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Animation Designer Overview

Renderize Live supports full camera animation. When an animation is generated, the position and orientation of the camera is updated in each frame. In addition, the camera's field of view is updated, so the lens optics can be changed during an animation. You can also "mount" a light source on the camera such that it will move with it during the animation.

An animation is defined using a series of "keyframes". Each keyframe defines a camera position in space. Any view resource can act as a keyframe in an animation. Usually, all of the keyframes in a given animation are the same in all respects except that the camera position is different from keyframe to keyframe.

The Animation Designer window is used to "queue up" a series of keyframes to define an animation path. The total number of frames in the animation determines the length of that animation, and the amount of distance between any two keyframes determines the speed at which the camera moves between those two positions.

The Animation Resource Icon

Animation resources are different from other project resources in that they don't appear as icons until you begin to define an animation. That is, you won't find a "default" animation resource on the interface. You must open the Animation Designer by selecting the Edit, Animation command on the Menu Bar, then select Save on the Animation Designer to generate an animation icon.

Once an animation is created, the animation icon appears in the View Resource Palette. This icon differs from normal view icons in that it has the word "Anim" written across it. However, like other resource icons, it can be dragged and dropped into command wells on the Project Designer.

When an animation icon is dropped into the View Well, the animation is loaded into the Project Designer viewport and the viewport changes to a Top view. If the Path option is enabled on the Animation Designer, the camera path is displayed in the viewport; if the Angle option is enabled, the camera angle at each frame is also displayed.

With an animation icon dropped into the View Well, you can now drop it into the Move Well to edit the animation path and execute wireframe animations for preview purposes. When you drop an animation into the Move Well, the Animation Toolbox is displayed, with commands that control the animation path.

The "Anim" animation icon can also be dropped into the Edit Well to re-open the Animation Designer Window.

Opening the Animation Designer

The first time you open the Animation Designer window, you must do so by selecting the Edit, Animation command from the Menu Bar. Once you have defined an animation and saved it (using the Save command on the Animation Designer), an animation icon appears in the View Resource Palette, and the Animation can subsequently be opened by dropping this icon into the Edit Well.

Defining an Animation

Defining an animation is done by creating two or more views, then assigning these views as "keyframes" so that they define a camera path. Once the basic camera path has been set, it can be fine-tuned using a variety of features in the Animation Designer windows and on the Animation Toolbox on the Project Designer window.

The basic steps involved in defining an animation are defined in this section. The use of each specific interface entity on the Animation Designer window is discussed in the Animation Designer Interface section below.

Create Views

Views are used as keyframes in an animation. These keyframes define the basic path of the camera. Keyframe views are created in the same way as other views, using a combination of a camera position, objects and lights organized in 3D space.

Usually, each of the views that are created as keyframes should share the same object and lighting information: only the camera location changes from view to view. Therefore after you create your first view, you can simply copy that view and change the camera position for each of the subsequent keyframe views in the animation.

There are several ways to copy views. First, you can load the view into the View Designer window, assign a new name to the view, then press the Save button to save a new copy of the view under this name. Or, you can point to that view's resource icon and hold down the right mouse button to display the pop-down menu for that icon, then select the Copy option on that pop-down menu and a new name will be assigned to the copied view by default. After copying a view, make that view current in the viewport, then drag and drop the view into the Move Well to enable the Move Toolbox commands for camera manipulation.

The Animation Designer includes a command to facilitate the process of creating keyframes. When you press the  button , the view that is current in the viewport is copied, and the copied view is made current in the View and Move Wells so that the camera position can be changed.

The keyframe views can be created "on the fly" as you define an animation, or they can be created before you begin to define an animation.

Determine the Length of the Animation

The length of an animation is determined by the number of frames. The time length of an animation depends on the speed at which frames are played back. Standard video displays 30 frames per second to achieve a smoothly flowing animation. Therefore, to display 10 seconds of smooth video animation, your animation would need to be 300 frames in length.

The Number of Frames type-in is used to determine the length of the animation. Just type in the total number of frames and press the  button beside the type-in to execute the change.

