setting appears, such as Custom, Photons, Photoshop, etc. If you leave this setting empty, your new preset will appear in the Custom family group.
To change this from the assigned default, open the text file and enter a name after the **FamilyName** entry. Be sure to enter the new name after the comma.

The **Family sort** order determines where in the list your new preset family will appear. To change the sort order, enter a value after the **FamilySort** entry. Again, the comma after the FamilySort entry must remain for your changes to take effect.
A lower value in this field will cause the family to be displayed earlier in the list of presets, and a higher value will make the family appear later in the list.

You can also edit the **Setting name** and **Setting sort**. The Setting name field determines the actual menu entry in the rendering presets menu, and the Setting sort determines its placement in the list. These settings are edited in exactly the same way as the Family name and Sort order.

**NOTE:** Family names and setting names with the same sort values will be sorted alphabetically within that group. These custom presets will be available on the next launch of the application, or you can use the Load Settings button to immediately load the preset into your model.

## Saving Custom Slider Settings

You can override the default Render Image dialog slider settings by saving your own settings to the **Slider Settings** folder. You must use the following exact slider names: Quick, Good, Better, Best and Extreme. These slider settings will be available on the next launch of the application.

## Saving A Model for the Render Preview

You can create your own custom scene for use in the Preview window of the Render dialog. To do this, create a scene with a camera pointing at the object or location you want to use as a preview. This step defines the preview.

Next, name the camera "Preview Camera," and name and save the model. Place the model into the **Render Previews** folder. The new preview model will be available immediately.

You can override the default rendering dialog preview by naming the new file "Default Preview.s3d". If you name the new scene differently, **both** the original default and your newly created scene will be available in the Preview menu.

## Save Locations for Custom Settings

There are specific locations for storing the Render Settings, Render Previews, Slider Settings folders. You will want to store any new custom settings you create in one of the following locations, depending on your needs:

**Macintosh**
• **User-specific:** Inside of your home folder found at Users/(your account)/Library/Application Support/Strata Design 3D CX 60/.
• **Machine wide:** For multiple users to access on the same machine: Inside of /Library/application Support/Strata Design 3D CX 60/.
• **Application folder**: Inside the Strata Design 3D CX applications folder. To avoid losing your custom settings, make sure you remove them before you replace your Resource Libraries or install a new version of the software.

**Windows XP**
• **User-specific**: C:\Documents and Settings\<user account>\Application Data\Strata Design 3D CX 60.
• **All users:** C:\Documents and Settings\All Users\Application Data\Strata Design 3D CX 60.
• **Application folder**: Inside the Strata Design 3D CX applications folder. To avoid losing your custom settings, make sure you remove them before you replace your Resource Libraries or install a new version of the software.

**Windows Vista**
• **User-specific:** C:\Users\<user account>\AppData\Roaming\ Strata Design 3D CX 60.
• **Machine wide:** C:\ProgramData\Strata Design 3D CX 60.

• **Application folder**: Inside the Strata Design 3D CX applications folder. To avoid losing your custom settings, make sure you remove them before you replace your Resource Libraries or install a new version of the software.

## Override Object Settings

This checkbox tells the renderer to override any object-level render settings you may have made. Design 3D allows you to specify render settings for individual objects and local lights in your model that are different from the overall render settings you make in the Render image dialog. To override per-object and per-light render settings, enable this checkbox.

To access the per-object render settings, select your object, then choose **Add Attribute > Surface Control Attribute** from the Plus menu of the Project window. The new Surface Control attribute will become available in the Project window under the Object Properties section of your object. All of the available render settings for your object can be accessed there.

You can also make per-light render settings for Spotlights and Point Lights. To access these settings, first select the light. Then choose **Add Attribute > Lighting Control Attribute** from the Plus menu of the Project window.

For more information see **Overriding Render Settings on Objects and Lights** in **Chapter 20 - Special Renderers.**

## Alpha Channel and Background Settings

### Render Alpha Channel

An alpha channel is a single 8-bit (grayscale) channel in a color image used to store transparency data. The alpha channel makes it easy for you to place renderings into image and animation composition applications. This feature is available only if you save the rendering in full-color, 32-bit (Millions+Alpha) QuickTime, PICT, Targa, or TIFF format.

### Exclude Background

This checkbox excludes the Visible Background from the image. When rendering with this checkbox enabled Design 3D does not anti-alias to any background color - just to transparency. When Visible Backgrounds are included in an image the edges of objects are anti-aliased to those colors, which can cause

color fringing when you blend your rendering into another image using the alpha channel.
For example, if you render a sphere against a black background and then try to silhouette the sphere into a photograph in Photoshop using the rendered alpha channel, you will see a black fringe around the sphere. If you enable the Exclude background checkbox, you will have a nice clean edge around the sphere.

## Render to Photoshop® Layers

Although a part of the Render Image dialog, the Render to Layers setting and options control a significant part of how your image is created and saved. Checking the **Render to Layers** option tells the Design 3D renderer to create various **Adobe Photoshop® layers** in the final image. These layers can contain individual components of the overall rendered image just like the channels of the Image Texture contains components of an overall texture. In fact, many of the channels are the same in both.

**NOTE:** You must save your rendered image as a Photoshop file to retain the layer information. Therefore, using Render to Layers results in a “flattened” file for pre-compressed animations like QuickTime movies or Flash SWFs. You can render an animation's frames as individual .psd files, however.

To turn on **Render to Layers**, either check this option in the Render Image dialog, or choose one of the Photoshop presets such as **Layers Best**. The presets will automatically check the option and set certain options in the Layer Options dialog as well.

### Layer Options

Once the Render to Layers option is checked, the **Layer Options..**. button becomes active. Pressing this button opens the full **Render to Layers** dialog. In this dialog you can check which components of your rendering (in Raytrace or Raydiosity rendering methods) will be stored to individual layers in a Photoshop file. The various components represent everything from individual texture attributes, to post-processing FX, to useful masks and modifier layers.

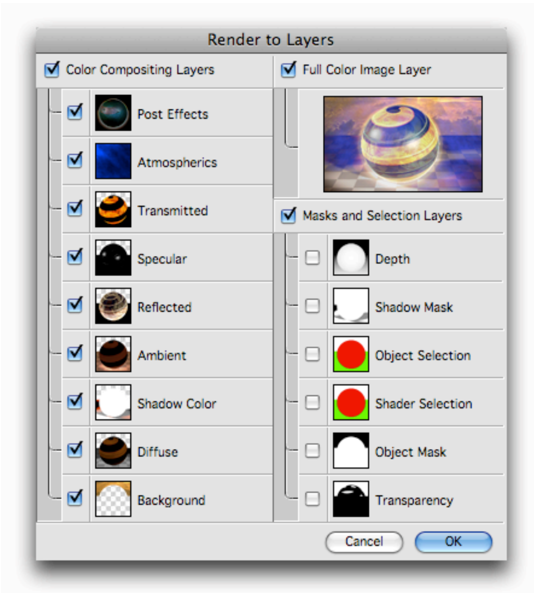
The reason behind rendering your image to **Photoshop Layers** is to aid in composing and controlling the scene **after** the Design 3D pixel-based render is complete.

For example, if you have a very complex scene of a shiny car in a garage, it may take hours to render at a fully printable resolution. If, after you open the final high-quality render in Photoshop, you wish to reduce the reflections on the car, it would be difficult to impossible to do without re-rendering the whole scene. When you render to Photoshop layers, one of the options is to have all reflections stored on a separate layer, so you can simply reduce the Opacity of that layer in Photoshop to reduce the overall reflections!

This is not the only utility of Render Layers, of course. You can also add depth-of-field blur to the image using the Lens Blur filter and a Design 3D Depth layer, or change the colors of shadows, objects, even highlights and backgrounds. All of this can be accomplished without needing to edit textures or re-render the scene just by using Render to Layers.

## Render to Layers Dialog

Each selection in the Render to Layers dialog renders a separate Photoshop layer. Each image component has a descriptive name and a (generic) preview with a checkbox to activate the Layer for rendering.
There are three main types of layers. Each type can be toggled on or off. You can also  (including all layers of that type) with its master checkbox at the top of the list) The three types are: the **Full Color Composite**, which is identical to any other output format using the same render settings; the **Color Compositing** layers, which can be stacked in Photoshop to recreate your full image by component; and the **Masks and Selection** layers, which are helpful maps based on the objects and shaders in your scene. Each layer is outlined below:



• **Full Color Composite:** this layer is typically at the top of your Photoshop file and is hidden by default. This RGB image is identical to the full output of the rendering processes, as if no layers were separated out. You can use this layer to build further variations of your image, or as reference to the initial rendering.

**Color Compositing Layers**

• **Post Effects:** Any post-rendering effects, such as Auras, Flares, and Hotspots, are stored as a group in this layer.

• **Atmospherics:** Any volumetric Fog or Mist applied to the entire scene through the Air panel of the Environment palette.

• **Transmitted:** The transparency color of surfaces with less than 100% Opacity. For partially transparent objects, hiding this layer in Photoshop will make the entire object appear to be opaque.

• **Specular:** The simulated reflections of light sources in the scene, seen as specular highlights, are saved to this layer with a special layer blending state.

• **Reflected:** This is the light that an object reflects onto other objects.

• **Ambient:** All of the visible surfaces in the scene are shown with just the Ambient light of the scene cast on them. Photon caustics are also saved to this layer.

• **Shadow Color:** All cast shadows are collected on this layer, with their colors and intensity set for the Multiply blending state. Shadow color is based on the color of the surface that is receiving the shadow and any transmitted light.

• **Diffuse:** All of the visible surfaces are shown with just the Diffuse color and shading applied to them. This is the base for other layers to build upon.

• **Background:** Any visible background in the scene is clipped out and stored here in the same form as it would have been visible in the final render. Portions of backgrounds obscured by visible objects are not included.

**Masks and Selection Layers**

• **Depth:** A depth Map of the scene, with objects nearest the camera being white, and all depth shown as a gradient to black in the visible scene.

• **Shadow Mask:** A grayscale mask of the cast shadow regions in the scene.

• **Object Selection:** A false-color mask of each discreet object in the scene. Used for separating objects by geometry in the image with selection masks.

• **Shader Selection:** A false-color mask of each discreet texture in the scene. Used for separating textures applied in the image on a global scale.

• **Object Mask:** A grayscale mask separating all visible objects in the scene from the background.

• **Transparency:** A grayscale mask separating all regions of transparency that expose the background.

## Stereo/Video Controls

### Field Rate Rendering

This feature allows you to render animations that are compatible with video. Most broadcast video is interlaced, with each frame consisting of two fields. Each field contains every other horizontal line in a frame. The first field of horizontal lines is displayed on the screen, and then the second field is displayed, filling in the gaps. Normally, each field is displayed for approximately 1/60th of a second, resulting in a frame rate of 30 frames per second. However, NTSC standards require precisely 29.97 frames per second.

- **Field Rate:** Toggles the interlaced field rendering on and off.
- **Start with Upper/Lower:** You can begin the rendering with the upper field (first horizontal line) or the lower field (second horizontal line). This setting defaults to Upper. These buttons are available only when the Field Rate option is enabled.

### Stereoscopic Settings

To render a stereoscopic image or movie, you **must** render the view through a **stereoscopic camera** that you have inserted into your model. If you try to render in the Modeling window, the stereo options will be disabled in the Render dialog and the view will not be stereo.

To insert a camera into your model, use the Camera Tool. To designate a camera type as stereoscopic, use the Camera Tool Settings dialog or the Object Properties palette.

For information about setting up a Stereoscopic Camera in your model see **Chapter 13 - Using Cameras**.

There are three controls in the Rendering dialog that help you set up a stereoscopic rendering.

- **Stereo Output:** This menu determines the arrangement of stereo views in the final rendered image. The two views can be Side by Side, Over and Under, or simply Disabled to render a single, centered view from a stereo camera.
- **Left First:** When this box is checked, the Left camera rendering will be either on the left side, or above the right camera rendering.
- **Gap:** Enable this checkbox to add a gap between the two images rendered. The Gap field allows you to specify the number of pixels desired.

## Light Overflow Handling

Automatic exposure control is a built-in feature of Design 3D. You can specify the method used for handling lighting overflow during the rendering process with this setting. Select an option from the pop-up menu:

• **Clipped**: If you select this method, all lighting intensity over 100% is ignored. This is the fastest method of overflow handling. However, it may cause color shifts in the rendered image. The quantity of light falling on a specific area is based on the total of the red, green, and blue components of light. Excess light is clipped as individual components, then recombined, which tends to affect each color component differently. If exact color is critical, clipping the excess light may not be the best solution.

• **Scaled**: This method scales the total lighting intensity down so the highest intensity is equal to 100%. It does not adjust the lighting if no area in the scene exceeds 100%. This method is least likely to cause color shift problems, but may mute your lighting and make the image look flat.

• **Debug**: If any lighting exceeds 100%, this option shows the overflow areas in the debug color you have specified. You can then adjust the lighting components manually to reduce these hot spots. To select the color, click the Debug button to display the color picker dialog.

• **Debug Overflow Color:** When the Debug light handling option is selected, the color specified here is used to show areas of the rendered model where the lighting intensity exceeds 100%. Click the Debug Overflow Color field to summon a color picker dialog and choose a Debug color.

## Disable Particle Preroll

When rendering animation sequences which contain a particle effect such as Fountains, Design 3D must compute the exact position of the particles, any effects applied to them, the amount of energy the particles have, etc. in each frame of the animation. This process is referred to as pre-roll. These calculations may require a significant amount of time, depending on the settings for the particle effect.

Even if you are only rendering a single frame of the animation, Design 3D must make these calculations for each previous frame to determine how the effect appears in the frame you're rendering.

When you check the **Disable Particle Pre-roll** box, any particle effects present in your model are temporarily disabled. This allows you to accomplish test renderings in less time without the need to remove the particle effects, and then reapply them.

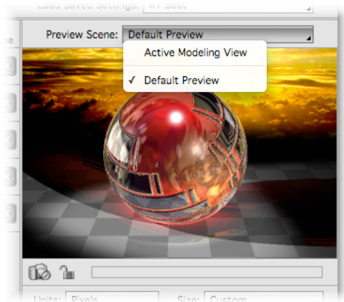
**NOTE**: You may want to set up a custom rendering setting with Particle Pre-roll disabled for the purpose of test rendering. To do this use the Save Settings button at the bottom of the Render Image dialog. For more information see **Saving Custom Settings** earlier in this chapter.

## Preview Window

You can preview your rendering by clicking the camera icon in the Preview area of the Render Image dialog. Previews reflect the changes you make in the render settings, and can help you adjust your settings without rendering a full-sized image or animation.

To **start** a preview, click on the camera icon located in the lower left corner of the preview area. To **stop** a preview click again on the camera icon.

Use the **Lock** icon to enable or disable the Preview's **auto-update** feature. If you want the Preview to automatically update whenever you make a change to any rendering setting, click the Lock icon. To turn off the auto-update, Unlock it by clicking the Lock icon again.

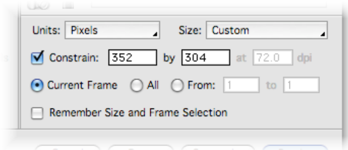



In the Preview Scene menu, you can choose from different options:
• **Active Modeling View:** Using this option creates previews of the active Modeling window. You can preview from any active Modeling window, including Edit windows, Camera windows, Spotlight windows, etc.
**NOTE:** You can also preview a **marquee selection.** With the Rendering Tool selected, draw a marquee with your cursor while holding down the Shift key. The Render Image dialog will open automatically, and the marquee area will appear as the Active Modeling View preview.
• **Default Preview:** This is the standard Render Preview model that is included with the software.

• **Custom Scene:** You can create and save your own model or scene to use as a Render Preview. For more information see **Saving Custom Settings** earlier in this chapter.
• **GL & Toon Preview:** Use this preview for any Toon or OpenGL renders.

## Output Settings

The Output Settings section in the lower right of the Render Image dialog includes options for determining the size and resolution of your image, and which frames of an animation (if any) to render.




### Frame Size

In addition to allowing you to specify which frames to render, this section of the Render dialog also lets you set the units and adjust the dimensions of the frame size. These fields are connected, so that the Size will be based in the Units and Resolution specified. You can also override this by entering the exact dimensions, and using the Constrain checkbox. The options are as follows:
• **Units:** In this pop-up, values for the image size can be specified in pixels, inches, centimeters, percentage, etc.
• **Size:** You can choose from a set of pre-defined sizes in the **pop-up menu**. You can also enter your own custom size, using the **numeric fields** below. The first field sets the height of your rendering, and the second field sets the width.
• **Constrain:** This checkbox allows you to constrain the proportions of the frame size.
• **Resolution (dpi):** You can also adjust the number of dots per inch in the final rendered image. This setting determines the resolution of the final image. (If Pixels is selected in the Units pop-up, the resolution is always 72 dpi and cannot be changed.)

### Frames to Render

These selections control what frame of an animation (if any) to render when the rendering process begins. By default, the first option for rendering just a single frame is selected. There are three radio buttons to select from:

• **Current Frame:** Renders the current frame that the Project window playback head is set to. For non-animated scenes this is the default "frame 1."
• **All:** Renders all frames of the animation as set by the Cut-in and Cut-out markers in the Project window. Unless you have moved them, this is typically every frame of your animation.
• **From:** Allows you to manually enter the frame range to render from your timeline. These can be values outside of the Cut-in and Cut-out markers in the Project window.

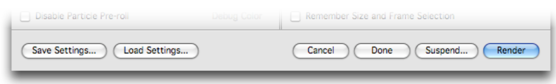
### Remember Size and Animation State

The Remember Size and Animation State checkbox allows you to maintain the output settings during the current session of Design 3D. These settings include the **frame number** (Current, All, or the range of frames indicated), **Units** and **Size**, and the status of the **Constrain** and **Field Rate** checkboxes.

Each time you initiate a rendering using the Render Image dialog or the Rendering Tool, these settings will stay the same. The output settings are maintained until you change them or until you quit Design 3D.

## Render Dialog Commands

The buttons along the bottom of the Render Image dialog allow you to save or load custom render settings; and initiate or suspend a rendering.




**Save Settings:** Click this button to save your render settings as an editable text file. For more information see **Saving Custom Settings** in this chapter.

**Load Settings:** Use this button to locate and load any custom render settings you have previously saved.

**Cancel:** Click Cancel to exit the Render Image dialog, without saving your render settings.

**Done:** This button allows you to save your render settings without initiating a rendering. Once you choose your rendering options, click Done. Your current render settings will be retained when you use the Rendering Tool, or when you summon the Render Image dialog again.

**Suspend:** Click Suspend to render the animation later. When you select Suspend, a dialog appears which allows you to specify a name, location, and file format for the suspended rendering. For more information see **Chapter 17 - Rendering Basics**.

**Render:** After you have made all of your render settings, click the Render button to initiate the rendering.

*Chapter 19*

# Rendering Methods

Strata Design 3D CX provides a variety of rendering techniques or algorithms, commonly called "renderers." There are five main renderers in Design 3D, each with its own subsets of various styles or quality settings.

The main renderers are OpenGL, Toon, Raytracing, Raydiosity and Scanline. Each produces a pixel based image of your scene, but of very different appearances. In addition, you can choose from several quality levels of the Photon Caustic and Soft Shadow preset rendering options. These special presets are based on the main renderers.

The renderers and the special presets are described in this chapter. For information about the Photoshop® Layers preset rendering options, see **Render to Photoshop Layers** in **Chapter 18 - The Render Image Dialog.**

**Selecting a Renderer**

At the top of the Render dialog, there are two menus which allow you to choose a rendering method: the Renderer menu and the Load Saved Settings menu.

The **Renderer menu** lets you choose from the main rendering categories. Once you choose a renderer, you can adjust different settings to suit the needs of your project.