Assign Views as Keyframes

After creating a series of two or more views with different camera locations, you can begin defining an animation. The views are assigned to different frames in the animation as keyframes. The order in which keyframes appear in the list for frames, and the distance (in frames) between each keyframe determines the camera path and the speed at which the camera moves along that path.

To add a view as a keyframe, first select the frame number on the Keyframe List where you wish the

keyframe to be assigned, and that frame number becomes highlighted. Now drag the desired keyframe view from the list of views in the Animation Designer and drop it into the Set Key Well below the Keyframe List. That view's name now appears at the selected position in the Keyframe List.

Repeat the process of assigning keyframe views to locations on the Keyframe List to determine the desired camera path, and the speed at which the camera moves along the path. The fewer frames between keyframes, the faster the camera will move between these frames. To modify the number of frames between keyframes, use the Resize Range type-in.

If after defining an animation you wish to increase the number of keyframes, you can create new keyframes at specified frame positions using the commands in the Animate Toolbox on the Project Designer.

Select the Desired Range of Frames

Highlight the frames in the Keyframe List that you wish to display, edit or animate. To select all of the frames in the current animation, simply select the  button on the Animation Designer and all frames will be highlighted in the Keyframe List.

To select a range of frames, either drag the mouse in the Keyframe List to highlight the desired range, or use the Range From type-ins to define the first and last frame of the range that you wish to display, edit or animate.

Display and Edit the Camera Path

Once the keyframes have been assigned, a camera path is created. That is, Renderize Live creates a spline (a curved line) that runs through all of the camera positions as defined in the keyframes. This spline can be displayed and edited in the Project Designer viewport.

To display a camera path in the Project Designer viewport, first make sure the Path option is selected in the Display area of the Animation Designer: this will ensure that the animation path is displayed. In addition, you can select the Angle option to display the camera angle (lens optics) at each frame of the animation. After enabling at least the Path option, save the animation using the Save button on the Animation Designer.

Now drag and drop the animation icon from the View Resource Palette into the View Well. When you drop an animation in the View Well, Renderize Live changes to the Top viewport display and shows the camera path. Keyframes in the path are indicated with frame numbers highlighted in red.

Once an animation is current in the viewport (loaded into the View Well), it can be dropped into the Move Well. When you drop an animation in the Move Well an Animate Toolbox appears, displaying commands to step through the animation, edit the curve of the spline that defines the camera path, and create additional intermediary keyframes.

Preview the Animation

The buttons on the Animate Toolbox also includes commands to step through the animation sequence, or play that sequence in its entirety. These buttons allow you to preview the animation in a wireframe mode, either from the camera view or from one of the orthographic views.

Generate the Animation

Once you have defined an animation, simply select the  button to begin generating the animation. When you select this command a File Browser appears, and you are prompted to set a drive, path and filename for the animation.

The animation is rendered according to the aspect ratio and resolution defined in the Render to File

area of the Render Toolbox. In addition, all rendering options that are selected in the Render Toolbox are in effect during the generation of an animation sequence.

The Keyframe List

Located on the left side of the Animation Designer, the Keyframe List displays, in sequential order, all of the frames in the current animation sequence (the total number of frames in this list, and hence in the animation, is determined using the Number of Frames type-in).

Keyframes are added to this list at intervals to determine the camera's path during an animation, as well as the speed at which the camera moves between each of the keyframes. The camera path is determined by the camera position in each of the keyframe views, and the order in which these views appear on the keyframe list.

To add a keyframe to the Keyframe List, first highlight the frame number on the list where you wish to insert a keyframe. Next, drag the view that you wish to use as a keyframe and drop it into the Set Key Well on the Animation Designer. This view is now assigned as a keyframe at the highlighted position on the Keyframe List.

The number of frames between each keyframe determines the speed at which the camera moves between the positions represented in each keyframe. If there are 10 frames between two keyframes, the camera will move more quickly between these two camera positions than if there are 20 frames between the two keyframes. If after setting keyframes you decide to change the number of frames between two keyframes, you can do so using the Resize Range From type-in.