The **Load Saved Settings menu** lets you choose from a number of preset render settings, including any custom settings you have loaded or created yourself. The options in this menu are also available in the Rendering Tool Presets pop-up menu.

The left side of the Render Image dialog contains the controls for determining the quality and speed of your rendering. If you select OpenGL, Toon or Scanline in the Renderer Menu, a **Settings** button appears just under the Renderer menu. Click the button to access the settings for these renderers.

If you select Raytracing or Raydiosity™, the sections containing controls for these high-powered renderers become available. This section of the dialog contains settings for Detail, Lighting, Shadows, Transparency, Reflection and Effects as well as a quality slider which can be used for quick adjustments.

# OpenGL

The OpenGL renderer is a polygon based rendering technique that is extremely fast and efficient. OpenGL can render in software, running on the main processor, or it can utilize 3D accelerated video hardware for very fast calculation. This is the same interactive renderer that is used when displaying your objects in the Modeling windows.

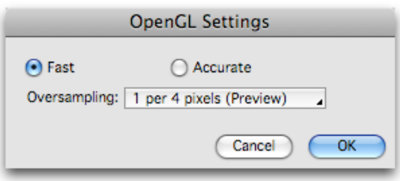
OpenGL provides a series of techniques for displaying the geometry, including PointCloud, Outline, Wireframe, HiddenLine, Flat and Smooth.

The main difference between the use of this rendering method in the interactive displays and using the Rendering Tool or Rendering dialog, is that by explicitly rendering the scene this way you can create much larger images, and save the images created.

**NOTE:** For this renderer, use the Active Modeling View or the GL & Toon option in the Preview pop-up menu to get an accurate preview of your render settings.

## OpenGL Settings

When you select any of the OpenGL renderers from the Render Image dialog's pop-up list of available rendering methods, the **Settings** button becomes available. When you click the Settings button, the OpenGL Settings dialog appears.



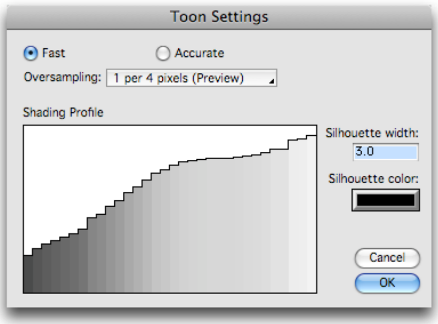

The **Fast** and **Accurate** settings are dependent on your video card and/or the speed of your computer and therefore may not be different from each other in quality or speed, but they can potentially impact larger OpenGL renderings.
• **Oversampling:** Anti-aliasing during the rendering process is achieved through oversampling. The Oversampling field determines the smoothness of the final image. This pop-up sets the upper limit on the number of samples the renderer will use in rendering a single pixel.

# Toon

Toon is based on OpenGL and mimics a hand drawn, cell animation cartoon look. Each of the preset Toon rendering types provide an outline for each object in the scene. The outline color defaults to black but can be changed using the Expert Settings dialog.

Toon provides a series of styles for displaying the geometry, including Flat, Gradient, Average, Bi-Level, and Tri-level.

**NOTE:** For this renderer, use the Active Modeling View or the GL & Toon option in the Preview pop-up menu to get an accurate preview of your render settings.




## Toon Settings

When you select any of the Toon renderers from the Render Image dialog's pop-up list of available rendering methods, the **Settings** button becomes available. When you click the Settings button, the Toon Settings dialog appears. The **Fast** and **Accurate** settings are dependent on your video card and/or the speed of your computer and therefore may not be different from each other in quality or speed, but they can potentially impact larger Toon renderings.
• **Oversampling:** Anti-aliasing during the rendering process is achieved through oversampling. The Oversampling field determines the smoothness of the final image. This field sets the upper limit on the number of samples the renderer will use in rendering a single pixel. High oversampling levels can increase the time required to complete a rendering.
• **Shading Profile:** Unique to Toon, the Shading Profile offers a high level of control over how the Toon renderer shades the object surface. To alter or create your own profile, simply click and drag in the Shading Profile area as if drawing with big pixels. The left side of the area determines the shading for the

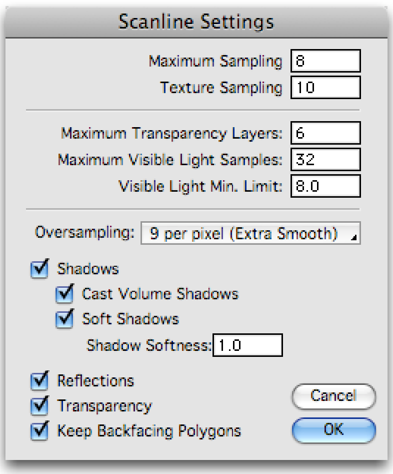
darkest parts of the object and the right side determines control for the lightest areas of the object.
• **Silhouette width:** Use this field to set the width of the silhouette.
• **Silhouette color:** Click on this button to summon a color picker dialog, where you can set the outline color for the Toon rendering.

## Scanline

Scanline renders most of the texture and object effects available in Design 3D, but it does not support refraction or inter-object reflectivity like Raytracing. However, Scanline still renders high quality images, and in some cases renders faster than Raytracing. Scanline also has a limited capability to render shadows. In most cases, Scanline is an excellent choice for animations because of its speed.

The Scanline renderer renders images one line at a time, top to bottom. It supports limited shadows, environmental (or Global) reflectivity, and basic transparency, although additional time may be required to complete the rendering process when these options are enabled.

This renderer is also capable of rendering extremely small detail, including individual lines that may be missed by other rendering methods.




### Scanline Settings

When you select the Scanline renderer from the Render Image dialog's pop-up list of available rendering methods, the **Settings** button becomes available.

When you click the Settings button, the Scanline Settings dialog appears. The default values for Scanline are designed to deliver the most efficient overall performance. You can customize these settings to fit your own specific requirements.

• **Maximum Sampling:** The Scanline renderer works with an entire line of pixels at a time. Each horizontal line is broken into segments. The value in this field determines the maximum length of these segments.
• **Texture Sampling:** When the maximum sampling interval is reached, the renderer scans the image to see if it needs to be refined further. If two adjacent segments have a difference color values greater than what this value indicates, the image is refined further.
• **Maximum Transparency Layers:** The value in this field represents the number of transparent surfaces the Scanline renderer will look through to see if something is behind it. This only affects models that have multiple transparent objects in front of each other. This setting has no effect unless the Transparency checkbox is enabled.
• **Maximum Visible Light Samples:** The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadow casting through objects that have Volumetric effects applied to them. (Shadows are cast within the volume, not by the volume.
• **Visible Light Minimum Limit:** The value in this field determines the size of the visible light samples. Too large a number in this field results in coarser samples and shadows cast through a volume may be missed.
• **Oversampling:** Anti-aliasing during the rendering process is achieved through oversampling. The Oversampling field determines the smoothness of the final image. This field sets an upper limit on the number of samples the renderer will use in rendering a single pixel. High oversampling levels can increase the time required to complete a rendering.
• **Shadows:** This option determines whether or not any shadows appear in the final rendering.
• **Cast Volume Shadows:** When this option is enabled, shadows are cast within volumes.
• **Soft Shadows:** This option creates soft edges on shadows cast by objects that are illuminated by local light sources. This effect is very limited.
• **Shadow Softness:** This field determines the number of samples taken to calculate the edges of the shadow.
• **Reflections:** When this option is enabled, the Scanline renderer supports environmental reflectivity. If your model contains many objects with reflective surfaces, you may want to use Raytracing instead.
• **Transparency:** This option enables transparency. When disabled, all transparent objects present in the model appear opaque in the rendered image. Scanline supports transparency, but not refraction.

• **Keep Backfacing Polygons:** When this box is checked, the Scanline renderer also renders the back side of one-sided polygons. Leaving this option enabled ensures that all objects render correctly, regardless of the angle from which they are viewed.

## About Raytracing

Raytracing is the workhorse renderer of Design 3D, and is a balance between speed and extremely high quality. This method of creating the image works by "shooting" a ray into your scene through each pixel of the image, then tracing that ray's path to determine how the surfaces and lights in your scene generate the color for that single pixel.

If the ray strikes an object, and that object has a reflective surface, then the ray must be followed further backward from this surface to determine whether it came from another surface or from a light source. This backward tracing continues until each light ray is accounted for, ending at either a light source or passing out of the scene.

What all of this means is that Raytracing can produce brilliant reflections and accurate refractions with a very high degree of accuracy. It also produces very accurate shading and shadows, and can trace very small details in both geometry and textures.

**NOTE:** The minimum number of rays that must be traced is equal to the number of pixels in the image being rendered. The larger the image and the higher its resolution, the longer the rendering time. A 144 dpi image, for example, has four times as many rays to trace to produce its pixels as a 72 dpi image of the same dimensions. This means that the render can take four times as long to produce the larger image.

## About Raydiosity

The photo-realistic effects of lighting, shading and reflection in scenes can be very complicated and subtle. Indirect lighting is particularly complex to render, but can greatly increase the realism of any scene. Raydiosity calculates the illumination caused by reflected light from nearby objects, or "inter-object diffuse illumination." These effects are then included in a rendering process almost identical to Raytracing, incorporating the same effects and controls. Raydiosity can be thought of as a form of "super-raytracing" although it goes beyond even that.

In addition to indirect and bounce lighting, Raydiosity also supports soft edges on shadows from Spotlights, Point Lights, Lightdomes and glowing objects. Raydiosity also supports the rendering of blurred reflections and transparency.

Obviously, to do all of this complicated rendering Raydiosity requires a substantial number of calculations. The Raytracer uses only a finite number of rays limited to the viewing position of the image produced, but the Raydiosity renderer is also capable of tracing rays that are not limited to the viewing position. The result is a more time and resource intensive rendering process with both subtle and dramatic results.

## Raytracing and Raydiosity Settings

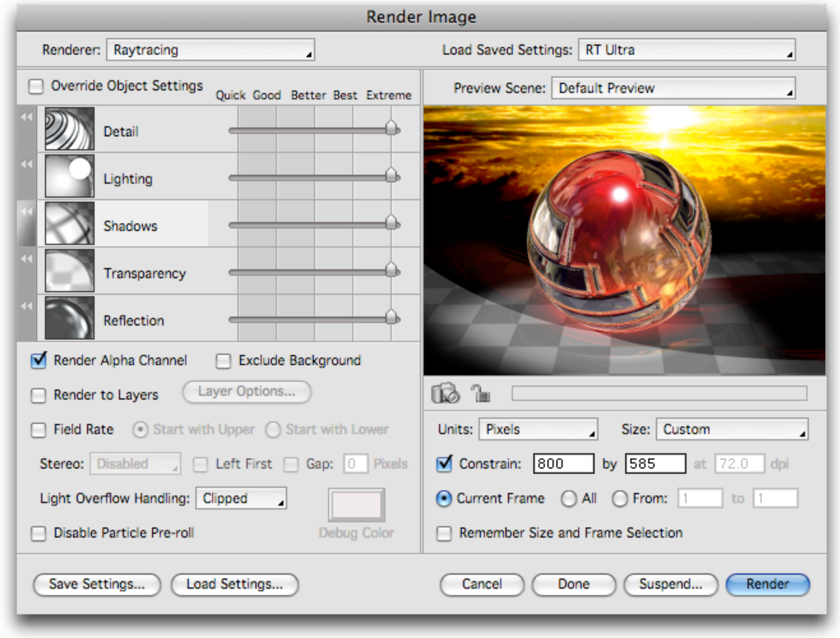
Raytracing and Raydiosity render settings are accessed in the same section of the Render Image dialog, and so the various sliders and numeric entry fields are described together. The difference between the Raytracing and Raydiosity renderers comes in the different settings you make, or the different preset options you choose.

In particular, the Raydiosity rendering engine uses the Radiant Illumination and Caustic Photons sections of the Lighting render settings.

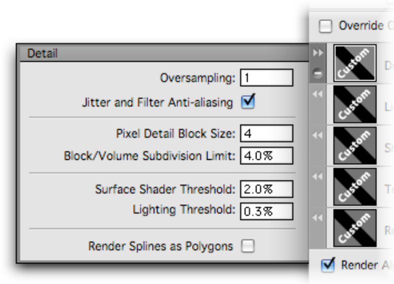
The settings specific to Raytracing and Raydiosity are described here. For more information about other options in the Render Image dialog, see **Chapter 17 - Render Basics** and **Chapter 18 - The Render Image Dialog**.

To select Raytracing or Raydiosity as your rendering method, you can use the Renderer pop-up menu at the top left of the Render Image dialog. You can also select one of the preset Raytracing or Raydiosity options from the Load Saved Settings menu.

When you select Raytracing, Raydiosity or one of the associated presets, various render settings become available. The available settings are organized into different **sections** for controlling a rendering's **Detail**, **Lighting**, **Shadows**, **Transparency** and **Reflection**.




Each of the settings sections utilizes these controls:
• **Sliders**: The rendering setting sliders allow you to quickly set the features of the rendering for each area from a range of Quick, Good, Better, Best and Extreme.
Rendering is always a trade-off between speed and quality, and the settings you choose will depend on the needs of your particular project. The higher the quality settings you choose, the longer your rendering will take.
• **Custom setting indicator:** You can use the setting sliders to quickly make render settings. If you then make a change in any of the drawer settings, the presets are invalidated, and a "Custom" icon appears over the slider to remind you that the render settings have been changed.
**To remove the custom setting** and any changes you made in the drawer, simply click on the Custom graphic and the slider (and drawer settings) will return to the previous setting.
• **Drawers:** These contain more advanced render settings which are used to refine the render settings. They are described in detail below. The drawers contain various checkboxes and numeric fields.




**Dialog Shortcuts**
Navigating through the many available settings in the Render Image dialog is quick and easy using these shortcuts:
• **Section name:** Clicking on or near a section name, such as Detail, Lighting, etc., makes that section active, and opens the section drawer. Clicking on the section name again closes the drawer.
• **Spacebar:** Opens or closes the active section drawer.
• **Scroll wheel:** Moves the focus (active area) up or down through the settings sections. If you have a section drawer open, the scroll wheel will move you to the next section drawer.
• **Tab key:** Moves from one numeric field to another in the Render Image dialog. If you have a section drawer open, its available numeric fields will be included when you tab from one field to field.
• **Shift-Tab:** Reverses the tabbing order.
• **Shift:** Holding down the Shift key while moving one of the sliders moves all the other sliders to the same quality setting.
• **Arrow keys:** Use the right/left arrow keys to move the active slider, and the up and down arrows to move from one section to another. With a numeric field highlighted, use the up/down keys to increase or decrease the field's values. Using **Option** or **Alt** (Win) with the up/down arrow keys in numeric fields changes the value in small increments, while using **Command** or **Ctrl** (Win) changes the value in large increments.

## Detail Settings

• **Oversampling:** Anti-aliasing during the rendering process is achieved through oversampling, and also through the **Jitter and Filter Anti-aliasing** setting. The Oversampling field determines the smoothness of the final image. This field sets an upper limit on the number of samples the renderer will use in rendering a single pixel. High oversampling levels can increase the time required to complete a rendering.
• **Jitter and Filter Anti-aliasing:** Although oversampling is the primary method of anti-aliasing, the oversampled pixels can also be jittered and filtered

to obtain an even higher quality image. This method alters the color of the pixels along diagonal lines or edges, and can produce visually pleasing images without the need for higher resolution and larger file sizes.

Jittering happens while the renderer is casting the oversampling rays. It randomizes the locations within the pixel where the sample is taken. This produces a result that is more pleasing to the human eye. The filtering of oversampled pixels happens after the rendering is finished and smooths out any remaining noise.

• **Pixel Detail Block Size:** When creating an image, the renderer starts with large blocks of pixels which are refined smaller and smaller during the rendering process. The refinement continues on every pixel block until the maximum block size is reached. At that point, the Block/volume subdivision limit setting decides which blocks to refine smaller. A setting of four in this field means a four-pixel by four-pixel block.

A block size that is too large may result in missing letters in text, or single-pixel lines in surface textures not displaying correctly. These problems can be especially noticeable in animations. Higher numbers result in less accuracy in rendering of fine details. Smaller numbers (smaller block sizes) will improve rendering of fine details.

• **Block/Volume Subdivision Limit:** When the maximum tracing block size is reached, Design 3D scans the image block-by-block to see if it needs to be refined further. This setting is a threshold which determines if two adjacent pixels need to be resolved further through taking more samples.

Setting the value higher increases rendering speed, but may cause banding of certain colors on curved, shaded surfaces. Setting the value lower forces all block sizes to be resolved more finely, even if banding is not visible.

• **Surface Shading Threshold**: This setting controls the threshold at which a texture (shader) channel value is determined to be all the way on or off. For example when the Stencil channel gets close to zero, the renderer assumes the surface should be completely stenciled away. This is an optimization that allows the renderer to be faster and more efficient. Setting the threshold to zero eliminates this optimization, but may be needed in certain circumstances.

• **Lighting Threshold:** This setting controls the threshold used while calculating the values of a light source. Increasing this threshold will raise the value at which a light is considered too dim to be calculated. Setting this threshold to zero ensures that the light is always calculated by the renderer.

• **Render Splines as Polygons:** When this box is checked, all Bézier surfaces are treated as polygonal meshes while rendering. This may significantly reduce the time required for rendering, but may require additional memory. This option does not change the model in any way, only the way it renders.

**NOTE**: You may also want to use the Interpolate Polygon Shadows setting, located in the Shadows settings drawer. It helps smooth the edges of shadows on curved mesh surfaces.

## Lighting Settings

- **Enable Radiant Illumination:** This checkbox enables or disables all render settings related to Radiant Illumination. Radiant Illumination utilizes the Raydiosity renderer. Disabling this checkbox allows you to speed up rendering times if you don't need these options in a particular project or rendering.
- **Raydiosity Lighting Samples:** This field determines the maximum number of secondary light rays generated when a primary ray strikes a diffuse surface. The actual number depends on the roughness of the surface. This field determines how much other surfaces contribute to the appearance of a primary surface. This field is the setting that most significantly influences the amount of inter-object illumination or color bleed between adjacent objects.
A setting of one means just one secondary light ray is traced for every primary ray. The higher the value, the more the secondary objects influence the illumination of the primary object, and the longer the rendering time.
- **Raydiosity Bounces:** This field sets a limit for Raydiosity Lighting Samples. A setting of zero in this field effectively disables Radiant Illumination. A setting of one will only accumulate lighting from objects directly visible from the surface being renderered. A setting of two (two bounces) means the renderer will also gather Raydiosity lighting samples for a surface encountered while gathering lighting for the first surface, and so forth.
- **Raydiosity Amplifier:** This field controls the overall brightness of the image by controlling the amount of diffuse illumination. Acceptable ranges for this field are usually from 0.1 to 1.9. If this field is set at 1.0, the image is not affected. Values less than one reduce the brightness; values greater than one increase the brightness level.
- **Cache Threshold:** A cache is a set of stored data from previous operations that is referenced when similar conditions are encountered later. This field sets the distance from a pixel that the renderer will check for cached diffuse light information. The larger the cache setting, the faster the rendering, while a lower setting is more accurate.
- **Cache Hits:** This field determines the number of samples that must be found in the cache at a given spot (given the constraints of other settings such as Cache Threshold, Angle Deviation, etc.) before the renderer will use the cache. If too few samples are found, the renderer will continue tracing light rays until the cache has enough information. A higher value in this field will increase the quality but will also increase rendering times.
- **Cache Angle Deviation:** This field determines how much the surface normal in a particular spot is allowed to deviate from the normal of a previously cached place. A larger value allows wider differences in the surface normal orientation, which is more likely to result in cache matches for curved surfaces. Flat surfaces share the same surface normal over the entire surface, and will not need any changes in this field. Lower values may be needed for accurate rendering of small, curved surfaces.

• **Enable Caustics Photons:** This checkbox enables or disables all of the Lighting settings for **Photons**. Caustics Photons utilize the Raydiosity renderer and allow you to easily speed up your rendering by disabling these options when they are not needed.
**NOTE:** Caustics are a type of effect created when light passes through a refractive object or is reflected off of an object. An example of this is the way light is affected as it passes through a lens. With a light on one side, the lens will create a pattern of focused light on the opposite side. Design 3D can calculate light based on simulated photon particles to achieve highly realistic effects such as transmissive and reflective caustics.
• **Photons Per Light:** This value sets the maximum number of photons for each Point or Spotlight in a scene with Photons active. The value entered is Millions of Photons. Large numbers of photons, in the millions, should be used to get effective results. However, it takes more time to render the scene with better Caustics, and increases exponentially with each photon-casting light source in your scene. A setting of zero will cast no photons, meaning that no Caustics will be generated in the scene.
• **Photons per Estimate:** This setting determines how many photon samples must be found at a particular spot before the renderer will calculate the contribution of caustics to the surface lighting. Setting the value higher may result in higher quality results, but will take longer to render.
• **Estimate Search Distance:** This setting determines how large an area will be searched, in model units, for photons to include in a given pixel of the rendering. You can change the model's default units in the Set Units dialog, available in the Edit menu.
• **Caustics Brightness:** This number effectively scales the brightness of collected light in the caustics. Higher settings result in more powerful photons and therefore brighter Caustics.
• **Volume Lighting Samples:** The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadows cast through objects to which volumetric effects have been applied.
• **Volume Lighting Minimum:** This value determines the size of the light samples. Too large a number in this field results in coarser samples, and shadows cast through a volume may be missed.

## Shadow Settings

• **Cast Surface Shadows:** This checkbox enables or disables the Spot/Point Light Soft Shadow Samples and Interpolate Polygon Shadows settings. This allows you turn these settings on or off, depending on the needs of your individual project.
• **Spot/Point Light Soft Shadow Samples:** This field determines the number of samples taken to calculate the softness of the edges of shadows cast by

Spot and Point Light sources. Higher numbers reduce noise in the soft shadow edges, but take longer to render.

• **Interpolate Polygon Shadows:** In some cases the renderer is forced to triangulate when calculating the shadows on a polygonal mesh object. When this occurs, some polygonal surface shadow edges can have a jagged appearance. Enabling this option forces the renderer to interpolate the edge of the shadow, creating a smooth transition from shadow to non-shadow area.

• **Cast Volume Shadows:** When this option is enabled, settings become available to allow objects to cast shadows **inside** volumes.

In addition to enabling this option, you must also check the Enable Shadows checkbox in the Volumetric texture's editing dialog.

• **Volume Shadow Softness:** This setting specifies the number of samples taken for calculating the shadows cast within volumes.

• **Allow Shadow Buffer for Volumes:** Shadows within volumes can require a lot of time to render. Enabling this checkbox speeds up the rendering process by setting up a buffer to store previously sampled information to use for calculating shadows cast inside volumes.

**Shadow Threshold Settings**

The following three shadow threshold settings are applied when the rendering engine is determining whether or not to cast shadows. If the diffuse reflectance and opacity of the surface fall below the set thresholds, the renderer assumes the shadow will not be visible and stops looking for shadow information. The shadow threshold settings allow you to raise or lower this threshold. In most situations, you will not need to adjust these settings.

• **Shadow on Surface Diffuse Threshold:** This threshold is applied by the renderer as it determines whether to cast a shadow on a surface. This setting looks at the surface's diffuse reflectance; if it is below the threshold it assumes the surface is in full shadow; it considers the light intensity to be zero and stops looking for more information.

• **Shadow on Surface Opacity Threshold:** This threshold is applied by the renderer as it determines whether to cast a shadow on a transparent surface. If the surface's transparency is below the threshold, the renderer assumes the surface has no shadow and stops looking for more information.

• **Shadow Through Surface Threshold:** This threshold is applied by the renderer as it traces rays of light through one surface to another, checking for shadow information. If the intensity of light is diminished to below the threshold value after passing through a surface, it is assumed to be in full shadow. At this point the light intensity is considered to be zero and the renderer stops looking for more information.

## Transparency Settings

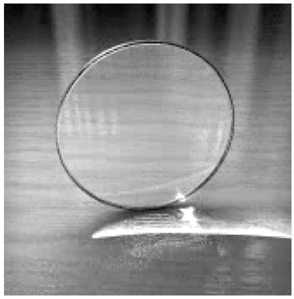
• **Transparency Layers:** This field determines how many layers of transparent surfaces the renderer will look through to see if there is something behind them before simply rendering the background color. Therefore this setting only affects models with multiple transparent objects positioned in front of each other.
• **Blurry Transparency Samples:** This field determines the number of samples taken when rendering blurry transparency. Blur on a surface is determined by the texture's Smoothness channel setting, and whether blurriness is enabled in the Image Texture dialog. A higher sample count renders blurry surfaces more accurately, but will take longer.
• **Enable Radiant Cache for Blurry Samples:** This setting allows you to enable the radiant (Raydiosity) cache while rendering blurry transparency. This may eliminate "noise" from the image in some circumstances, but it will increase rendering times and is generally not needed. This checkbox is not available unless you have **Enable Radiant Illumination** in the Lighting drawer enabled.

## Reflection Settings

• **Reflection Bounces:** This field affects how a ray of light is traced as it reflects from surface to surface. It determines how many times an object will be reflected in the surfaces of other objects.
• **Blurry Reflection Samples:** This field determines the number of samples taken when rendering blurry reflections. Blur on a surface is determined by the texture's Smoothness channel setting, and whether blurriness is enabled in the Image Texture dialog. A higher sample count renders blurry surfaces more accurately, but will take longer.
• **Enable Radiant Cache for Blurry Samples:** This setting allows you to enable the radiant (Raydiosity) cache while rendering blurry reflections. This may eliminate "noise" from the image in some circumstances, but it will increase rendering times and is generally not needed. This checkbox is not available unless you have **Enable Radiant Illumination** in the Lighting drawer enabled.

# Photon Settings

Design 3D can calculate light based on simulated photon particles to achieve highly realistic effects such as transmissive and reflective caustics. Caustics are a type of effect created when light passes through a refractive object or is reflected off of an object. An example of this is the way light is affected as it passes through a lens. With a light on one side, the lens will create a pattern of focused light on the opposite side.



To use photons and to create caustics you must use the **Raytracing** or **Raydiosity** renderer, **and** have Spotlights or Point Lights in your model. The Spot or Point Lights must have the **Photons** checkbox in the Object Properties palette enabled. When using photons, the Total Fall-off and Full Intensity Distance settings of these lights play a major role. Directional lights, Lightdomes and glowing objects will not generate photon-based caustics.

For more information about using light sources while creating Photon Caustics see **Chapter 14 - Lighting the Scene**.

The easiest way to get the right rendering setting is to choose one of the **Photon presets** from the Rendering Tool presets menu, or from the Load Saved Settings menu in the Render Image dialog. The Photon presets that ship with Design 3D are already highly optimized and a good choice in most situations.

**Caustics**
The settings for photon maps and creating photon caustics are found in the **Lighting** section drawer. For more information about Photon Caustics settings, see the section **Raytracing and Raydiosity Settings**, earlier in this chapter.

## Soft Shadow Settings

Using the **Raydiosity** renderer or one of the **Soft Shadow preset** rendering options, you can create soft shadows in your images.

The Raydiosity renderer and Soft Shadow presets that ship with Design 3D are already highly optimized and a good choice in most situations. You can select one of these presets from the Load Saved Settings menu. There are various quality levels, and tuned presets for scenes with Lightdomes or Local Lights casting the soft shadows.

To create soft shadows you need a light source that provides a diffused point of origin. A small Light Source Radius or physical size creates a harder shadow. (Think of the different shadows cast by a fluorescent light and a camera flash.)

You can create these types of soft, diffused light sources in several ways:
• **Bounced light:** The Raydiosity renderer can actually calculate light bouncing from one object to another. This effectively creates a diffused light source.
• **Lightdome:** A Lightdome will typically provide a very soft and diffused source of light, depending on the image used in the Background applied to the Lightdome.
• **Local lights:** Local lights (Point Lights and Spotlights) have a special control specifically designed to determine the size of the light source. Use the Light Source Radius field on the Object Properties palette to set the size. The larger the radius of the light source, the softer the shadows. Make sure you also enable the **Shadows** checkbox to create soft shadows. For more information about using light sources while creating soft shadows see **Chapter 14 - Lighting the Scene**.
• **Glowing objects:** The Glow Factor channel in the Image Texture dialog allows you to enter a number to cause the surface of an object to glow. When using the Raydiosity renderer, glowing objects will act as diffused light sources which will cast very soft shadows. For more information about using the Glow Factor texture channel, see **Chapter 9 - Using Image Textures**.

## Chapter 20

# Special Renderers

Strata Design 3D CX contains several special rendering options. These include making custom render settings for individual objects or lights, designating objects for Boolean rendering, rendering to Strata Live 3D CX for 3D web delivery, and rendering for a QTVR Panorama.

## Overriding Render Settings on Objects and Lights

Strata Design 3D CX allows you to override the global render settings for objects and local lights. You can make render settings for objects, Point Lights and Spotlights that are different from those you make in the Render Image dialog. Using these per-object and per-light render options "forces" new settings which override those made in the Render Image dialog.

While the rest of the model or animation will render according to the Render Image dialog settings, the specific object or light will render with its own settings. This can be very useful when trying to optimize render speed vs. image quality. Consider using these overrides when you encounter a scene that has problem objects, illumination, or shadows in an otherwise acceptable render.

### Object-Specific Render Settings

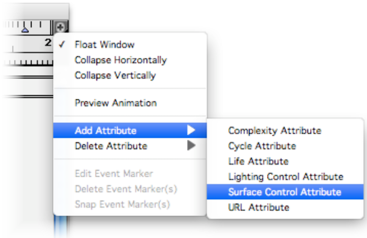
Per-object rendering lets you make render settings that are specific to a single object, or hierarchy of objects. This can be very useful in situations in which you have many objects in a model or scene. You may need certain objects to render with a lot of detail and precision, while other objects in your scene may be in the background, or simply need less detail and thus different render settings.

These per-object render settings are made in the Project window, and will **override** the render settings for the whole scene, which are made in the Render Image dialog. The settings you make in the Render Image dialog will apply to every object and surface in your scene, unless you have made per-object settings in the Project window.

#### Making Per-object Render Settings

To set up per-object render settings, you first need to add a Surface Control Attribute in the Project window. Attributes like Scale, Rotation and Position appear in the Project window automatically, while others can be added if you need them.

**To add a Surface Control attribute:** With the object selected, choose Add Attribute > Surface Control Attribute from the Project window Plus menu.



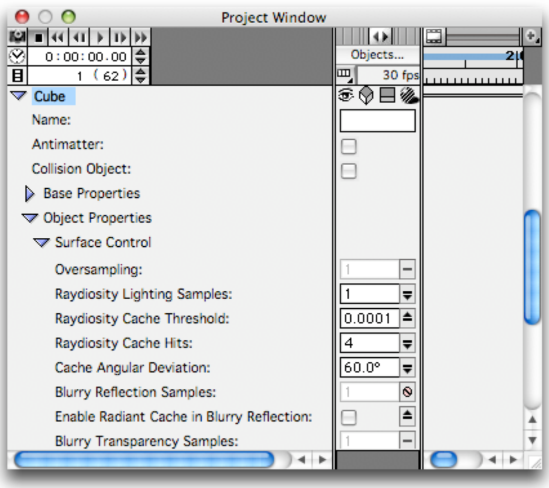

The new Surface Control attribute will appear in the Project window, under the object's Object Properties. Turn down the arrow by the object's name to access the per-object render controls and other editable attributes.

The settings you see in the Project window are similar to the render settings that are available in the Render Image dialog, but they apply only to the object, not globally.

You can make adjustments to the available settings using the numeric fields and checkboxes. You can choose to override just one setting, or you can use them all, depending on your needs. You can also "force" the new render settings on any other object in the original object's shape or group hierarchy.

The icon to the right of each Surface Control field has three states. Clicking the icon toggles through the different states:
• **Dash:** This is the default state - the object will render according to the Render Image dialog settings. As long as this icon appears, the Surface Control Attribute setting is not in effect.
• **Down arrow:** This means you are providing custom settings for this object and any contained objects, **unless** the contained objects supply their own settings. "Contained" objects include those in groups, shapes, etc. The per-object render setting you make in the object's Surface Control fields will override the Render Image dialog settings (unless the Override Object Settings checkbox is enabled in the Render Image dialog).
• **Up arrow:** This means you are forcing custom settings for this object and all contained objects, **regardless** of whether or not those objects have their own settings. "Contained" objects include those in groups, shapes, etc. In other words, the new setting you make in the object's Surface Control field will override the Render Image dialog settings (unless the Override Object Settings

checkbox is enabled), and will also override the render settings of any other contained objects.
• **Circle with slash:** Disables the field. Some settings, for example those having to do with Raydiosity and Photons, can be disabled. Disabling these settings in situations where they are not needed can significantly speed up your renderings.




**Per-Object Render Settings**
These settings are very similar to what you will find in the Render Image dialog, however they apply only to a specific object or object hierarchy, not the entire model or scene.
• **Oversampling:** Anti-aliasing during the rendering process is achieved through oversampling. The Oversampling field determines the smoothness of the final image. This field sets an upper limit on the number of samples the renderer will use in rendering a single pixel. High oversampling levels can increase the time required to complete a rendering.
• **Raydiosity Lighting Samples:** This field determines the maximum number of secondary light rays generated when a primary ray strikes a diffuse surface. The actual number depends on the roughness of the surface. This field determines how much other surfaces contribute to the appearance of a primary surface. This field is the setting that most significantly influences the amount of inter-object illumination or color bleed between adjacent objects.
A setting of one means just one secondary light ray is traced for every primary ray. The higher the value, the more the secondary objects influence the illumination of the primary object, and the longer the rendering time.
• **Raydiosity Cache Threshold:** A cache is a set of stored data from previous operations that is referenced when similar conditions are encountered later. This field sets the distance from a pixel that the renderer will check for cached

diffuse light information. If the renderer finds cached information, it will use it instead of doing further calculations. The larger the cache setting, the faster the rendering, while a lower setting is more accurate.

• **Raydiosity Cache Hits:** This field determines the number of samples that must be found in the cache at a given spot (given the constraints of other settings such as Cache Threshold, Angular Deviation, etc.) before the renderer will use the cache. If too few samples are found, the renderer will continue tracing light rays until the cache has enough information. A higher value in this field will increase the quality but will also increase rendering times.

• **Cache Angular Deviation:** This field determines how much the surface normal in a particular spot is allowed to deviate from the normal of a previously cached place while calculating Radiosity lighting. A larger value allows wider differences in the surface normal orientation, which is more likely to result in cache matches for curved surfaces. If the renderer finds a cache match, it will use the cache information instead of doing further calculations.

Flat surfaces share the same surface normal over the entire surface, and will not need any changes in this field. Lower values may be needed for accurate rendering of small, curved surfaces.

• **Blurry Reflection Samples:** This field determines the number of samples taken by the renderer when calculating blurriness in reflections. Blur on a surface is determined by the texture's Smoothness channel setting, and whether blurriness is enabled in the Image Texture dialog. A higher sample count renders blurry surfaces more accurately, but will take longer.

• **Enable Radiant Cache in Blurry Reflections:** This setting allows you to enable the diffuse (Raydiosity) cache while rendering blurry reflections. This may eliminate "noise" from the image in some circumstances, but it will increase rendering times and is generally not needed.

• **Blurry Transparency Samples:** This field determines the number of samples taken when rendering blurry transparency. Blur is determined by the texture's Smoothness channel setting, and whether blurriness is enabled in the Image Texture dialog. A higher sample count renders blurry surfaces more accurately, but will take longer.

• **Enable Radiant Cache in Blurry Transparency:** This setting allows you to enable the diffuse (Raydiosity) cache while rendering blurry transparency. This may eliminate "noise" from the image in some circumstances, but it will increase rendering times and is generally not needed.

• **Surface Shading Threshold:** This setting controls the threshold at which a texture (shader) channel is determined to be all the way on or off. For example when the Stencil channel value gets close to zero, the renderer assumes the surface should be completely stenciled away. This is an optimization that allows the renderer to be faster and more efficient. Setting the threshold to zero eliminates this optimization, but may be needed in certain circumstances.

• **Shadow on Surface Diffuse Threshold:** This threshold is applied by the renderer as it determines whether to cast a shadow on a surface. This setting

looks at the surface's diffuse reflectance; if it is below the threshold it assumes the surface is in full shadow, considers the light intensity to be zero and stops looking for more information. In most cases, you will not need to change this setting.
• **Shadow on Surface Opacity Threshold:** This threshold is applied by the renderer as it determines whether to cast a shadow on a transparent surface. If the surface's transparency is below the threshold, the renderer assumes the surface has no shadow and stops looking for more information.
• **Spot/Point Light Soft Shadow Samples:** This field determines the number of samples taken to calculate the softness of the edges of shadows cast by Spot and Point lights. Higher numbers reduce noise in the soft shadow edges, but take longer to render.
• **Photons per Estimate:** This setting determines how many photon samples must be found at a particular spot before the renderer will calculate the contribution of caustics to the surface lighting. Setting the value higher may result in higher quality results, but will take longer to render.
• **Photon Estimate Search Distance:** This setting applies to photon mapped caustics. It determines how large an area will be searched for photons to include in a given pixel of the rendering.

## Light-Specific Render Settings

You can make light-specific render settings for local lights using the Project window. This allows you to individually control how light from a particular Point Light or Spotlight is rendered.

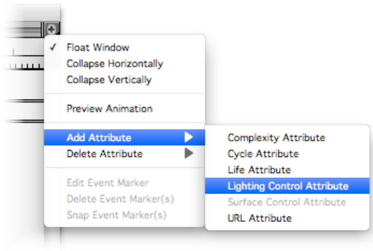
This is useful because settings made in the Render Image dialog apply to all lights in your model or scene. With the per-light settings, you can individually control the way light from a particular source is rendered.

**NOTE:** These render settings can also be applied to groups or shapes which contain a light source.

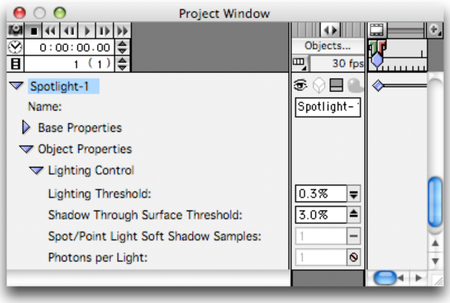
### Making Per-light Render Settings

To set up per-light render settings, you first need to add a Lighting Control attribute in the Project window. A local light has several attributes that appear in the Project window automatically, but you will need to add the Lighting Control attribute manually:

With the Point Light or Spotlight selected, choose **Add Attribute > Lighting Control Attribute** from the Project window **Plus menu**. You can also add a Lighting Control attribute to a group of lights.




The new attribute "Lighting Control" will appear under the light's Object Properties. Turn down the arrow to access the per-light render controls.




The icon to the right of the numeric field has three states. Clicking the icon toggles through the different states:

• **Dash:** This is the default state. The light from the Point or Spotlight will render according to the Render Image dialog settings. As long as this icon appears, the Surface Control Attribute setting is not in effect.

• **Down arrow:** This means you are providing custom settings for this light and any contained objects, **unless** the contained objects supply their own settings. "Contained" objects include those in groups, shapes, etc. The per-object render setting you make in the object's Surface Control fields will override the Render Image dialog settings (unless the Override Object Settings checkbox is enabled in the Render Image dialog).