The Set Key Well

Located directly below the Keyframe List, the set Key Well is the well into which view resources are dropped to inset them as keyframes on the keyframe list. As described above, simply highlight a position on the Keyframe List by highlighting the desired frame number, then drag and drop the desired view into this well. That view is inserted as a keyframe at the current frame position.

The Copy Current View button

The easiest way to define an animation is to create one "master" view, then copy this view and change the camera position in each copy to create the desired number of keyframes. This button facilitates the creation of keyframes by executing several steps at once.

Before using this button, an animation must exist in the View Well, and the view that you wish to copy must exist in the Move Well. Then, select this button, and the current view in the Move Well is copied, and the new copy is placed int he Move Well, ready for manipulation.

Notice that this new copy is not yet added to the animation. You must add this view into the desired position of the Keyframe List in order to add it as a keyframe in the animation.

The Number of Frames Type-in

Indicate the total number of frames in the current animation. The number of frames that you set determines the length of the animation. The higher the number you enter, the longer the animation is, but it also takes longer to render all of these frames.

Generally, you need to display 30 frames per second of video to generated a smooth looking animation. If you know how long you want your animation to be in terms of time, multiply the total number of seconds by 30 to determine the number of frames you need to generate and enter that value.

After entering the desired value, press the  button beside this type-in to update the Keyframe List. The list will now contain the selected number of frames.

The Range From Type-in

Select the range of frames that you wish to display, edit or animate. Only those frames that are highlighted are manipulated, so you must select a range of frames before you can do anything of consequence.

The frames that are selected appear highlighted in the Keyframe List. When an animation is loaded into the Project Designer viewport, the animation path is calculated only for those frames that are highlighted. In addition, when you press the  button to generate an animation, only those frames that are highlighted will be generated and rendered.

To select all of the frames in the current animation, simply select the  button that appears beside the Range From type-in, and all the frames in the Keyframe List are highlighted.

To select a range of frames to animate, you can either drag the mouse in the Keyframe List to highlight the desired range, or use the **Range From** type-ins to define the first and last frame of the range that you wish to display, edit or animate.

The Resize Range From Type-in

Use this type-in to insert or remove frames between keyframes. This is very useful to fine-tune the pace of an animation sequence. If you find that the camera moves too quickly between two keyframes, you can insert a number of frames between these keyframes to increase the time it takes for the camera to travel between these two points.

Before you use this command, you must highlight a frame or a range of frames on the Keyframe List. To highlight frames on the Keyframe List, point to a frame on the list and drag the left mouse button to expand the range of highlighted frames. The number of frames that are highlighted is displayed next to the **Resize range from** type-in.

The value that you enter in the Resize range from type-in indicates the number of frames that will replace the highlighted frames. For example, if you have highlighted one frame in the Keyframe List and you enter a value of 5 in the Resize range from type-in, the single highlighted frame will be replaced by five frames, for a net increase of four frames. If you highlight 5 frames in the Keyframe List and enter a value of 5 in this type-in, there is no net change.

The Display Options

When an animation is displayed in the Project Designer viewport, you can enable or disable the display of the animation path and the camera angle at each of the points in the animation.

The **Path** option in the Display area of the Animation Designer enables the display of the camera path when the animation is loaded into the Project Designer viewport. Usually you will want to leave this option enabled so you can see the animation path that is displayed for the camera.

The **Angle** option in the Display area of the Animation Designer enables the display of the camera's view angle at each frame in the animation. This is especially useful if you are changing the camera's view angle during the animation sequence.

The **Length** type-in in the Display area of the Animation Designer allows you to determine the length of the lines that represent the camera direction and lens angle when viewing an animation in the Project Designer viewport. Sometimes it is useful to draw these lines long in order to better understand what is falling within the camera's field of view. However, at other times these lines can become overwhelming, obfuscating the display of the animation in the viewport.

The Spline Slack Type-in

The value in this type-in determines the amount of slack between any two keyframes. The more slack that exists between two keyframes, the more you can manipulate the curve of the spline between these two points.