• **Up arrow:** This means you are forcing custom settings for this light and all contained objects, **regardless** of whether or not those objects have their own settings. "Contained" objects include those in groups, shapes, etc. In other words, the new setting you make in the light's Surface Control field will override the Render Image dialog settings (unless the Override Object Settings checkbox is enabled), and will also override the render settings of any other contained objects.

• **Circle with slash:** Disables the field. Some settings can be disabled, for example those having to do with Raydiosity and Photons. Disabling these settings in situations where they are not needed can significantly speed up your renderings.

**Per-light Render Settings**
• **Lighting Threshold:** This setting controls the threshold used while calculating the values of a light source. Increasing this threshold will raise the value at which a light is considered too dim to be calculated. Setting this threshold to zero ensures that the light is always calculated by the renderer. Setting the threshold too high can lead to the appearance of unexpected dark circles or edges.
• **Shadow Through Surface Threshold:** This threshold is applied by the renderer as it traces rays of light through one surface to another, checking for shadow information. If the intensity of light is diminished to below the threshold value after passing through a surface, it is assumed to be in full shadow. At this point the light intensity is considered to be zero and the renderer stops looking for more information.
• **Spot/Point Light Soft Shadow Samples:** This field determines the number of samples taken to calculate the softness of the edges of shadows cast by Spot and Point Light sources. Higher numbers reduce noise in the soft shadow edges, but take longer to render.
• **Photons per Light:** This value sets the maximum number of photons for each Point or Spotlight in a scene with Photons active. The value entered is Millions of Photons. Large numbers of photons, in the millions, should be used to get effective results. However, it takes more time to render the scene with better Caustics, and increases exponentially with each photon-casting light source in your scene. A setting of zero will cast no photons, meaning that no caustics will be generated in the scene for this light source.

## Boolean Anti-Matter Renderings

Design 3D offers you the option of performing Boolean renderings by making an object into an **anti-matter** object. Boolean anti-matter renderings can simulate objects created with the Subtract and Intersect Boolean tools, but without explicitly creating the geometry. Instead, the Raytracer removes certain parts from the final image, while the actual, untouched objects are still seen intact in the Modeling window.

To designate an object as anti-matter, expand the object's down arrow in the **Project window** to see the Anti-Matter checkbox. Checking this box for any object will cause it to be invisible in the rendering. Any non anti-matter object that intersects the anti-matter object will get that section removed and also be invisible. If two anti-matter objects intersect, where they intersect will become visible (double negative). Another useful effect of anti-matter rendering is that the surface texture of the anti-matter object gets applied to the hole that it leaves behind in any object it intersects.

## QTVR Panorama

The QuickTime VR Panorama simulates a camera with a 360° panoramic lens, and must be rendered through a **Camera Window** and not a Modeling window. Because the camera sees all around the central location of the camera, this type of output is best when the camera is in the middle of the action or in an interior space.

The panoramic image output can be handled as a regular image, or composed into an interactive VR playable in any version of QuickTime. There are utilities for converting the pixel-based image to an unwarped QTVR file for display on the web or anywhere a QuickTime file can be used.

It is best to have the Camera Window aspect ratio set to Panorama or a very wide custom view to adequately see a preview of the scene as it would be rendered.

## Live 3D CX Rendering

Strata Live 3D CX ™ is a companion product to Design 3D capable of producing interactive 3D presentations for web delivery. A Live 3D presentation is an optimized 3D object with textures, animation, and hotspots. These are different from QTVR objects or Vector animations because they are not 2D images, but rather true 3D objects that are optimized for online viewing. Creating, texturing and animating your objects in Design 3D is the best place to start a Live 3D project.

**NOTE:** You will need the Live 3D package to utilize the XMM files created by this "rendering" process. The output files themselves are not yet ready to viewed on the web, using Live 3D or any other interactive technology. The Design 3D package includes no tools for re-opening or optimizing these files.

### Building Your File

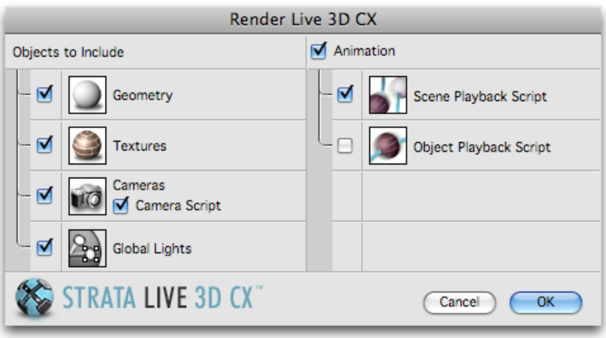
Because Live 3D is much more than a pixel or vector-based 2D representation of your current view, more information than just a "snapshot view" needs to be stored in the file. This includes the actual geometry of your models, along with any textures and image maps, lights, and even some types of animation. All of this information comes from your current 3D scene in Design 3D. Design 3D is designed to build nearly any scene you want, without regard for fast web viewing. This means that your scene will need to be optimized before being used for a web presentation.

Strata Live 3D CX does a lot of this optimization for you by automatically dealing with the three key areas of optimization: decimation, compression and streaming. As powerful as these proprietary optimization features are in Live 3D, you can still achieve a more streamlined web presentation by doing some optimization in Design 3D first. You'll find that your models will likely have extra polygons, objects and high resolution texture maps that aren't necessary for a Live 3D presentation. If possible, you'll want to clean up or remove some of these objects prior to exporting the model for use in Live 3D.

Some of the areas of concern include:
• Small details (nuts, bolts, etc.)
• Hidden & unused details (internal machinery, components, etc.)
• Fine details (high polygon count representation of surfaces)
• High resolution textures (images that are meant for very close examination in the original model but may not see such scrutiny in your Live 3D presentation)

## Render to Live 3D CX Dialog

To begin the Live 3D rendering process, choose **Render Live 3D CX ...** from the **Rendering** menu. This will bring up the Render to Live 3D dialog. You might notice that this dialog is built like the layers palettes in many other programs. This is because the Live 3D file format can support many different elements, but they are all optional. Generally, however, you will want to include your Geometry to have something to display in Live 3D.




The options for including each element are:
• **Geometry:** This includes **all** geometry in your scene, including Hidden and Construction objects. All objects will be converted to Polygon Meshes upon be-

ing rendered to Live 3D, and Subdivision objects will be reverted to their base cage mesh. Though this automatic process can produce quality models, you may want to use the Convert command from the Modeling menu to create the specific polygon mesh conversion you desire.
• **Textures:** All simple colors and specular data attached to each object are included, as well as mapped Image Map textures. Live 3D requires UV mapped textures so the Render Live 3D feature automatically converts other mapping techniques (such as Cubic and Spherical) into UV mapped textures. You can manually achieve this same result by using the Burn UV command from the Modeling menu. Burn UV only works on polygon mesh objects.
• **Cameras:** This option outputs any and all camera objects as named views for your Strata Live 3D CX file.
• **Camera Script:** If you have animation applied to your camera and wish to use this in your Live 3D project, check this box to include it as a script that can be understood by Live 3D.
• **Global Lights:** Only Directional Lights and the Ambient color are supported for lighting your scene, so these lights are converted to their Live 3D equivalents. Some lighting might need to be adjusted in Live 3D.
• **Animation:** Use this checkbox to turn all animation output options off.
• **Scene Playback Script:** This option will include a scene level script that combines all object animations into one named script.
• **Object Playback Script:** This option will include an object level script that combines all object animations into individual named scripts.

Once you have your Design 3D model rendered out to an XMM file, you're ready to take it into Strata Live 3D CX to create high quality interactive web presentations perfect for marketing projects, online catalogs, training manuals, design presentations and more.

Chapter 21

# Menu Commands

This chapter describes the Strata 3D CX menu options and commands. While many of the commands are described in more detail elsewhere in this manual, all of the menu options are described briefly here.

## Preference Settings

Preferences are a way to set options for the entire application environment of Design 3D These settings will carry over into all of your projects, and control the behavior, function, and look of many other parts of the application. Default settings are provided, but these Preferences can be used to customize Design 3D based on your workflow and needs.

### Using The Preferences Dialog

You can access the application preferences in different ways, depending on the operating system (OS) you are using. If you are using Design 3D in the Windows OS, choose the **Preferences** command from the **Edit** menu to display the Preferences dialog. If you are using Design 3D under the Macintosh OS (X), choose the **Preferences** command from the **Strata Design 3D CX** application menu.

The dialog contains three panels: General, Rendering, and Windows. Preferences for different portions of the application are in each panel. Common to all panels are the **Reset, Cancel,** and **OK** buttons. Cancel and OK are self-explanatory and common to all dialogs.

**Reset Button**
Each panel contains a special Reset button at the bottom left of the palette. The Reset button, which is available on all three panels of the Preference dialog, allows you to reset all of your preference settings back to the default. It takes effect only when you re-launch the software.

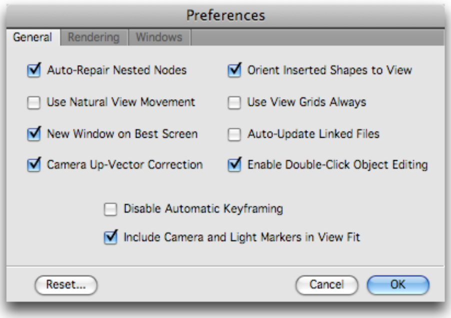
The Reset button serves the same purpose as deleting your preferences file from the system. Occasionally, preference files can become corrupt. If you are having problems with the software, this is a quick possible fix.

When you click the Reset button a dialog appears stating: “Preferences will be reset when the application is relaunched. Would you like to quit now?” You’re given the opportunity to Cancel, Continue or Quit.

• **Cancel** returns you to the Preferences dialog without making any changes.
• **Continue** closes the Preferences dialog and returns you to the main window.
• **Quit** shuts down Design 3D and resets your preferences for the next launch.

## General Panel

The General panel provides preference settings for various areas of the application that do not fall under the Rendering or Windows categories.




• **Auto repair nested nodes.** If you check this box, Design 3D will automatically repair nested nodes - a problem that can occur when you group and ungroup objects multiple times.

• **Use natural view movement.** This allows users who are familiar with Design 3D’s previous view movement to continue using that behavior, or the newer, more intuitive method. This checkbox essentially toggles a reversal of mouse-to-view directions when altering the view in a Modeling window.

• **New window on best screen.** If you have more than one monitor, checking this box will cause the new window to open on the best color monitor. If there is no difference in color depth between the monitors, the window will open on the monitor where the Menu bar appears. If this option is disabled, the new window also opens on the monitor where the Menu bar appears.

• **Camera up-vector correction.** When this box is checked, the default Camera Object Tool setting is to constrain the camera from rolling as it moves through your model. The camera always remains in a vertical orientation.

• **Orient inserted shapes to view.** With this box checked, shapes can be inserted into your model in these ways:
**Drag-n-drop**: At mouse release position, the shape is placed on the active grid, oriented to the active view.
**Insert button**: The shape is placed on the active grid, oriented to and near the center of the active view.

Unchecking this option enables several command keys pertaining to the ways shapes can be inserted into your model. For more information see **Chapter 4 - Advanced Modeling.**

• **Use view grids always.** When this box is checked, new models open with the View Grids active. With View Grids enabled, all modeling occurs relative to the active view. To disable View Grids, click the View Grid button in the Modeling window. If this box is unchecked, all models open with the default grid specified on the Windows panel.

• **Auto-update linked files.** When this box is checked Design 3D will automatically update linked files once you edit the file in a third party application.

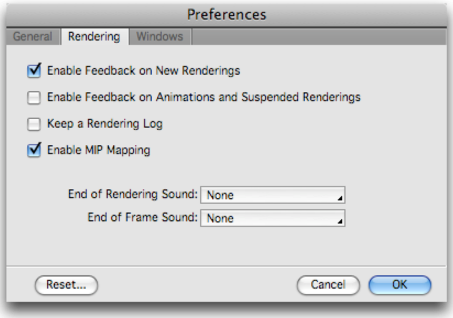
•**Enable double-click object editing.** Enabling this checkbox allows you to double-click on an object to enter the appropriate Editing mode, with the object in a new separate window.

• **Disable Automatic Keyframing.** When objects are modified at different points in the timeline, Design 3D can automatically add an animation keyframe for you, speeding up the animation process by saving that change in the appropriate channel. However, this can create unwanted keyframes if you do not intend to change your object over time (animate it), so by default this option is set to "disabled."

• **Include camera and light markers in view fit.** By default, camera and light markers are recognized by the "Fit Views to All" command (Command = on Mac, Ctrl = on PC) found in the Windows Menu. To disregard these markers when fitting all items in a scene to the view, you will need to uncheck this option.

## Rendering Panel

The Rendering panel contains settings pertaining to rendering and suspended renderings. For more information about rendering see **Chapters 17 - 20.**




• **Enable feedback on new renderings.** Check this box if you want to watch the image take shape on screen while it is rendering. This will cause the rendering process to take a little longer, however. If this box is not checked, images still render, but no information is sent to the screen. In many cases this can make the rendering proceed faster.

**NOTE:** With the feedback turned off, you can still display the progress of the rendering by clicking on the button with the pencil icon to update the Rendering window. The image redraws, and the rendering continues without further updating until the pencil icon is clicked again.

• **Enable feedback on animations and suspended renderings.** When this box is checked, screen feedback is on when suspended renderings are restarted. This is the same as the previous description of screen feedback for new renderings.

• **Keep a rendering log.** Enabling this option creates a text file that records the start and end times for your rendering projects. It also documents the name of the file, the number of frames, frame size, resolution, and image depth of the rendering.

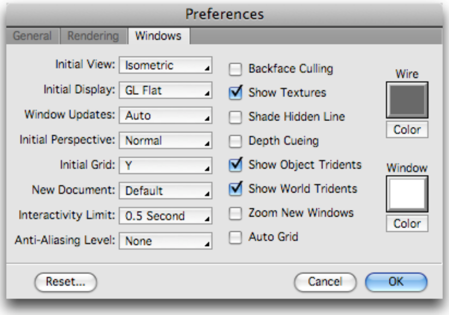
• **Enable MIP Mapping.** MIP mapping prevents moiré patterns and/or background flickering in textures or backgrounds that contain surface maps. Enabling this option may increase the amount of memory required.
When this option is disabled, MIP mapping won't be available in any new textures you create, but existing models will retain any MIP mapping already present.

• **End of rendering/frame sound.** When a rendering or frame of an animation finishes Design 3D can play a sound to let you know it's done. The pop-up menus display sound files that are placed in the Sounds folder. The Sounds folder can be found in the Design 3D application folder on your computer's hard drive.

Supported sound file formats for the Macintosh include: WAV, AIF, and MP3. For Windows any system supported formats may be used.

## Windows Panel

These settings determine how new Modeling windows are displayed.




• **Initial view.** This allows you to specify the directional view that is used by default when you create a new file. There are several choices that correspond to the cardinal directions and the Isometric view, which is a view above and slightly off center of the center of the 3D world.

• **Initial display.** You can specify the display method used when a new model window opens. There are several choices in the Initial object display field's pop-up menu.

For the fastest redraws, use the PointCloud, Outline, Wireframe, or Hidden Line options. Flat speeds up redraws, but retains some of the color and lighting information in the Modeling window. Smooth lets you take advantage of all of Design 3D's interactive rendering features, but takes a little longer to redraw. Toon rendering methods are also available for a stylized look at your model.

You can change the display method later from the Display Method pop-up menu located at the top of the Modeling window.

• **Window updates.** When you perform an action in any window, this option determines how the other windows in your model update. Multiple windows may include Modeling windows, Camera windows, or Spotlight windows. (If views are split, all views within a single window update simultaneously, regardless of this setting.)

- None. Windows only update when they become the active window.
- Auto. When you let go of the mouse button, all inactive windows update.
- Live. All windows update as the action is performed in any window.

If you find that your video card cannot keep up with a large model you may want to select None or Auto from this menu.

• **Initial perspective.** The default perspective used when opening new Modeling windows is set by the Initial Perspective field. The pop-up menu allows you to choose from three settings: Orthographic, Normal, and Wide Angle.

These settings correspond to the three-position perspective control located at the top of each Modeling window. The three choices indicate how the views in the new window present objects in the model. They indicate how much perspective is in the display.

**Orthographic** displays present the parallel lines of objects in the model as parallel lines in the views. There is no vanishing point, no convergence of lines with distance. Orthographic displays preserve the absolute dimensions of objects, so they can be sized accurately relative to each other.

The **Normal** and **Wide Angle** settings provide perspective and produce more realistic views, but do not maintain actual or relative dimensions. Distant objects appear smaller than those closer to the viewing plane, even when they are the same size. This setting can also be changed at any time in each individual Modeling window.

• **Initial grid.** You can specify the default grid that appears each time you open a new model.

• **New document.** You can specify the default window arrangement that appears for all new documents. Some users find it helpful to model in three or four views at the same time. This setting allows you to automate the creation of these split views when you create a new document.

• **Interactivity limit.** This pop-up menu allows you to set the speed at which a selected object reverts to a simple outline (bounding box) while in motion.

• **Anti-aliasing level.** This feature allows you to set the level of OpenGL anti-aliasing that will occur in the Modeling windows. This gives a smoother (less jagged) display of the objects in the Modeling window.

OpenGL anti-aliasing is dependent on the 3D graphics card installed in your computer. Some graphics cards may not fully support this feature. In these situations the anti-aliasing option will be disabled.

In situations where the OpenGL hardware renderers cannot be used, Design 3D relies on the system supplied software renderer. Software rendering typically does not provide the necessary support for this Modeling window anti-aliasing.

• **Backface culling.** When this option is enabled, the back side of objects don't appear in the Modeling window. This results in much faster redraw times for the interactive renderer(s), because the inside surfaces of objects aren't calculated.

When this option is enabled and modeling is done in Wireframe, only the front side of the wireframe is displayed. However, you can still see "through" the wireframe, and objects behind other objects are visible; but the inside surfaces are eliminated from any of the calculations. Also, the inside surfaces of objects without endcaps won't be visible in the Modeling window.

This option applies to interactive renderers only, it does NOT affect final renderings.

• **Show textures.** When this box is checked, a representation of the texture appears on objects in the Modeling window. Only Image Textures are displayed; solid textures (Solid Marble, Solid Stone, etc.), and other procedural textures appear as a single color in the Modeling window. If multiple textures are applied to an object, and they use UV mapping, a composite of all the textures appears. If any of the textures use any mapping style other than UV, only the top texture is displayed.

• **Shade hidden line.** When this option is enabled, objects displayed in Hidden Line appear with surfaces, similar to Flat, except the lines are also visible.

• **Depth cueing.** When this option is enabled, the farther away an object is from the view plane, the less visible it is. The effect is similar to a fog that is the same color as the background applied throughout the scene. This effect is to aid in visualizing depth, and does not appear in renderings.

• **Show object/world tridents.** You can choose to show object tridents, world tridents, or both. Tridents provide a visual indication of the orientation of grids and objects in your model. With these tridents enabled you'll find it much easier to keep track of an object's orientation. This is especially true when using the Transform panel of the Object Properties palette to move, scale, or rotate objects.

When you change views, the tridents make it much easier to establish the object's orientation. Changing grids becomes much easier also. You need only glance at the world tridents in the lower right corner of the window to determine which grid you want. When views are split, each view displays its own world trident.

• **Zoom new windows.** When this box is checked, new windows fill the entire screen space up to the locations of the palettes of Design 3D. The windows can be resized manually after their creation.

• **Auto grid.** When this box is checked, switching views automatically switches the active grid to the face-on grid. For example, if you switch to a top, bottom, or isometric view, the Y grid becomes the active grid. If you switch to a front or back view, the Z grid becomes the active grid. And if you switch to a right or left view, the X grid becomes active.

This does not in any way restrict you to a particular grid. You may still change to any grid you want, but this option automatically activates the grid that's easiest to model on from your current viewing orientation.

• **Wire Color/ Window Color.** You may specify the Wire and Window color using the color picker. The Window color is the background color used in the Modeling window in your interactive display. Don't confuse the background color with the background applied to the model on the Environment palette. This field is for specifying the background color used in the Modeling window only and will not effect renderings from this or any other view.

Wire color is the color of lines and wireframes displayed in your view windows. It is best to choose a very different color from the Window color so that the contrast makes the thin lines of the wires visible.

**NOTE**: If you have multiple monitors installed on your computer, Design 3D will always open the system color picker on the monitor with the most color depth available.

If you change the Wire and Window color, this change applies immediately to the current model when you click the OK button, as well as for all future models by default. The Wire and Window colors are not saved with the model, so saved models will also open to the colors specified in this preference.

### Saving Preference Settings

Once you click **OK**, changes in the Preferences dialog box take affect immediately in the current model, and Design 3D updates its Preference file on the hard drive. All of your Preference settings will thereafter be the same every time you launch the program, until you adjust them again.

## The File Menu

The File menu provides functions for handling complete scene files within Strata Design 3D CX, similar to the File menu in most other computer applications. This includes opening, closing, saving and importing other files.

Each File menu item name that ends in an ellipsis (three periods or dots) such as “Import...” indicates that an additional dialog box will be opened by invoking this tool. Typically this dialog provides either a file browser window and/or additional options for the tool.

Keyboard shortcuts for all File menu items also follow operating system standard conventions. The keyboard shortcut for each item is listed on the right side of the File menu itself.

### New

**Command-N** (Mac) or **Control-N** (Win)
Creates a new, empty Design 3D Scene file with an open Modeling window. This is the blank slate to start your projects in. The settings in the Design 3D Preferences, under the Window panel, will greatly effect the shape, layout, perspective, grid and shading of this New scene file.

By default, all New scenes include a single Directional Light and Ambient light enabled, as well as other settings in the Environment palette to set up a “neutral” scene. This cannot be overridden or changed, but a new, empty scene with different Environment attributes can be created and then Opened and Saved under a new name to act as a template when starting your projects.

### Open

**Command-O** (Mac) or **Control-O** (Win)
Opens a File Browser for browsing through the files and folders on the hard-drive (or all connected resources) to find a compatible file type to open in Design 3D. This is not limited to Design 3D files, but also includes all supported 2D and 3D file types.

A drop-menu allows for "filtering" of files by the selected file or resource type. Unsupported files (as determined by file extension) will be grayed out in the File Browser. (NOTE: Movie files and rendered animations will be opened by the QuickTime player installed on the system.)

## Open As

Similar to the basic Open... command, except that **all** files will be available for the Open command, regardless of file extension. The file loader to be used on each file can be determined from the drop-down menu of supported file types. If a file does not have a file type extension, or is mislabeled, this can "force" the opening of a file with a certain loading module.

## Open Recent

The Open Recent command is a sub-menu of all of the files recently opened or saved from Design 3D. Selecting any file by name from this menu will open it immediately in a Modeling window (or windows) identical to the file when it was last saved.

## Close

**Command-W** (Mac) or **Control-W** (Win)
Closes the currently selected window. This command works not only for Modeling windows, but also for Camera, Light, and Rendering windows as well. If the Modeling window to be closed is the last (or only) Modeling window open for that file, a Save prompt will come up unless the file was just Saved.

## Save

**Command-S** (Mac) or **Control-S** (Win)
Saves the file under its current name, and in its current location on the computer hard-drive. If the file has not already been saved and given a name, it will open a File Browser window and provide the same options as the Save As... command.

## Save As

Opens a File Browser dialog allowing the choice of a location to save the currently active Image or Scene file on the hard-drive. If the file to be saved is a rendered Image file, then the File Browser will include a drop-down menu of possible file types for the image. All Design 3D scene files are saved as ".S3D" file extension types.

## Save a Copy

Opens a File Browser dialog to select a location on the hard-drive to save **a copy** of the currently active Scene file. Because this is a copy of the current Scene, any further Save or Save As... functions will not replace the copy, but rather the original file.

## Revert

Reverts the currently active Scene file to the last saved state. This is identical to closing the file without Saving it and then Opening it from the previously Saved version immediately. This is useful when you want to simply discard all changes made since the last Save or Save As... action.

## Geometry Import and Export

The geometry in your scene can be derived from or shared with other 2D and 3D applications through the Import and Export functions in Strata Design 3D CX. While similar to the Open and Save commands, these functions provide options for handling many different file formats, other than Design 3D native formats, within the context of the currently active file.

It should be noted that while you can use the Open command on all supported file formats, Design 3D will create a new scene and open the geometry in that otherwise empty file. If you instead use the Import command on the same resource, it will be merged with the currently active scene at the center of the current view. The Export command will export the currently selected object, or the entire scene if the format supports multiple objects. If you have no currently active scene, the Import and Export commands will be dimmed and unusable.

## Importing Geometry

Importing or Opening geometry is a great way to jump-start a 3D scene with objects that have been saved from Design 3D or another 3D modeling application, or even a 2D drawing program. The Stratacafe community website also includes an entire section of freely available resources in common Design 3D formats, and you can also find object-specific models on the web, both free and for purchase.

### Import

Models are imported using the Import command, found in the File menu. The Import command can also be accessed by using **Command-I** (Mac) or **Control-I** (Win). The Import command allows you to bring models or images of different formats into the current model; or, you can import images as three-dimensional meshes. This command can also be used to import resources (shapes, textures, etc.) into the active model.

**Relative Scale and Units**

All 3D and 2D geometry are calculated with arbitrary units when inside a computer, however it is frequently desired that these units be defined with a consistent real-world equivalent such as inches or meters. When importing geometry it is very important that these units be consistent to keep the relative scale of your objects the same. Importing a file that was built using a different internal unit can result in unusual scaling differences. Because of this, it is important to understand the "internal units" of Design 3D, which is assigned to imported geometry if they do not carry a unit designation.

Design 3D bases its units on the typography standard "point." You may recognize this term from the way that fonts are sized in many applications ("12 point type"). A point is defined as a unit that is 1/72 of an inch, and most desktop publishing and vector illustration programs also share this internal unit.

So if you set your units to be inches, and you create a 1x1x1 inch cube in Design 3D, it is actually seen as 72x72x72 units internally. This has little effect if you create and save your objects only within Design 3D because you can define the real world units (inches, meters, feet) that you work in. However, when importing geometry from another program that uses a different internal unit, a model of a 1x1x1 "inch" cube, could instead be 1x1x1 units. When brought into Strata 3D CX at 1:1 scale it would be 1/72 of the expected size when compared to other objects built in "inches."

Because of this, some Import functions include a dialog box which allows you to set a scaling factor for the imported geometry before placing it into the current scene. If you are Importing from a desktop publishing program, or vector drawing program such as Adobe® Illustrator, you will not need to adjust the scale and a 1x1 inch square will be 1x1 inches in Strata 3D CX as well.

**Importing from Adobe Illustrator**

To import current Illustrator-native files, the Illustrator file should be saved with the "Create PDF Compatible File" option selected. Design 3D will read the PDF portion of the file. When PDF files are used, the following guidelines apply:

- An Illustrator path to be imported into Strata should be filled or stroked, but not both.
- Both a filled path and a closed stroked path will import as a 2D Bézier region.
- A non-closed path with a stroke but no fill will import as a Bézier Curve.

• A non-closed, filled path will import as if it were a closed path, with a straight segment drawn across the open edge. It will be imported into Design 3D as a Bézier 2D Region.
• If the Illustrator path has both a fill and stroke, two objects will be imported, one for the fill and another for the stroke. Using a path with both a fill and a stroke is typically not desired, and can cause problems. This is because the two duplicate objects are imported into exactly the same location, and are frequently imported as the same object type (2D Bézier Region).
• Illustrator imports are more predictable if all artwork lies within the artboard bounds. If artwork does not import well, switching from the current version of Illustrator to Illustrator 8 or earlier is often a useful trouble-shooting measure.
**NOTE:** Illustrator 8 and earlier formats are Postscript rather than PDF, so some of the above guidelines will not apply, especially the double-object import for stroke and path, and some artboard issues.

**Importing DXF files**
There are several import options available for DXF files that let you specify how to transport the imported file into Strata 3D data.
The options set in this dialog are retained from session to session, so the next time you import a DXF file, the DXF Reader Preferences dialog appears with the same settings you chose the last time it was used.
If a DXF file consists of several components, each component may appear in its own shape preview on the Resource palette after importing. The entire DXF file can be easily located on the palette because it appears with the same name as the DXF file that was imported.

**Import Formats**
Strata 3D comes with several plug-in extensions that allow you import many different file types. Some of these extensions provide special import dialog boxes that give you further options while importing the file.

**Import - 3D File Formats**
3D Mesh
Autodesk 3D Studio (3DS)
Collada
DXF
IGES
MiniCAD Text File
OBJ
TGS Amapi
U3D
VRML 1
VRML 2

**Import - 2D Vector Formats**
EPS
PDF

**Import - 2D Image File Formats**
Bitmap (BMP)
JPEG
OpenEXR
Photoshop (PSD)
PICT
QuickTime Movie
Targa
TIFF

## Extracting 3D Objects from 2D Images

The Import command allows you to create three-dimensional objects from a 2D image. The grayscale values of an image are interpreted as elevation data from which a 3D object is created. Light areas become raised and dark areas become low areas.
If a color image is imported, it is converted into grayscale data. Once the image is converted into a 3D object, it becomes a shape and is placed in the center of your model space. It also appears on the Shapes panel of the Resource palette.
When you import an image into Strata 3D using the Import command, a the Import As 3D Mesh dialog appears. It contains these options:

• **Previewing the object**. The preview area shows you how the 3D mesh will appear with the current settings. You can change the settings until you get the results you want. Click the camera icon to render a preview image of the mesh.

Controls for View Orientation and Display Method are found at the top of the preview. You can also grab the preview mesh and move it around to see it from different angles.

• **Setting Mesh Density and Size.** You can control the density of the mesh by adjusting the number of grid divisions. The higher the number of divisions, the more control points and the denser the mesh. The number of control points should not exceed the total number of pixels in the image. (Each pixel can only be sampled once.)

• **Adjusting the height.** The elevation can be controlled by changing the value in the Height field. The value in this field represents the total height of the white areas in the image.

Once the image is converted to geometry and becomes part of your model, you can still adjust its height, using the Project window or the Transform panel of the Object properties palette.

• **Mesh Type.** The 3D mesh you create can be either a Bézier mesh or a trimesh. If you are creating a trimesh, a **Don't make polygons for black pixels** check-box is provided. If the image you are using contains a black background, this option makes it possible to ignore the background entirely.

• **Sampling the image.** The Import dialog allows you to control the type of sampling used when converting the image into a mesh. The more subdivisions, the denser the mesh and the more points that are sampled.
- **Point sample** uses only information from the points being sampled.
- **Average** also samples information from the surrounding pixels, then averages the grayscale values together.
- **Adjust samples to intensity** is available when using Point Sampling. When this box is checked, Design 3D looks for intensity extremes near the points that are to be sampled, and uses these pixels to sample instead. You may want to use this option if your image contains areas of high contrast.

• **Projection.** You can select the type of object you want to create by selecting one of the three projection options: Planar, Spherical or Cylindrical.

• **Smoothing the Geometry.** This slider controls the smoothness of the object. A low number produces geometry with the sharpest angles; higher values produce smoother transitions between elevations.

## Exporting Models

In addition to being able to render a two dimensional image of your model in pixels, the **Export** command allows you to save your model as 3D and 2D geometric data that other applications can open.

When exporting to a 3D geometry model format, the Export command saves the entire model, including unused shapes in file formats where shape hierarchy is supported.

The Export command opens a dialog that allows you to choose the location where you want to save the exported file, as well as a pop-up menu that allows you to select the file format. The default format is Strata 3D Model.

### Export Formats

Individual export formats may present a special dialog with options that are particular to that format. Formats vary in the degree to which they support the content of a Strata model. Some formats will result in an exported file that is a sub-set of your model data and a re-import may reveal a loss of some aspect of the original model.

**Export - 3D Formats**
Collada
DXF
OBJ
Strata 3D Shape
TGS Amapi
U3D
VRML 1
VRML 2
XMM (Strata Live 3D CX)

**Export - 2D Formats**
Bitmap (BMP)
JPEG
Macromedia Flash (SWF)
Photoshop (PSD)
PICT
QuickTime Movie
Targa
TIFF

## Page Setup

Opens the standard Page Setup dialog for printing on the computer system. This dialog will vary widely based on installed printer drivers and options. The simplest is the operating system-provided Page Setup for setting page size, scaling, and orientation.

## Print One

Automatically prints the currently active window once, using the current settings from the Page Setup, and the defaults from the Print dialog.

## Print

**Command-P** (Mac) or **Control-P** (Win)
Opens the standard Print dialog to print the currently active window. (If a view is split, only the currently active or selected view will be printed.) This dialog will vary widely based on installed printer drivers and options. The simplest is

the operating system's Print dialog for setting the page range, number of copies, and destination printer.

All printed Modeling windows will fill the horizontal width of the page as set in the Page Setup. If an **Image** window is selected, the resolution of the image (and its dimensions in real-world units) will be used to determine the printed size. This can be set in the **Render Image** dialog box under **Units** and **Size**.

### Send Model/Image to Photoshop

These menu options give you access to the Strata Design 3D CX plug-ins for Adobe Photoshop® CS4 Extended. If you have installed the plug-ins, these options are available and you can use them to send a model, texture or rendering to Photoshop.
You can also access Send Model to Photoshop and Send Image to Photoshop using the icons on the **Button Bar.**

For complete information about using these plug-ins, see the **3D[in] Quick Start** in the Strata 3D CX Help menu.

## Edit Menu

The Edit menu provides many standard editing features common to most computer applications, and some very specific editing tools unique to Strata Design 3D CX.

### Undo

**Command-Z** (Mac) or **Control-Z** (Win)
Steps back in History, or reverses/"un-does" the most recent command. Typically the name of the command or action to be Undone will appear in the menu as well. This works for as many History States as are kept in the **History panel** of the **Details palette**, until you have reached the numeric limit of actions that can be undone. Some actions cannot be undone, and they will not show up as a History state or as the named action to Undo in the Edit menu.

**NOTE:** Entering an Edit session will erase all previous History states (or possible undoes) to allow for that session's own History states to be built up. Once you Exit the Edit session, all of that session's History states will then be cleared to allow for new History states outside of the session.

## Redo

**Command-Shift-Z** (Mac) or **Control-Shift-Z** (Win)
Advances in the History, or "re-does" a previously undone action. When the History list has reached the last action taken, the Redo command will not be available.

Just like the Undo command, Entering or Exiting an Edit session will erase the History states, so no more Redos can be advanced through after this action is taken.

## Cut

**Command-X** (Mac) or **Control-X** (Win)
Removes the currently selected item(s) and places it on the application Clipboard, replacing the current contents of the Clipboard. This is different from a Clear or Delete because it retains a "copy" of the Cut object for possible reinsertion by Paste. You can also Cut by clicking the **Cut button** on the **Button Bar**.

You can Cut anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, rendered images, etc. Objects that are Cut, then **Pasted** back into the same Modeling window will be placed in the exact same location, as if they had not been Cut at all.

## Copy

**Command-C** (Mac) or **Control-C** (Win)
Copies the currently selected item(s), placing a copy on the application Clipboard. Copy does not remove anything from the document, but replaces the previous contents of the clipboard with the copied items. You can also Copy by clicking the **Copy button** on the **Button Bar**.

You can Copy anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, rendered images, etc. Objects that are Copied, then **Pasted** back into the same Modeling window will be placed in the exact same location - you won't be able to tell by looking that you have two or more objects in the same location.

## Paste

**Command-V** (Mac) or **Control-V** (Win)
Pastes the contents of the Clipboard into the active document, keeping all of the data intact (including the location and orientation of the original when copied). This command is available as long as the clipboard contains an appropriate

item. You can also access this command by selecting the **Paste button** on the **Button Bar**.

Items that you Paste must be in the same format and context as the place from which you copied them. For example, you can't paste a 3D object into a text field in a dialog, or text from a dialog into an Image Texture window.

## Clear

**Backspace/ Delete** (Mac) or **Delete** (Win)
Removes or deletes the currently selected item(s) from the scene. This **does not** move the items to the Clipboard, so once they are Cleared, they cannot be pasted back into the scene. The Clear action can be Undone to reverse it.

You can Clear anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, rendered images, etc.

## Show Clipboard

Shows the current items on the Clipboard in a new Clip window. This window is resizable, and will show geometry, text, images, etc. - whatever is on the application Clipboard. **Copying** or **Cutting** an item from the scene, a dialog, or another application will remove the current Clipboard contents and replace it with the Cut or Copied item. This item can now be Pasted into Design 3D.

**NOTE:** Items copied from most other applications use the same Clipboard as Design 3D, so this is a useful way to determine if you still have the same items on your clipboard before Pasting or replacing the item.

Showing the Clipboard window can display geometry, images, text, even lights and cameras. However, these are non-interactive elements and must be **Pasted** into the scene, a dialog, or a selected text entry area for the items to be used again. Geometry on the Clipboard is shown, by default, from the Front orthographic view in Smooth Shaded form, with textures.

## Duplicate

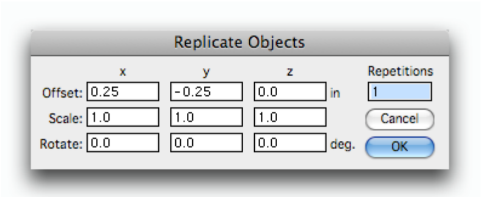
**Command-D** (Mac) or **Control-D** (Win)
Creates a copy of the selected object slightly offset (0.25 inches or equivalent unit) from the original, by default. The copy becomes the new selected object.

Repeating the command will Duplicate the object again, but allows a different offset. To change the default offset, first select an object and choose Duplicate from the Edit menu. Then drag the newly duplicated object the desired distance from the original. The distance you drag the duplicate from the original becomes the new offset each time you use the Duplicate command, regardless if you Duplicate other objects. This is a quick way of creating copies at regular intervals.

If more than one model is open, each model can have its own offset value which remains in effect until the model is closed. However, each time you open a model, the original default offset of 0.25 inches (or equivalent unit) is restored.

## Replicate

The Replicate command can create multiple copies of a selected object, group or shape, all at the same time with pre-set conditions. The dialog box lets you input numeric values for each replication setting. The values are in the same units as defined in the Preferences settings.




The fields in this dialog are arranged vertically by function, and horizontally by axis. They perform the following functions:

• **Offset:** These fields allow you to specify the offset distances along one or more of the three axes for each successive copy. If the units are set to inches, the default value of the offset is 0.25 inches on all three axes.

• **Scale:** These fields let you specify the size of each copy relative to the original. A value of two will double the size of the object(s) with each repetition. A value of one, which is the default value, will make all copies the same size as the original. A value of 0.5 will result in half the size with each repetition.

• **Rotate:** These fields allow you to specify the amount (in degrees) on all three axes by which each repetition should be rotated from its predecessor. The default value for rotation is zero degrees on all axes.

• **Repetitions:** This field specifies how many times the Replicate command should copy the object(s). The default setting for this field is one.

Any settings you enter in the Replicate dialog are retained until you change them or until you close the model. The settings in the Replicate dialog apply to the current model only. If more than one model is open, the replicate settings in each model can be different. However, the original default settings are restored each time you open a model.