The slack value can be set anywhere between 0 and 2. The default value is 1. Values less than 1 create a "tauter" line between keyframes; values greater than create a looser line between keyframes. The more slack that exists between any two keyframes, the more the curve of the spline can be altered between these two points.

The Slack value that you set here only takes affect over those frames that are currently highlighted in the Keyframe List. As soon as you change a Slack value, that change is implemented over the highlighted range of the animation.

In addition, you can duplicate a Slack setting over another range of frames by highlighting the desired range in the Keyframe List and pressing the  button. The highlighted frames will now take on the current Slack value.

The Reset Tangents Button

When a camera animation path is defined using keyframes, Renderize Live automatically connects the keyframes with a curved line, or spline. The amount that the spline curves between keyframes depends on the amount of **slack** in the spline. The way in which the spline curves around these keyframe points is controlled by changing the direction of the tangent lines at these keyframe positions. The direction of tangent lines is controlled using the and commands on the Move Toolbox for animation.

When you first create an animation, Renderize Live sets the tangent positions to generate a smooth spline curve throughout the animation path. To reset the tangents, select the button. This is useful to recalculate tangents after changing keyframe positions, or if you have edited tangent positions manually and are not satisfied with the results.

When this button is selected, the slack between the keyframes is also updated according to the current value in the Slack type-in.

This command only takes affect over those frames that are currently highlighted in the Keyframe List. Therefore, be sure to select the range of frames whose curve you wish to redrawe before selecting this command.

Note: if you select the Loop to Beginning option, you must select to recalculate the tangents based on this option.

The Loop to Beginning Option

Select this option to modify the curve of the animation spline at the first and last keyframes in order to optimize the animation path for a looping animation. After you select this option you must press the  button to execute the change.

This option does not automatically create a looping animation. To do this, the first frame and the last frame in the animation should share a common keyframe. This option simply changes the Slack value that you set here only takes affect over those frames that are currently highlighted in the Keyframe List. As soon as you change a Slack value, that change is implemented over the highlighted range of the animation.

The Redo Floor Reflect Option

Remember that Floor Reflect maps are static in Renderize Live. If you change the camera position of a view after generating a Floor Reflect map, that reflection will not update according to the new camera position until you manually regenerate it in the Material Designer window.

Enable the **Redo Floor Reflect** option in the Render Control area of the Animation Designer to instruct Renderize Live to recalculate the Floor Reflect map for each frame in the animation. When the animation is generated, a new Floor Reflect map is calculated according to each new camera position. The result is a realistic reflection that moves as the camera moves.

The value in the **Size** type-in of the Render Control area determines the resolution at which the Floor Reflect map is generated for each frame in the animation. The value that you choose depends on the output resolution of your animation and the prominence of the Floor Reflect Map in the view. For example, if your animation is being output at a video resolution of 512x486, and the object on which the floor reflect map appears is a prominent feature of the view, you may wish to recalculate the reflect map at a resolution close to 512x486. However, if the object does not figure as prominently in the rendering, you can use a much lower resolution. The advantage of generating Floor Reflect maps at lower resolutions is performance: lower resolution image maps are rendered more quickly than higher resolution image maps.

The Skip Frames Type-in

The value that you enter in this type-in tells Renderize Live to skip frames when rendering the animation to disk file. This is useful to speed the rendering process by rendering fewer frames so that you can quickly generate a "rough cut" or a storyboard animation.

The default value here is 0, meaning that no frames are skipped. If you enter the value 1, Renderize Live will skip every other frame when generating the animation. If you enter 2, every third frame is rendered when generating the animation.

The Flashlight Well

Drag and drop a light resource into this Well to assign that light as a "flashlight" in an animation. A flashlight is a light source that is "mounted" to the camera, and therefore moves with the camera. This feature provides an easy way to insure that the area of a scene that is in the camera view is always well illuminated.