## Snap to Grid

Select this command if you want objects to snap to the active grid when you draw or move them. Snapping occurs in the increments that you've specified in the Set Units dialog. The Snap to Grid command is a toggle that applies to any active, visible grid in your model, and allows snapping objects, points, and vertices to the Snap Subdivisions you have set in the Set Units dialog. If a grid is hidden or inactive, the Snap will not apply to that grid. When the command is active (toggled ON), a check mark will appear next to it in the Edit menu.

## Hide Grids

When this command is enabled, the View grid becomes the active grid, even though it is hidden. When the grids are hidden, a check appears beside the Hide Grids command in the menu.

To display the grids, select the Hide Grids command again. The grid that was active when you chose the command becomes the active grid again, and the check is removed from beside the command name in the menu.
For more information see **Chapter 3 - Modeling Basics** and **Chapter 4 - Advanced Modeling.**

## Active Grid

You can use the Active Grid submenu from the Edit menu to change active grids. You can also use this submenu to determine which grid is active if you are unsure. A check mark appears next to the name of the active grid. Only one grid can be active at a time.

The Active Grid command is available only if the **Hide Grids** command is disabled. When you select the command a submenu appears, and each grid in the model appears in this list. The default grids of the X, Y, and Z axes are listed, and any User Defined (Custom) Grids will also appear in this submenu by their given names.

**NOTE:** If you select a grid that is currently hidden (determined by using the Visible Grid command), that grid becomes visible only while active. Then, when you choose a different grid from the submenu, the current grid returns to its hidden status.

You can also switch between active grids using the **Grid hotkeys:**
**X** - selects the grid perpendicular to the X axis (**purple** colored grid).
**Y** - selects the grid perpendicular to the Y axis (**blue** colored grid).
**Z** - selects the grid perpendicular to the Z axis (**tan** colored grid).

"**+**" - **cycles forward** in the list of all grids, including User Defined.
"**-**" - **cycles backward** in the list of all grids, including User Defined.

For more information see **Chapter 4 - Advanced Modeling**.

## Visible Grids

When you select the Visible Grids command, a submenu appears that allows you to specify which grids to display in the Modeling window. To view individual grids, select them by name from this submenu. Any number of grids may be designated as visible at a time, or none at all, but the active grid is always visible unless Hide Grids is enabled.
Grids that are visible in the Modeling window appear with a check mark in front of their names. To turn off a grid that is currently visible (checked), select the grid again to de-select it. This will remove the check from beside its name and toggle its visibility in all active Modeling windows.

## Current Guides

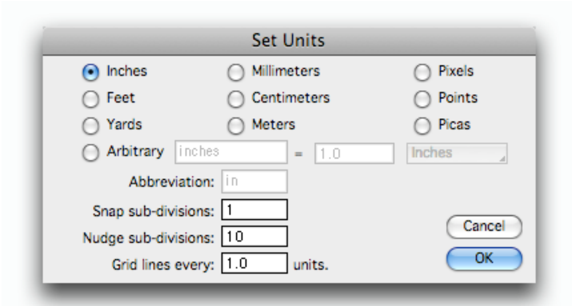
This submenu gives you access to the current guides in your model. Guides are one-dimensional lines used to constrain and precisely position objects, surfaces, edges and points. There are three default guides in the X, Y and Z directions, and one that is perpendicular to the active grid. You can also create custom guides with the Guide Tool.

When you select one of the guides in the list, it becomes the current guide and will be shown in your Modeling window when the Guide Tool is selected. A check mark appears in front of the currently selected guide. To select another guide and make it current, just select it from the list.

For more information see **Chapter 4 - Advanced Modeling**.

## Set Units

Choose the Set Units command from the Edit menu to select the default units of measurement. This command displays a dialog box which allows you to choose from pre-defined units of measure. Set Units is available whenever a model is open. If no model is open, the command name changes to Set Default Units, and any changes you make to the dialog become the new default settings.




You can set the Units you wish you use in the current scene or as a default value by clicking on any of the **Units of Measure** designations at the top of the dialog. These units are arbitrary inside your scene, because the entire 3D environment is "virtual," but using these designations can be useful when exporting files or measuring and plotting a real-world object.

**NOTE:** Design 3D scenes and models do not save the units in which they were constructed. If you change the default units, and then open a model that uses another scale, the current units and scale are adopted by the opened model.

There are additional settings as outlined below:
• **Arbitrary:** this setting allows you to specify your own units of measure. You can also specify the abbreviation that's used for the units you define.
• **Snap Subdivisions:** this field allows you to specify the number of subdivisions within each unit. This value is then used when the Snap to Grid option is enabled. You can enter any integer value greater than zero in this field.
• **Nudge Subdivisions:** this field allows you to indicate the number of subdivisions within each unit to use for nudging objects in your model. Enter any integer value greater than zero in this field. Nudging allows you to move selected objects in small increments using the up/down and right/left arrow keys.
• **Grid Lines Every:** allows you to specify how often grid lines are displayed. You can enter any number greater than zero in the Grid Lines field and the visible grid lines will be this many world units apart in all directions.

**About Nudge**
Nudge works to move the selected object, so long as one of three selection tools is active (Object Move, Rotate, or Scale). All nudge operations are relative to the active grid. The arrow keys nudge the selected object along the grid in the direction indicated by the arrow.

**Command-Shift** (Mac) or **Ctrl-Shift** (PC) along with the **Up** or **Down** Arrows nudge the selection perpendicular to the active grid.

### Nudge Speed Modifier Keys

Holding down the **Shift** key while using the nudge arrow keys nudges the selected object at a faster rate. The speed acceleration factor while using the modifier key is 10. In other words, a nudge sub-division setting of 10 - ten nudges per unit - would translate to 1 unit step per nudge.

Holding down the modifier key **Option** (Mac) or **Alt** (PC), while using the nudge arrow keys, nudges the object at a slower rate. The speed deceleration factor is 10 or 1/10 the default speed. In other words, a nudge sub-division setting of 10 - ten nudges per unit - would require 100 nudges to move the object one unit.

## Customize Menus

Design 3D ships with a default set of keystrokes for many commands and tools, but with the **Customize Menus** command you can define your own hotkeys to use for menu commands. It is important to note that this is applicable to items accessible through the drop-down menus at the top of the workspace, so you cannot assign a hotkey to a non-menu item or tool (such as a modeling tool that is not in one of the menus, like the Spotlight tool).

These user-defined hotkeys require a system-specific key held down: **Command key** (for Macintosh) or **Control key** (for Windows), but you can also add the **Option** (Mac) or **Alt** (Win) modifier to create a three-stroke hotkey. This requirement is because most of the single-key hotkeys are assigned to non-menu items in Design 3D. Many of these single-key hotkeys will also change based on the active state or context of the modeling environment. This makes it extremely difficult to select and keep track of them.

After selecting the Customize Menus command, a dialog opens instructing you to choose the command to which you want to add or change the keystroke shortcut.

Select a menu command to change from the top drop-down menus just as you would normally select it. During this time the command won't perform its normal function; instead, a second dialog appears. Here you can type the letter or keyboard symbol that will be combined with the system-specific key to create your new hotkey combination.

The original dialog remains open, allowing for many more menu items to be selected and new hotkeys to be defined for all of them. When you are finished defining hotkeys, press the "Done" button in the original dialog and all of the menu items will return to their active state. Any new hotkeys you have defined or altered will now show up in the drop-down menus next to their associated menu items.

## Selection Menu

The Selection menu commands help you handle complex models and control how objects are selected. You can hide/show objects in your model to make it easier to work with other objects, designate Construction objects, and also hide or show your animation paths.

### Select All

**Command-A** (Mac), **Control-A** (Win)
Selects all objects in the scene. Use the Select All command to select all of the visible objects, light sources, and cameras in your model. Select All is available when a model is active and there is at least one object in the model.

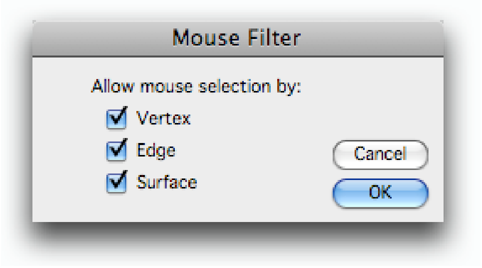
Selection handles appear around all selected objects. Any objects or shapes that are hidden are not selected with this command.

### Select None

**Command-1** (Mac), **Control-1** (Win)
Deselects all objects in the scene. The Select None command de-selects all currently selected objects. Using this command is the same as clicking the mouse button while the cursor is in the active view, but away from any objects.

### Mouse Filter

The Mouse Filter command displays a dialog with options for selecting objects. These checkboxes allow you to select surfaces only, vertices only, or edges only; or you may use any combination of the three. The mouse filter settings are retained between sessions or until you change them.



Sometimes it's difficult to select objects, either because they are inside another object or behind an object in the active view. Each time you click the mouse, Design 3D checks to see if this point matches any of the mouse filters you've selected. If the point matches, the object is selected. If no match is made, no selection is made.

If you turn off ALL three selection filters, clicking on an object will never select it, since no condition exists to match the settings. However, you can still select objects in the Project window, or by dragging a selection marquee around the objects in the Modeling window.

**NOTE:** You can also use the Context menu to select objects that are difficult to access. **Right-clicking** with your mouse with one of the Object Manipulation tools will summon the Context menu, where you can select the desired object from the list.

## Hide Selected

**Command-3** (Mac), **Control-3** (Win)
Hides all selected objects from view in the interactive Modeling views. Hidden objects don't appear in the Modeling window, nor do they render while hidden. You can use this command when you're trying to select objects behind, or inside, other objects. This command may also be useful when you want to temporarily hide objects. Hiding complex objects may decrease the time required for rendering and re-drawing.

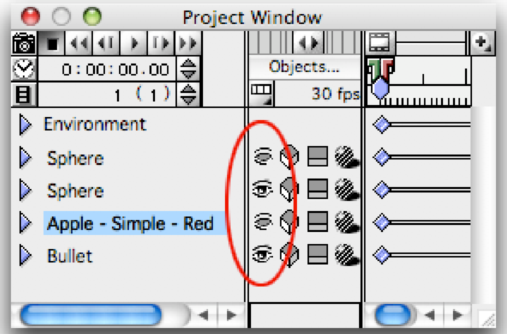
When you select the Hide Selected command, the "hide" icon (a closed eye) appears next to the name of the selected object(s) or group in the Project window. This icon can also be used to Hide or Show any object in the scene.

## Show Hidden

**Command-4** (Mac), **Control-4** (Win)
This command returns all Hidden objects to visibility in the Modeling views. These objects are then made the active selection.

When you select the Show Hidden command, the "show" icon (an open eye) appears next to the names of all previously hidden objects in the Project window. This icon can also be used to Hide or Show any object in the scene.

For more information see **Chapter 15 - Adding Animation.**




## Make Shy

**Command-5** (Mac), **Control-5** (Win)
The Make Shy command allows the object(s) to be visible when rendered, but shy objects do not appear in the Modeling window. This feature is useful when you've finished working on an object in the model. You can remove the object from the Modeling window so that it doesn't obscure other objects or interfere with the modeling process.

If the object you've selected is an instance of a shape, then only the instance is hidden. Other instances are still visible. You can still access the shape for editing.

When you select the Make Shy command, the "shy" icon (a small face) appears next to the name of the selected object in the Project window. You can also click on this icon to make objects shy, instead of using the menu command.

## Make Shy Normal

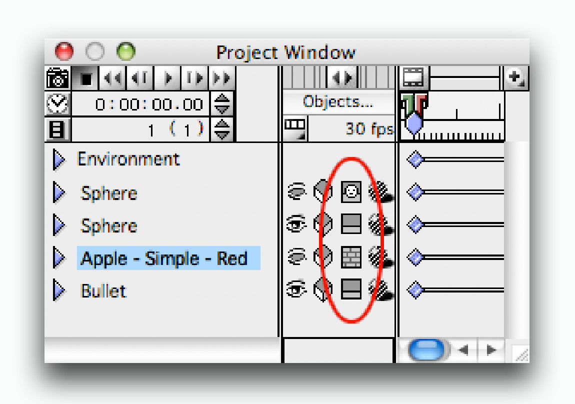
**Command-6** (Mac), **Control-6** (Win)
Use this command to make objects that were previously designated as "shy" appear in the Modeling window, as well as in renderings.

When you select the Make Shy Normal command, the "normal" icon (split gray) appears next to the names of all objects that were previously shy in the Project window.

## Make Construction

**Command-7** (Mac), **Control-7** (Win)

Use the Make Construction command when you want the selected object(s) to display in the Modeling window only. Construction objects are used as an aid during the modeling process. They do not appear in renderings.




When you select the Make Construction command, the “construction” icon (brick wall) appears next to the name of the selected object(s) in the Project window.
This icon has three states:
**Normal** - the split gray icon. Objects appear in the Modeling window and in renderings.
**Shy** - the small face icon. Objects do not appear in the Modeling window, but do appear in renderings. This is useful with models that contain many objects, and speeds up screen redraws.
**Construction** - the brick wall icon. Objects appear in the Modeling window, but do not render. Construction objects can be used as targets or hosts for lights or cameras, for example.

## Make Construction Normal

**Command-8** (Mac), **Control-8** (Win)
Use this command if you want all of the previously-designated construction objects to appear in rendered images.

When you select this command, the “normal” icon (split gray) appears next to the names of all objects that were previously specified as construction objects.

## Hide Animation Paths

**Command-9** (Mac), **Control-9** (Win)
Use this command to hide all animation paths in the Modeling window.

### Show Animation Paths

**Command-0** (Mac), **Control-0** (Win)
Selecting this command displays the animation path of the object selected in the Modeling window, if that object has an animation path.

## Modeling Menu

The Modeling menu provides various tools and commands for modifying the objects in your scene, and editing and controlling their animation and active states.

### Edit Object

**Command-L** (Mac) or **Control-L** (Win)
This command is used to enter a special "editing session" to change the shape of an object through modification of sub-parts or components. You can Edit polygon objects, Bézier objects and some specialty objects with the Edit command. If the object you select cannot be edited, the command is dimmed. Some object types need to be converted to another type of geometry before they can be edited.

You can begin an Edit session in different ways:
• By pressing the **Edit** button at the top of the main Tool palette.
• By double-clicking on an editable object.
• By using the hotkeys: **Command-L** (Mac) or **Control-L** (Win)
• By selecting the object and then choosing the **Edit Object** command found in the Modeling menu.
• Select the **Edit** command from the **Plus menu** of the Object Properties palette for the selected object.

You can end an Edit session in these ways:
• By toggling the Edit button at the top of the Tool palette.
• By closing the Edit window.
• By pressing the hotkeys: **Command-E** (Mac) or **Control-E** (Win).

**Edit Location and Windows**
If you choose to use the Edit command from the Modeling menu the object will be edited directly in place in the Modeling window. If you double-click on the object (using any of the three Object Manipulation tools) it will open in a separate window where it can be edited by itself in isolation.

To edit an object that belongs to a group or shape, you can double-click on the group or shape. The group or shape opens in its own window, allowing you to select a single object. You can then edit the object in this window, or double-click to edit in a separate window.

#### Edit Tool Palette

Different object types are edited in different ways. When in Edit mode the tool palette changes to a special Reshape Tool palette. The tools available on the Edit Tool palette depend on the type of object that you're reshaping.

#### Editing Different Object Types

There are basically three types of objects that can be edited: polygon objects, Bézier objects and specialty objects. Polygon objects are defined by a series of flat sections (polygons) that can approximate a curved surface. Bézier surfaces are defined by spline curves which can be 3D or 2D. Specialty objects can come in many forms such as Deformation Objects and IK Objects. Each type of object has its own Edit mode and tools.
If the object you are attempting to Edit is a primitive (a sphere or cube, for example, created using the 3D drawing tools), you will need to Convert it to another object type.
Double-clicking on a primitive object summons the Convert dialog, where you can change the object type to one that can be edited.

## Position Texture

You can edit the texture placement of the selected object by clicking the Position Texture menu command. The mapping mode of the texture you select from the drop-down menu will effect the type of placement and editing controls that are offered.

If UV mapping is used, the Position Maps dialog box will appear. You can change the location, rotation, and scale of the Texture across the U and V parameters of the surface of the object that is selected. This is only for the selected object, and not all objects that have this texture applied.

When a non-UV mapped texture is selected and you select the Position Texture command, the Tool palette changes, similar to modeling edit modes. Tools are provided for moving, rotating or scaling textures on the object. Handles appear on the selected object. You can move, rotate, or scale the texture as desired. The handles display "+" and "-" symbols to indicate up/down, front/back and left/right.

For textures applied with the Decal projection, the front and back handles (in the "Z" axis to the texture) are also used to determine the depth or distance that the decal penetrates the object.

Some procedural and Volumetric texture types (Wildlife and Mist for example) don't offer a way to position the texture.

For more information see **Chapter 8 - Texture Basics** and **Chapter 9 - Using Image Textures.**

## Edit Texture

The Edit Texture submenu displays the textures applied to the currently selected object and allows quick access to editing them. Choosing one of the textures from the Edit Selected menu opens the appropriate Texture editing window.

## End Edit

**Command-E** (Mac) or **Control-E** (Win)
This command finishes an Editing session and returns the Edit Tool palette to the general Tool palette, and closes any opened Reshape windows. This is the closing command for any Edit session, including editing Texture placement, modifying Bézier Spline surfaces, Polygon Edits, and any other "in window" or "new window" Edits.

## Convert

The **Convert** command allows you to change an object from one type of geometry to another by selecting a new Object Type from the **Convert** dialog. Select the object(s) you want to convert then select the Convert command from the menu to display the Convert dialog.

The Convert command can also be accessed using the **Convert** button on the **Button Bar**. The Convert icon at the far left of the Button Bar changes appearance depending on the object selected. When you select an object, the icon changes to show the object's geometry type.

The Button Bar Convert icon also contains a pop-up menu that functions in the same way as selecting the Convert command from the Modeling menu.

All of the allowable conversions appear in the dialog or pop-up menu. Those that don't apply to the selected object(s) are dimmed and unavailable.

The Convert dialog can also be summoned by double-clicking on an object. For these objects, such as 3D primitives, the Convert dialog appears after the double-click, allowing you to select which kind of object type you wish to convert it to.

The dialog offers the following options:
• **Weld tolerance:** The Weld Tolerance field sets the maximum value for welding points together during the Convert operation. If two points on an object fall within the range set in this field, they will be welded together. This prevents holes in the object's geometry.

• **One Sided Result:** This checkbox allows you to specify whether the object becomes one-sided or two-sided. If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as Fog or Mist, it must be created as a solid, one-sided object.

**Conversion Changes**
All conversions occur on a one-to-one basis. That is, if five objects are selected and converted to Bézier Surface, the result will be five Bézier surfaces. If the five objects are grouped together first, the result will be one group with five Bézier surfaces.

However, if five objects are grouped together and converted to Polygon Mesh, the result is **one** mesh. When converting to Polygon Group, the result is one group with all of the polygons. This allows you to combine multiple meshes together.

When objects are converted, all of the properties listed under their Base Properties in the Project window are lost during the conversion process. All of the properties listed under Object Properties in the Project window (which includes textures) are maintained. However, once you group an object, the object and **all** of its properties - both Base Properties **and** Object Properties appear under the Group's Base Properties.

So, if you group an object **before** converting it to another object type, **all** of its properties are lost. This is a way of eliminating any information that may become unnecessary later.

## Align

**Command-/** (Mac) or **Control-/** (Win)
The Align command allows you to align selected objects on the horizontal, vertical, or depth axis, either separately or in any combination of the three. Align is available whenever two or more objects are selected.

When you select Align, a dialog opens where you can specify which combination of alignments you want. When you first open the dialog, the settings default to No Change on each axis, so to make any alignment at all, you must choose an option for at least one axis.

The alignment options in the dialog box (left, center, top, front, etc.) are relative to the **Front** view in world coordinates. You can align the objects horizontally by either their left or right sides, or by their centers. The vertical alignment can be by the tops, bottoms or centers of objects, and depth alignments are by front, back or object centers.

If none of the selected objects are locked, the location of the outermost object on each axis determines the boundary for the edge alignment point. If the position of one of the selected objects is locked (on the Transform panel of the Object Properties palette), the command uses the outermost dimensions (extents) of the locked object(s) as the alignment boundaries.

## Recenter Origin

The Recenter Origin command positions an object's origin point back to its geometric center after the origin point has been moved. The Recenter Origin command is only available when an object is selected.

The object origin point is the point that the object rotates around. This point is usually, but not necessarily, at the geometric center of the object. When the display method is set to Wireframe, Outline, or PointCloud, you can see the object origin point whenever an object is selected. It appears as a small blue diamond about the size and shape of the red handles of the object.

When you first create an object, the origin point is located at the geometric center of the object. However, you may want to move the origin point to a new location. The position of the origin point can affect the object in the following ways:

- It sets the axis for rotation on the object.
- It is where a child object is linked to its parent.
- It locates the object on its animation path.

To move the origin point without moving the object itself, hold down **Command** (Mac) or **Control** (Win) while dragging the origin point to its new position. This position now becomes the point around which the object rotates. Instead of grabbing the origin point, if you hold down the Command key (Mac) or the Control key (Win) and grab the object, the object moves and the origin point remains stationary.

You can move the origin point in any direction on the active grid or in a plane parallel to the active grid. To move the origin point perpendicular to the active grid, you must switch to a perpendicular grid.

The Recenter Origin command is the easiest method for putting the origin point back in the geometric center of an object, although you can reposition it back to its center manually, as well. The origin point of objects imported from other applications may not be located in the geometric center. You may need to use the Recenter Origin command on objects after importing them into your model.

You may need the Recenter Origin command in these situations:
• After using the Joint Tool. For example, you might want the child-object to rotate about its own geometric center rather than the parent's. (When you use Joint to connect one object to another, the child's origin point moves to the position of the parent's origin point.)
• After lathing or extruding a 2D object. Otherwise, the origin point remains in the center of the template.
• After manually moving the origin point for some operations. This is often done for special rotation needs.

## Group

**Command-G** (Mac) or **Control-G** (Win)
Grouping does just what the name suggests - it allows you to group objects together so that they can be selected, moved, rotated, scaled, textured, animated, (etc.) as a group. The Group command can also be accessed through the **Group button** on the **Button Bar**.

This command is available whenever any objects, groups and/or shapes are selected. You can group any combination of any type of objects you have in your model, and even group together multiple groups to create "sub-groups." Once you've grouped them, they act as one object. You can perform the same basic operations on a group that you can perform on a single item. When a group is established, its coordinate system is aligned to the active grid.

When selected, groups normally appear within a single bounding box. However, if the group's Base Properties is opened (turned down) in the Project window, individual components of the group can be selected individually. (See Editing Groups, below.) A group can contain other groups; for example, two or more groups can be grouped together.

This command can also be used with single objects. There may be times when you want the object's coordinates aligned to the grid. Once you rotate an object, for example, its own coordinates and bounding box may no longer be aligned to the grid, and moving the object perpendicular to the grid may be difficult. When you group an object, a new set of coordinates is established for the group, with its new coordinates aligned to the active grid. Therefore, once you group the object, you can grab the handle parallel to the active grid and move the object away from (perpendicular to) the grid. Then, after you've moved the object, you can ungroup it to restore its previous coordinates.

## UnGroup

**Command-U** (Mac) or **Control-U** (Win)
Use the UnGroup command to split Grouped objects into separate objects again. You can access this command any time one or more grouped objects are selected. You can also select the **UnGroup button** on the **Button Bar.** When a group contains other groups, only the outermost group is affected by the UnGroup command, but each time you use this command, the next level is ungrouped.

### Editing Groups

You can access the individual objects within a group in two ways:
• **Double-clicking** on the group in the Modeling window. It may be easier to work with a group in its own window. You can open a group in its own window by double-clicking on the group.
For example, you may want to change the relative position of the individual objects within the group. If the model is complex, it may be difficult to access parts of the group without affecting other objects. You can double-click on the group so it opens in its own window, then change the position, scale, etc. of the individual components within the group. You don't need to ungroup the group first.
• **Open the Group in the Project window**, then open (turn down) the Base Properties triangle. Any time the Base Properties field of a group (or shape) is in its "open" position in the Project window, the individual objects that make up the group can be edited and otherwise manipulated in the Modeling window.

### Shapes Within Groups

Even when you can't access individual objects within a group, you can still access shapes that are part of a group in their own shape windows. Any changes you make to a shape in its workspace will appear in any instances of the shape, even if it is inside of a group at the model level.

### Nested Nodes

A nested node happens when an attribute is applied to a group, and then the group is ungrouped. During the UnGroup operation, the software applies each attribute that was applied to the group to each individual object. This information is then stored under a "nested node" entry in the Object list in the Project window.

Nested nodes may not always cause problems, but in general it is best to avoid them. Problems can occur when you try to change or move an object that contains a nested node. The information in the nested node may override other changes and interfere with what you are trying to do. Nested nodes are especially problematic with textures. It's best to apply textures to individual objects, not to groups.

**Avoiding Nested Nodes**
Use group windows to apply attributes, including textures, to individual objects. Double-click on the group to open the group in its own window, or have the Base Properties for the group open in the Project window. This is the same as editing in a Group window: when the Base Properties arrow is turned down, all the objects can be edited individually, either in the Project window or in the Modeling window.

**NOTE:** With Booleaned objects, do not apply textures until you are through with the Boolean and UnBoolean operations. Nested nodes can also occur with objects that have had a texture applied, and then Booleaned and UnBooleaned. You can avoid nested nodes by selecting the "Auto repair nested nodes" checkbox in the General panel of the Preferences dialog.

**Deleting Nested Nodes**
To remove attributes in nested nodes, delete all of the numeric values from the fields under the Nested node in the Project window. This means you must turn down every arrow and delete every numeric entry. With the object's name selected and highlighted in the Project window, select **Delete Attribute>Empty Attribute** from the **Plus** menu. If the Nested node does not disappear from the Project window, make sure you have deleted all the information from all of the fields.

• **Nested Textures:** Textures cannot be deleted from nested nodes, and nested textures are always the main texture that will render on the object, regardless of any other textures applied to the object. However you can negate the effect of a texture: In the nested node, you will see a subcategory titled Surface Shader. Turn down the arrow and find the texture name and Edit button.
Click the edit button to summon the texture editing dialog. Set the Stencil field to 0 percent.
If there is a map in the Stencil map field, you need to remove it. Click on the map in the editing dialog to summon the image map dialog, then hit Delete, then OK. This makes the nested surface shader invisible. However, this texture will also be invisible on all other objects that it is applied to.

## Modeling Menu Tools

At the bottom of the Modeling menu (and taking up much of its size) are the various modeling and animation tools and commands.

These tools are describe briefly here, and in more detail in the Modeling and Animation sections.

### Meld

Meld objects are smoothly blended surfaces that are made up of two or more enclosure-defining objects. Objects that work well are Sphere and Rounded Cube primitives, but many other objects that define an enclosed space work as well. Meld objects can be described as being like gobs of solid mercury that melt together as they get closer to each other. How they blend, or Meld, is controllable.
To create a Meld object, select two or more objects and apply the **Meld** command from the Modeling menu. You have full control over how close the objects must be to one another before they begin to blend together. Objects can even be animated prior to being included in a Meld object to create a flowing, melting effect.

Only certain types of objects can be Melded. Some 3D primitives, such as spheres and cubes, and Polygon mesh objects which don't contain holes or concave areas can be used. All other object types must be converted into polygon mesh objects before they can be melded together. Any number of objects can be used in a single Meld operation.

The Object panel of the Object Properties palette provides settings that allow you to edit some important parameters of a Melded object, including the Range of Influence. This slider determines how the individual objects will merge together. For more information see **Chapter 7- Special Modeling Tools.**

### UnMeld

This command lets you undo the Meld operation on a selected Meld object. If no Meld object is selected, the button is dimmed and not available. You can access this command by selecting **UnMeld** from the Modeling menu.

### Align to Path

Select the **Align to Path** command to align an object to an animation path. To use this command, you must have an object selected in the Modeling window.

When you select the Align to Path command from the Modeling menu, the **Align to Path dialog** appears, displaying a representation of the selected object with controls to orient it relative to its animation path.

The dialog allows you to specify which parts of the object you want to point forward and up. You can click and drag in the dialog to rotate the object in the desired direction. This dialog also gives you the option of having the object "bank" on turns as the animation path changes direction. The slider allows you to specify the approximate maximum banking angle that may be used over the entire animation.

**NOTE:** Once an object is aligned to a path, it cannot be rotated with the Rotate Tool. However, you can change the rotation on the Transform panel of the Object Properties palette, although the new coordinates won't take effect unless you unalign the object with the UnAlign to Path command.

The forward and up alignment of an object is time varying. The settings in this dialog take effect at the current time (the time indicated by the position of the Current Time pointer on the timeline), and remain in effect unless changed again. For more information see **Chapter 15 - Adding Animation.**

## UnAlign to Path

This command removes the Align to Path constraint from an object. Select the object, then select the UnAlign to Path command from the menu. The object will no longer automatically point forward as it travels along its path.

## UnBoolean

Boolean modeling lets you use two 3D objects (of any shape or type) to produce a new object. The result is similar to gluing or carving with blocks of wood. The Boolean tools are located in the Tool Palette. For more information see **Chapter 7 -Special Modeling Tools.**

Boolean objects can be broken down back into their member objects using the **UnBoolean** command. Select the Boolean object, and the UnBoolean command will become available to use. Select the UnBoolean command to return any Boolean object back into its component objects. Any transformations (Move, Rotate, Scale) that were applied to the whole Boolean will still be applied to the component objects.

Each time you select Unboolean the Boolean object is undone one level. You can also use the History panel of the Details palette to undo an action or series of actions.

## Burn UV

UV mapping wraps a texture onto an object by matching the texture to the object's UV coordinates. The image maps follow the contours of the surface, stretching and squeezing where necessary.

Sometimes the UV coordinates aren't projected onto an object in a way that's most useful. This often occurs after importing meshes or performing Boolean operations. With the Burn UV command you can project a different set of UV coordinates onto a Polygon Mesh.

**To Change the Uv Coordinates:**
From the **Map** pop-up on the **Texture & FX** panel of the **Object Properties** palette, select the projection mapping style (Spherical, Cubic, etc.) that you want to use to establish the object's new UV coordinates. (You must already have a surface texture applied to the object in order to access the Mapping style pop-up. However, once the new UV coordinates are established, you can remove or change the texture because the UV coordinates are a property of the object, not the texture.)

**NOTE:** You can also change the position of the texture on the object before burning in the new UV coordinates. Click the Position button on the Object Properties palette to change the orientation of the texture.

Once you've got the mapping and positioning of the texture just right, select the **Burn UV** command from the Modeling menu.
New UV coordinates are established, and the Mapping style pop-up on the Object Properties palette immediately changes to UV.
For more information see **Chapter 8 - Texture Basics**.

## Drop a Curve

The Drop a Curve command allows you to easily duplicate the animation path of any object in your model by creating a Bézier curve that matches the path exactly. This command is only available if an object with an animation path is selected in the Modeling window.
To use Drop a Curve, select an object that has an animation path, and select the command. A duplicate of the animation path will be created as a Bézier curve.

You can select the new curve by right-clicking and selecting it from the Context menu. You can now position it anywhere in your model. This curve can then be converted into an animation path for another object with the **Convert to Path Tool**, creating identical paths.

For more information about creating animations, see **Chapter 15 - Adding Animation**.

## Hull

The **Hull Tool** forms a surface between four Bézier curves as if they were the four sides of a piece of cloth. Using Hull, you can create complex Bézier surfaces that may be difficult to define otherwise.

To create a Hull surface you need to start with four open (unclosed) Bézier curves. You can create these curves using the Pen Curve Tool or you can import the lines from Adobe Illustrator or similar software.

Once you have your curves drawn and positioned, select all four curves. Select the Hull command. In the Hull surface dialog which appears, use the pop-up menu to choose the algorithm used to create the surface. The options are Flat and Embossed.

There are two ways to edit a Hull surface - you can use the **UnHull** command from the Modeling menu to get access to the original Bézier curves to edit them individually, or you can convert the Hull surface to a 3D Bézier surface which can be edited.

After you've created the Hull object you can edit the surface algorithm in the Object panel of the Object Properties palette. The U and V settings on the Object Properties palette change the interpretation of the Hull surface. In other words, you can make the surface lean or flow from one side to the other. This weighting towards one side or the other can be animated. For more information see **Chapter 5 - Working with Bézier Objects.**

## UnHull

To edit the original Bézier curves of a Hull object, first **UnHull** your surface by selecting it from the Modeling menu. This removes the Hull surfaces, leaving the four original curves. You can then select the individual curves and use Edit Object command or double-click them to quickly Edit them. You can use the Hull Tool again to rebuild the surface from these edited curves.

## Fillet

The Fillet command rounds all of the edges of polygonal objects, according to the Range and Radius you specify. The Fillet command can be used only on three-dimensional Polygon Mesh objects, and it cannot be constrained to only certain corners or edges.

**NOTE:** Because this tool works on individual polygon edges, it is highly recommended that you use this tool on either very simple polygonal meshes, or ones with mostly planar polygons. This is because every polygon in your mesh is filleted if it meets another polygon at any angle. This is especially detrimental to Sphere or Cylinder shapes.

To use the Fillet command, select a Polygon Mesh object, then select Fillet. The dialog which appears includes a slider for the Range and a numeric entry box for Radius. Each edge that you smooth is divided into a set number of segments (the Range), which are then rounded at a specific Radius cutting inward from all of the corners of your object. For more information see **Chapter 7 - Special Modeling Tools.**

## Flip Faces

Occasionally you may find a model that seems to be shaded exactly opposite from what you would expect based on how you have the lighting set up. This most often happens with imported geometry. In other words, the surface lighting may appear as if it were facing in the opposite direction than it actually is (i.e. lit as if it were the bottom of the object, although it is actually facing up).

This incorrect surface direction (stored internally in Design 3D as the surface normal) can sometimes be corrected using this command. Flip Faces will actually tell the surface normals to point in the opposite direction.

To use the Flip Faces command, select the object then select **Flip Faces** from the Modeling menu.

## Explode

Explode is a geometry effect which makes changes to an object's surface **over time**. It explodes an object into a cloud of triangular polygons that move outward and then fall in a flurry of random motion.
This effect is adjustable for duration, force, gravity, and the life span of the exploded pieces before they disappear. There is also a Complexity Reduction feature, which can significantly reduce the number of polygons produced by Explode.

Explode works by first breaking the surface of the object into a group of triangle-shaped polygons. They explode outward in a spherical pattern away from the object origin point. The Force of the explosion determines how far and how fast the pieces move outward. After the initial exploding impact, the pieces begin to tumble and fall. How fast the pieces fall is determined by the Gravity setting.

To use Explode, first select the object to Explode by clicking on it with one of the Object Manipulation tools, then select **Explode**. The Explode dialog appears, with slider controls for the three main characteristics: Force, Gravity, and Life. For more information see **Chapter 11 - Effects.**

## Shatter

Shatter breaks an object or group into polygons which then tumble and fall; and eventually disappear.
You can adjust the duration of the process, the tumble energy and life span of the pieces, and the pull of gravity. You can set Gravity for your model in the Air panel of the Environment palette.

The polygons always fall in the **- Y** direction (negative Y axis), according to the absolute coordinates of the model space. This is not view-relative. You can make objects appear to fall up or sideways by setting up your model relative to the Y axis, and then rendering through a camera that is tilted. Enter a negative number in the gravity field to have the shattered pieces float in your scene.

To use Shatter, first select the object to Shatter by clicking on it with one of the Object Manipulation tools, then select the Modeling menu item **Shatter**. The Shatter dialog appears, with slider controls for the three main characteristics. For more information see **Chapter 11 - Effects.**

## Smooth Mesh

The Smooth Mesh command lets you fine-tune the surfaces of a polygonal mesh object by adding geometry to its surface, or by simply manipulating the way light reflects from the surface.

**NOTE:** Smooth Mesh should not be confused with the Subdivide command. Subdivide creates a new mesh surface with a different shape, but one that is based on the original mesh points. Subdivide can also be reverted back to the original mesh surface at any time by using the UnSubdivide command. The Smooth Mesh command will permanently modify the mesh structure, but not the shape.

If you do not have a Polygon Mesh selected, Smooth Mesh will not be available. When you select Smooth Mesh, a dialog appears which allows you to set how the command will refine or resmooth your selected mesh. For more information see **Chapter 7 - Special Modeling Tools.**

### Subdivide

The Subdivide command is one of Design 3D's most powerful and frequently used modeling features.

Subdividing a polygon surface approximates a curved surface by breaking the polygons into smaller and smaller faces, using a spline-like curve to fit the new mesh within the points that made up the original polygons. This original polygon mesh is retained as a "cage" which still controls the shape of the subdivided surface "inside" it, and is used when reshaping the Polygon surface.

Any Polygon mesh object can be either permanently or temporarily subdivided into a subdivision surface by selecting the mesh and then selecting the Subdivide command from the Modeling menu. For more information see **Chapter 6 - Working with Polygonal Mesh.**

### UnSubdivide

To reverse the subdivision of the Polymesh object, select the **UnSubdivide** command from the Modeling menu.

### Thickness

Thickness adds width to Bézier or polygonal mesh objects in your model. This command is great for quickly making an object with thickness while modeling.

To use the Thickness command, select the object, then select **Thickness** from the Modeling menu.

This dialog allows you to specify the thickness you want to add to the selected object. Your results will depend on the type of object you have selected.

The Thickness Tool can be used on two-dimensional polygonal meshes as well. You may need to first convert your 2D filled object to a Polygon Mesh. For more information see **Chapter 7 - Special Modeling Tools.**

## Rendering Menu

### Render Image

**Command-R** (Mac) or **Control-R** (Win)
Rendering is the process of creating 2D graphic images, or snapshots, of your 3D projects. Rendering produces pixel based images, also known as raster

images. All of the work of modeling, texturing, lighting and animating comes down to rendering, which is typically the eventual output of the 3D process.

Selecting Render Image opens the Render Image dialog. This command is available whenever a model, shape, or camera window is active. The Render Image dialog allows you to choose the rendering method, the level of anti-aliasing used, set the frame or number of frames to be rendered, the image size and several other options.

A faster way to see your scene in a raster (pixel-based) image is to simply select the **Rendering Tool** at the bottom of the Tool palette, choose from the pop-up Preset menu, and click in your Modeling window. For more information about rendering see **Chapters 17 - 20.**

## Render Live 3D CX

Selecting this command summons the Render Live 3D dialog. Strata Live 3D CX™ is a companion product to Design 3D capable of producing interactive 3D presentations for web delivery.
A Live 3D presentation is an optimized 3D object with textures, animation, and hotspots. These are not 2D images, but rather true 3D objects that are optimized for online viewing. You can create, texture and animate your objects in Design 3D to start a Live 3D project.

**NOTE:** You will need the Live 3D package to utilize the XMM files created by this “rendering” process. The output files themselves are not yet ready to viewed on the web, using Live 3D or any other interactive technology. The Design 3D package includes no tools for re-opening or optimizing these files. For more information see **Chapter 20 - Special Renderers.**

## Rendering Queue

The **Rendering Queue** command lets you add suspended renderings to a rendering queue. A rendering queue is a line-up of suspended renderings waiting to be started. When one finishes and saves to disk, the next one in line begins, until the queue is finished.