Any light type can be used as a flashlight, and the flashlight can display any lighting characteristics. However, if a light source is dropped into this Well, it automatically is positioned at the camera position, even if it was previously added to a view at a different point in space. Therefore, be careful how you use this feature, as it can cause some confusion. The safest thing to do is to create a light source specifically to use as a flashlight.

The Execute Animation Button

Select this button to generate an animation and render each frame out to disk. Remember, only the range that is highlighted in the Keyframe List will be animated, so be sure to select the desired range of the animation that you wish to generate before you press this button.

To select a range on the Keyframe List, you can highlight the desired range with the mouse, or you can use the Range From and To type-ins to determine the range of frames to render. If you wish to highlight all of the frames in the animation, select the  button beside the **Range From** and **To** type-ins.

When you select this command a File Browser appears, from which you can set the desired output drive, directory and file type for the for the animation.

Before you select this button, be sure that all rendering and animation settings are to your liking. There is nothing more frustrating than executing a long animation sequence only to find that you forgot to enable a desired option. Specifically, check the output resolution and Final Aspect as set in the Render to File area of the Render Toolbox, and well as the settings on the Options area of the Render Toolbox. If you have Floor Reflect maps in your scene, be sure to enable the Redo Floor Reflect option if you wish for the reflection map to update for each camera position.

To abort the generation of an animation, you must first press the Abort button on the Render Toolbox to abort the rendering of the current animation frame, then immediately press the Abort button on the Animation Designer to terminate the generation of the animation.

The Render Icons Button

Press this button to render all of the view icons in the project. After creating a number of keyframes by copying them from a master view and changing their camera positions, it can be useful to get a visual display of each of these keyframes. Instead of dropping them into the View Well and rendering them one at a time to update their icons, you can select this button, and Renderize Live will render the views and update their icons to provide more detailed visual feedback.

The Clear Keyframe List Button

Clear a range of the Keyframe List, removing any keyframes that may have been inserted.

Before using this command, highlight those frames on the Keyframe List that you wish to clear. When you press the button, all the keyframes in the highlighted range are removed. No frames are deleted; only the keyframes are removed.

To select a range on the Keyframe List, you can highlight the desired range with the mouse, or you can use the Range From and To type-ins to determine the range of frames to clear. If you wish to clear all of the frames in the animation, first select the button beside the **Range From** and **To** type-ins to select all frames, then press the

button to remove all previously defined keyframes.

Editing an Animation in the Project Designer Viewport

Once you have indicated an animation length (in number of frames), inserted keyframes in the Keyframe List, and selected the display of the camera Path or lens Angle, you can save the current animation as a new resource by selecting the Save button on the Animation Designer. An icon appears for this animation in the View Resource Palette, and this icon can be used to load the animation into the Project Designer viewport for manipulation.

To make an animation current in the viewport, drag that animation's resource icon from the View Resource Palette and drop it into the View Well (or drop it directly into the viewport). When you drop an animation into the View Well, the viewport updates to display the animation from a Top view.

When an animation is current in the View Well, you can edit the animation in several ways.

Modify the Animation Path

Drag and drop the animation icon into the Move Well to edit the camera path and preview the animation in wireframe mode. When you drop the animation icon into the Move Well, the Move Toolbox displays a group of commands for changing the camera path.

The camera path is modified in several ways. First, you can alter the camera location at a keyframe, and the animation path will update according to this new position. You can modify a keyframe camera position using the commands in the Move Toolbox for animation, or if you require full camera manipulation capabilities, you can leave the animation in the View well and drop the keyframe view into the Move Well to display the Move Toolbox for camera manipulation.

In addition, you can control the way the animation path curves between each of the keyframes by modifying the direction of the line that runs tangent to the spline curve at the keyframe camera location. Finally, you can create additional keyframes along the animation path and modify these new keyframes as discussed above.

Preview the Animation

You can preview an animation in wireframe mode in the Project Designer viewport, either by stepping through each frame one at a time, or by pressing the  button to step through each frame automatically. You can preview an animation path from an orthographic view, or you can change the viewport to the camera display and preview the amination in wireframe from the camera.