You can add multiple suspended renderings to the job list in the **Rendering Queue dialog**. Only one rendering is active at a time. The order in which you add the jobs to the queue determines the order in which they are rendered. When you close a queued rendering, either because it has completed and been saved or it has been terminated by clicking the close box, the next rendering in the queue (if any) loads and begins rendering.

If you quit Design 3D while renderings are in the queue, they are deleted from the queue. The queuing of renderings between sessions is not retained. An alert is displayed informing you that renderings are still present in the queue, and asking if you are sure you want to quit.

For more information see **Chapter 17 - Rendering Basics**.

## Suspend Rendering

Use the Suspend Rendering command to save a rendering in progress. You can then restart it at a later time. The Suspend Rendering command is available when a rendering window is the active window, and the rendering is in progress.

When you select this command, the Suspend Rendering file browser dialog is displayed, allowing you to specify a name and location for saving the suspended rendering. Design 3D automatically adds the .rdf suffix to the end of the file name.

If you suspend a still image (single frame), the dialog allows you to specify a name, location, and file format for the suspended rendering.

If you suspend an animation, the name, file format, and location of the file would have been already set when the rendering was initiated. The Suspend Rendering command creates a suspension file containing all of the information necessary for continuing the rendering process. The dialog allows you to specify a name and location for the suspension file. This is the file that you need to restart when you’re ready to continue rendering. Suspended renderings can also be added to the rendering queue.

For more information see **Chapter 17 - Rendering Basics**.

## Suspend and Continue

Use this command to save the rendering in its current state of completion, and then automatically continue on with the rendering process. This command is available from both the Rendering menu and the Rendering window’s Plus menu.

For more information see **Chapter 17 - Rendering Basics**.

## Scripting Menu

Design 3D includes a powerful and tightly integrated scripting sub-system. The possibilities for script elements inside the application can be as diverse as a simple scripted animation of an object (such as the orbital paths of planets), a new texture applied to an object (such as a ScriptFX shader to simulate an X-ray effect), custom lighting effects, camera lenses and formats, or even geometry deformations and animations.

With the power of scripting in Design 3D, fully functional user-interface elements (such as pop-up dialog boxes with buttons, entry boxes, and sliders) can be quickly built, allowing for the creation of custom widgets and plugins to automate tasks or manage more complex scripted functions.

With the Lua scripting environment in Design 3D, animations and object attributes can be handled in more complex ways than simply keyframing changes over time. Attaching scripts directly to each attribute can be done with each attribute's **Script Editor**. For more information about the Script Editor, see **Chapter 15 - Adding Animation.**

See **Scripting Documentation** in the **Help** menu for additional Lua scripting documentation.

**Lua**
The scripting system in Design 3D is based on version 5.0.2 of the open source **Lua** programming language, with Lua 5.1 compatibility extensions. More information about Lua in general can be found at the Lua website (www.lua.org), and more information specific to Lua in Design 3D can be found at the Strata website (www.strata.com) and the Stratacafe (www.stratacafe.com). See the application folder for any additional Lua scripting documentation.

**NOTE:** Although the scripting environment in Design 3D is very powerful and integrated into the application, it is generally a safe place to experiment. Every attempt has been made to make scripting in Design 3D easy to use. However, using the scripting environment effectively still does require a familiarity with scripting and how 3D applications can function.

### Using Scripts

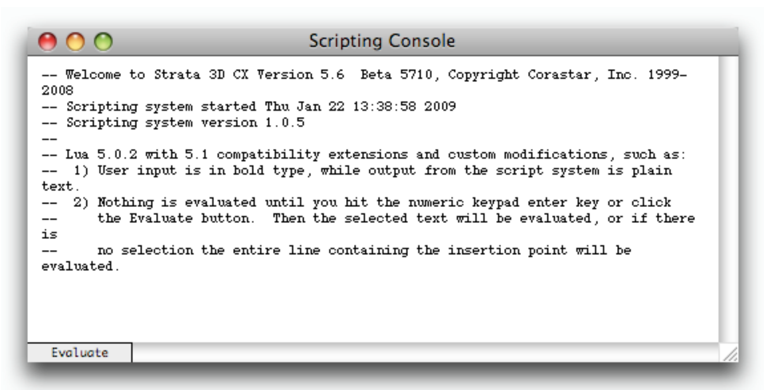
All scripts need to be "parsed" as a set of instructions for Design 3D to follow. For this to happen, they must be loaded into your current scene and then explicitly evaluated, or applied to either individual objects or your entire scene through a ScriptFX item, just like any Resource-based FX. You can also attach scripts to certain Object Properties in the timeline of the Project window to assist in complex animations, or even load entire libraries of scripted functions for use whenever you create and execute other scripts in the Design 3D application.

Some scripting samples can be found in the Scripting menu as basic menu items, as well as in the ScriptFX library in the FX panel of the Resources palette, and also in the Scripts folder next to the application itself on your hard drive. These samples, and the Resources available from the Stratacafe.com website, can start you off in the world of scripting inside Design 3D.

## Show Console

A very helpful tool when evaluating and experimenting with new scripts in Design 3D is the Scripting Console. This is a simple text-editor type of window that can be accessed from the Scripting menu. When it is opened it will contain some reported text about the version and loaded state of the Lua scripting extensions in Design 3D, as well as any warnings or errors encountered with auto-loaded scripts.

The Scripting Console is a way to directly access the Lua script environment in a very basic way. This is helpful when testing out scripts in a "live" scene to tune the effect or develop a larger script. The information entered into the Scripting Console is not saved in any way, so you should save your script as a text file for access to it later.




To run a script in the Scripting Console and check for any errors and see its effects, simply enter the script, highlight it with the text-entry cursor, and press the **Evaluate** button at the lower left corner of the Console. Alternately, you can press the Enter key on the numeric keypad to evaluate the script. A report of the evaluation will be written directly to the Console at the last line, and any effects it has on your current scene will be applied at that time.

## Smaller/Larger Font

Font sizes in the Scripting Console and in all Script entry editors can be made larger or smaller by using the **Smaller Font** and **Larger Font** menu items. This is helpful for readability, but can also require that the script entry editors be resized to show more or less of the text as the font size changes.

## Enable/Disable Preference Settings

This menu item allows you to enable or disable four commonly used Preference settings quickly and easily. You can toggle these settings on or off without having to open the Preferences dialog. When you select one of these options, it becomes enabled and a check mark will appear next to the item in the menu.

**Enable Auto Grids:** When this option is enabled, switching views automatically switches the active grid to the face-on grid. For example, if you switch to a top, bottom, or isometric view, the Y grid becomes the active grid. If you switch to a front or back view, the Z grid becomes the active grid. And if you switch to a right or left view, the X grid becomes active.

This does not in any way restrict you to a particular grid. You may still change to any grid you want, but this option automatically activates the grid that's easiest to model on from your current viewing orientation.

**Enable Automatic Keyframing:** When objects are modified at different points in the timeline, Design 3D can automatically add an animation keyframe for you, speeding up the animation process by saving that change in the appropriate channel. However, this can create unwanted keyframes if you do not intend to change your object over time (animate it), so by default this option is set to "disabled." You can use this command to quickly toggle Disable Automatic Keyframing in the General panel of the Preferences dialog on or off.

**Enable Backface Culling:** When this option is enabled, the back side of objects don't appear in the Modeling window. This results in much faster redraw times for the interactive renderer(s), because the inside surfaces of objects aren't calculated.

When this option is enabled and modeling is done in Wireframe, only the front side of the wireframe is displayed. However, you can still see "through" the wireframe, and objects behind other objects are visible; but the inside surfaces are eliminated from any of the calculations. Also, the inside surfaces of objects without endcaps won't be visible in the Modeling window.

This option applies to interactive (on-screen) renderers only, it does NOT affect final renderings.

**Shade Hidden Line Display:** When this option is enabled, objects displayed in Hidden Line appear with surfaces, similar to Flat, except the lines are also visible.

## Instance Nodes

Instance nodes are used in animation and are accessed in the Project window. They give you access to properties of your object that can be animated.

### Create Instance Nodes

These menu items give you a quick way to create instance nodes in the Project window. You can create instance nodes for scale, offset, rotation, and position.

When you add an instance node, it makes a specific property and its associated timeline available in the Project window.
Instance nodes are not always available for every object in the Project window, but they can be quickly added using this menu option.

### Enable Keyframing

When objects are modified at different points in the timeline, Design 3D can automatically add an animation keyframe for you, speeding up the animation process by saving that change in the appropriate channel. However, this can create unwanted keyframes if you do not intend to change your object over time (animate it), so by default this option is set to "disabled" in the General panel of the Preferences dialog.

The Enable Keyframing command allows you to quickly turn Automatic Keyframing on or off for specific attributes without opening the Preferences dialog.

### Edit Script Options

These options let you access (or add) scripts for scale, offset, rotation, and position nodes. Selecting one of these options summons the Script Editor dialog. This dialog is also accessible in the Project window.

For more information see **Chapter 15 - Adding Animation.** For more information about the scripting environment in Design 3D, see the **Scripting Documentation** link in the Help Menu.

### Set Object Origin

This command allows you to set an object's origin point to a specific location. When you select Set Object Origin, a dialog opens where you can set the World x,y and z coordinates in numeric fields.

The object origin point is the point that the object rotates around. This point is usually, but not necessarily, at the geometric center of the object. When the display method is set to Wireframe, Outline, or PointCloud, you can see the object origin point whenever an object is selected. It appears as a small blue diamond about the size and shape of the red handles of the object.

When you first create an object, the origin point is located at the geometric center of the object. However, you may want to move the origin point to a new location for rotation, modeling or animation purposes.

### Swap Geometry

This menu command allows you to exchange the geometry of two selected objects while retaining the scale, position, rotation, and offset information. This can be useful for exchanging or replacing objects with complex animation paths, or when you have used a placeholder object to set up your scene, lighting, etc.

The selection order is critical in Swapping Geometry. The first object you select will replace the second object you select (Shift-select), and inherit its size, rotation, etc.

## Windows Menu

The Windows menu includes commands to control which windows and palettes are displayed on the screen. There are also commands to adjust the views within the Modeling windows.

### New Window

**Command-** (Mac) or **Control-** (Win)
The New Window command opens a new window with the same configuration as the active window. This command is useful because it allows you to view your model through another window with a different focal point - or View Set Center as its known in Design 3D. New Window is available whenever a document is open.

Once the new window is open, it can be modified. For example, you can split the window into multiple views, delete or resize views, change the view orientation, or change the display scale - all without affecting the previously open Modeling window.

## Stack Palettes

This command "stacks" many of the floating palettes along the right edge of the screen (and expands them if they are collapsed), places the Resources palette along the bottom of the screen, and moves the Tool palette back to the upper left side of the screen. This is the equivalent to resetting the palette arrangement to the application default for your screen size.

**NOTE:** Some palettes will still overlap each other based on your monitor resolution. When you click on or in an individual palette, it will be brought to the front. Some palettes also expand automatically and may cover parts of "lower" palettes.

The Stack Palettes and Stack and Collapse Palettes commands are also accessible through icons on the right side of the **Button Bar**, above the Modeling window.

## Stack and Collapse Palettes

This command "docks and collapses" many of the floating palettes, and arranges all palettes at the edges of the current main monitor window. (This does not include the Project window or Modeling window - only palettes.) This is the equivalent to carefully collapsing each palette and then moving it to the top or bottom of the screen so that you can see your Modeling window, Project window, and other windows clearly. Palettes can be freely moved and arranged after being stacked. Collapsed palettes can easily be expanded again by clicking on one of their tabs, or choosing the Expand Palette command from the palette Plus menu.

The Stack Palettes and Stack and Collapse Palettes commands are also accessible through icons on the right side of the **Button Bar**, above the Modeling window.

## Show/Hide Palette Commands

This section of the Windows menu provides controls to show and/or hide all of the palettes in Design 3D. Palettes can also be managed using the palette management buttons on the right side of the Button Bar.

These commands control the display of the palettes. If the palette is already open, the command changes from Show to Hide. You can also press the hotkey listed to open the palette. If the palette is already open, the hotkey will collapse the palette.

Show/Hide **Environment** Palette
Hotkey: **E**
Show/Hide **Details** Palette
Hotkey: **I**
Show/Hide **Object Properties** Palette
Hotkey: **O**
Show/Hide **Modeling Commands** palette
Hotkey: **T**
Show/Hide **Resource** Palette
Hotkey: **R**

## Show/Hide Tool Palette

This menu item will toggle the visibility of the Tool palette. While many of the functions of the Tool palette remain accessible through hotkeys, many tools and settings require the Tool palette, so it is not typically hidden. There is no hotkey for hiding the Tool palette for this same reason.

## Show/Hide Project Window

Hotkey: **P**
Only one Project window is displayed at a time, even if you have more than one model open. However, when you change the active model, the Project window redraws to reflect the current model. If the Project window was showing when you quit the application it will be open when you re-launch the application.

## Fit Views to All

**Command-=** (Mac) or **Control-=** (Win)
The Fit Views to All command adjusts all views in the active Modeling window to include all objects in your model, excluding the grids. Fit Views to All is available anytime a model is open.
When you select this command, the distance of all views in the active window from the View Set Center is adjusted and repositioned, if necessary, so the entire model is displayed. The magnification settings are also reset so that all of the objects in the model will appear in all the views. This is useful when you have lost your place in your model.

This command allows you to automatically move to a larger view of the model or shape. The location of the active View Set Center at the time you select this command determines the extent to which the view must be modified.
Only the views of the active window are affected.

## Fit Views to Selection

**Command- "-"** (Mac) or **Control- "-"** (Win)
Use the Fit Views to Selection command when you want to adjust all views in the active window to include only the selected object or set of objects. It does not include any grids which may be associated with the object. Fit Views to Selection is available whenever an object is selected.

The command adjusts the distance of all views in the active window from their View Set Center and, if necessary, repositions the View Set Center to fit around the selection. The magnification settings are also reset so that any objects you have selected will appear in the views.

This command allows you to automatically move to a tighter view of a specific area within the model or shape. Depending on the location of the View Set Center at the time you select this command, the affected views may need to be relocated. You can also shift the views and viewing scale manually by using the tools on the Tool palette. Only the views in the active window are affected.

Modifier keys that apply to Fit Views to Selection command:
**Option** (Mac) or **Alt** (Win)
Holding down this modifier key while selecting the command will include animation paths of the selected object, as well as the objects, in the view fit. Without the Option or Alt key, this command fits the view(s) only to the selected objects. Determining the extents of the animation path for the selected object so it can be included in the views takes longer to calculate. This command may operate noticeably slower with the Option or Alt key held down.

## Fit Views to Active Grid

**Command-[** (Mac) or **Control-[** (Win)
The Fit Views to Active Grid command will ignore the geometry, lights and all other elements in your scene (whether selected or not), and instead fit the view to the currently active Grid.

If the Grid has been re-sized using the Grid tool, then all of the visible Grid will be fit into the view. If the active Grid is “edge on” then this command will fit the view to the only visible dimension of that grid.

## Reset Views

**Command-]** (Mac) or **Control-]** (Win)
Reset Views will reset the view (or views if you have split the view to two or more) for the active window. Specifically, this means the views will be reset to standard viewing orientation and magnification.

For example, set a view to the Front viewing position by selecting “Front” from the View Orientation pop-up menu at the top left of the view. Next, rotate the view using the View Rotate tool - the pop-up will read “Custom.” Now change the magnification level of the view using the View Magnify tool. Selecting Reset Views will return the view to the Front position with no magnification.

Reset Views does not change the position of the view, such as if it has been moved using the View Move tool or by using one of the “Fit Views” commands described above. Reset Views will, however, clean up any corruption to the modeling view that may have occurred while zooming or adjust the view position and/or rotation.

## Camera Windows Submenu

This submenu gives you access to a window’s associated camera objects by listing the names of the Camera objects in the scene. If you haven’t inserted any camera objects in the active model, the Camera Windows submenu is dimmed.

When you select one of the camera objects in the list, that camera’s window becomes the active window. You can also open a camera window by double-clicking on the camera object directly in the Modeling window. A check mark appears in front of the camera window’s name when it’s the active window. To make another camera window the active window, select that camera’s window from the list.

Camera windows are a special type of window. Each one contains a view of the model from the position of the camera object. It is not attached to any view set, as are the views in Modeling windows. Camera objects (and their windows) are free to move anywhere and to have any orientation in the model.

## Spotlight Windows Submenu

The Spotlight Window submenu displays a list of all the spotlights that are present in the active model. Each spotlight has its own spotlight window. Spotlights are placed into your model using the Spotlight tool from the Tool palette. Spotlight windows make it possible for you to “see” exactly where the spotlight is illuminating the model.

Spotlight windows are always square, and represent the area of full illumination. If the spotlight is selected in the Modeling window when you select its window from the submenu, the ring representing the area of full illumination is also visible and fits exactly in the window. This window also provides controls that help you aim the spotlight in the Modeling window.

When you select a spotlight from the list, the window associated with that spotlight opens and becomes the active window. You can also open a spotlight window by double-clicking on the spotlight icon in the Modeling window. When a spotlight window becomes active, a check appears in front of the spotlight window's name in the submenu. If no spotlights are present in the active model, the Spotlight Windows submenu is dimmed and unavailable.

### Snapshot/Image Windows Submenu

This submenu displays a list of all open rendering, snapshot, and animation windows. This command is available when one or more of these windows are open. If none are open, the command is dimmed. When a rendering, image, or animation window is the active window, a check mark appears in front of the window's name. To make another window the active window, select it from the list.

### Open Scenes/ Files List

At the bottom of the Windows menu is a list of all currently open scenes, or individual Design 3D modeling files. Because Design 3D can have multiple files open at one time, they are listed here to allow easy selection and switching between them by name. The currently active scene file has a checkbox next to its name.

## Help Menu

The Help menu provides access to learning and reference material, as well as registration , update information and the Strata.com website.

### User Guide

This command links to the Strata Design 3D CX User Guide PDF. Clicking this command will open the User Guide in Adobe Acrobat reader, or other default PDF reader on your operating system.

The PDF includes bookmarks to allow for quick access to various topics. The standard Acrobat Search function can also be used to find key phrases or words.

## 3D[in] Quick Start

This command links to the 3D [in] Quick Start PDF for the 3D[in] plug-ins. Strata Design 3D CX contains a set of plug-ins for Adobe® Photoshop® CS4 Extended. These plug-ins are synchronized to Strata's powerful 3D modeling, animation and rendering software, and can be used either from within Strata Design 3D CX, or while working in Photoshop.
If you have installed these plug-ins, you have the option of sending any model, texture or rendering to Photoshop with the click of a button. You can also use the plug-ins from within Photoshop.
The Photoshop plug-ins are described in detail in the 3D[in] Quick Start PDF.

## Scripting Documentation

This command links to additional documentation for scripting. Design 3D includes a powerful and tightly integrated scripting sub-system. The possibilities for script elements inside the application can be as diverse as a simple scripted animation of an object (such as the orbital paths of planets), a new texture applied to an object (such as a ScriptFX shader to simulate an X-ray effect), custom lighting effects, camera lenses and formats, or even geometry deformations and animations.

With the Lua scripting environment in Design 3D, animations and object attributes can be handled in more complex ways than simply keyframing changes over time.

Attaching scripts directly to each attribute can be done with each attribute's **Script Editor**. For more information about the Script Editor, see **Chapter 15 - Adding Animation.**

## Registration

This command is a link that takes you to Strata's registration web page so that you can register your software. Registering your software helps Strata keep up to date with a record of your most recent software versions and serial numbers, and allows us to send you important product update and upgrade information.

## Updates

This command allows you to quickly check for any software updates that may be available for you to download.

## Web Resources

This command is a live link to the Strata.com website. This is your hub for learning about Strata products, getting support, and entering the community portal for Strata enthusiasts. Clicking this command will open the web site in your default web browser if you are connected to the internet.