Add Lights, Objects and Backgrounds to an Animation

Once an animation has been defined you can add objects, lights and image backgrounds to all of the keyframe views in the animation simultaneously.

Add a light to all of the keyframe views that are associated with the current animation by dropping a light resource over the animation in the View Well (or drop it directly into the viewport);

Add an object to all of the keyframe views that are associated with the current animation by dropping an object resource over the animation in the View Well (or drop it directly into the viewport);

Add an image as a background to all of the keyframe views that are associated with the current animation by dropping an image resource over the animation in the View Well (or drop it directly into the viewport).

Edit Light, Object and Views in an Animation

Edit the position of a light or object in an animation by dropping that light or object resource into the

Move Well. These resources are manipulated in the same way as they would be manipulated when a normal view is in the View Well.

Edit the position of a View by dropping that view resource into the Move Well. When you change the position of a view that is used as a keyframe in an animation, that changes the animation path. Note that you can also reposition a keyframe when the animation icon is in the Move Well. Dropping the view into the Move Well simply gives you more commands for the reorientation of the camera.

Using Reflection Maps in an Animation

The use of environmental reflection maps in an animation add a high degree of realism because of the way the reflections move in relation to the updated camera position.

Remember that Renderize Live supports three different types of environmental reflection maps: Floor Reflect, Spherical Reflect and Cubic Reflect.

The Floor Reflect map is used to generate reflections on flat surfaces. This is a static image calculated based on the camera's position. In an animation, you can elect to leave a Floor Reflect map unchanged, so that it does not update for each new camera position. However, by selecting the Redo Floor Reflect button you can tell Renderize Live to recalculate the Floor Reflect Map for each new camera position, and the result is a very realistic reflection that "chases" the camera as the camera position moves.

The Spherical and Cubic Reflect maps are used to generate environmental reflection maps for non-rectilinear objects. Spherical Reflect generates an approximated reflection map: this map is fine for most still frame renderings, but it doesn't hold together well in animations. Therefore, use the Cubic Reflect map when generating environmental reflection maps for an object that will be included in an animation. The Cubic Reflect map automatically insures an accurate reflection as the camera moves around the reflective object.

Lighting and Animation

Lighting views for animation is a little different than lighting views for still frame rendering. Instead of optimizing your lighting for a specific camera location, you must place your lights so that the scene is nicely illuminated when viewed from various camera locations. For example, if you light your view from a single direction, that view might look fine at the current camera location, but if you move the camera to view the scene from the opposite direction, many objects may now appear too dark.

You can solve this problem by increasing the ambient lighting, but this reduces the contrast in the view. You can also define different lighting characteristics for each view, but Renderize Live does not animate these changes, so the resulting animation would show a discontinuity when the keyframe that represents a new lighting model is played.

You might be better off using multiple light sources, with one or two key lights which cast shadows and define the overall illumination model, and additional fill lights which serve to illuminate specific areas of the scene. Fill lights are generally of lower intensity and do not cast shadows. When you are working with multiple light sources, it is very easy to over-illuminate your scene. Therefore, be careful to reduce the intensity of lights to achieve a well balanced illumination.

Finally, Renderize Live allows you to define a Flashlight, which is a light source that is mounted to the camera. This light, unlike other lights, moves with the camera in an animation.

Setting the Resolution of an Animation

The resolution at which an animation is generated is determined by the X Res and Y Res type-ins on the Render To File area of the Render Toolbox of the Project Designer window, as well as the Aspect pop-down menu. Thus the resolution is set in the same way as it is for still frame rendering.

The resolution at which you generate an animation should be determined by your presentation format. If you are going to output your animation to videotape, you probably want to output the animation to a resolution of 512x486 (the standard overscan video resolution). If you plan to output to the AVI (Video for Windows) format to play back on your VGA display, then the output resolution should be based on the performance of your computer's CPU and graphics display card. Most 486 PCs don't have enough horsepower to update the screen fast enough to display a smoothly flowing animation of more than 200 or 300 lines.

Selecting the Output File Type for an Animation

Renderize Live supports the output of animations to a variety of file formats. The file format you choose depends on what you wish to do with the animation after you generate it.

Animations can be output to the AVI, FLI and FLC animation file formats. These are formats that store all of the frames of an animation into a single file.

In addition, animations can be output to any of the bitmap file formats (TGA, TIF, GIF, BMP, RAS, and RAW) in a sequential order so that they can be read in order by a VTR controller software. Each frame in the animation is saved to a separate file, and the filenames are numbered sequentially. For example, if you generate an animation in the TGA file format, and you name the animation "ROOM", then the resulting animation will consist of a group of files, with each file containing a single frame of the animation. The first frame will be stored in a file called "ROOM001.TGA", the second frame in "ROOM002.TGA", and so on. Renderize Live reserves the last three characters in the filename for the frame number. Given the eight character filename limit placed by DOS, Renderize Live will truncate any animation filenames that are greater than five characters in length.

Playing an Animation

Renderize Live cannot play animations on the screen. However, a number of utilities are available to play the various animation output types.

Animations saved into the AVI file format can be played using Microsoft's Video for Windows, or the Media Player.

Animations saved into the FLC file format can be played using the Autodesk Animation Player utility.

Animations saved into a bitmap file format can be played using the Visual Player utility.

The Animation Designer

View Designer Overview

The View Designer is a window in which view resources are created and edited for the current project. A view includes a camera position and is populated with object and light resources. The camera, object and light resources are oriented in 3D space to create a scene for rendering. A project can contain multiple views, either of a common scene or completely different scenes. The different views are displayed as icons in the View Resource Palette on the Resource Manager area of the Project Designer window.

The resources that make up a view include **objects** and **lights**, whose individual properties are defined in the Object Designer and Light Designer, respectively. The purpose of the View Designer is to populate a view with resources. The position and rotation of these resources to create the desired spatial relationship within a view is defined elsewhere, either by X, Y and Z coordinates in the Object and Light Designers, or visually in the viewport of the Project Designer.

In addition to objects and lights, each view contains unique properties for a **camera**, including Position, Rotation and Field of View or Focal Length. Additional properties that are unique to a view include Fog, which gives the illusion of distance by causing more distant objects to be obscured by fog; Ambient Light, which sets the light environment of the scene; and a Background, displayed as a backdrop behind the objects used in the view. The background may be a solid color or an image.

The Default View

If the View Designer is opened by dropping the "default" view resource icon into the Edit Well of the Project Designer, then the properties in the View Designer are updated to the default settings. The default view has no resources. There are no objects or lights assigned to the view, and the background is set to the default color of black. The camera position and rotation is at its "zero" position, and the lens is set to 50 millimeters, the standard focal length for a 35 mm camera.

The default view cannot be altered: it is the starting point for creating new views from scratch. Therefore, as soon as this view is dropped into the View Designer, the name is automatically changed (to default_1, if no view by that name currently exists) so that any changes to the view can be saved under the new name. More than likely, however, a meaningful name would be assigned to the new view, describing it in the context of the project.

Creating a View

A view is created by populating it with object and light resources, determining a camera position and rotation, etc. Views can be created from scratch (beginning with the "default" view), or by copying and editing existing views. In addition, Renderize Live is capable of loading the views that are saved with a DXF file. When a DXF file is loaded with its views, not only are object resource icons created to represent each of the imported objects, view icons are also created for each of the imported views.

Adding and Removing Lights and Objects in a View

The right side of the View Designer contains two Resource Palettes; one for objects, and the other for lights. These Resource Palettes list the objects and lights that populate the current view. Below the Resource Areas are the Add and Remove Wells; these Wells are the "doorway" through which object and light resources pass when being added or removed from the current view.

To add an object or light resource to a view, point to and select on the desired resource icon in the Project Designer's Resource Palette. Hold the mouse button down and drag the resource icon over the Add Well in the View Designer, then release to drop the icon into the Well. This resource is added to the view, and the icon appears in the current view's Resource Palette.

An object or light can also be added directly to a view from the Project Designer. First, drop the desired view resource into the View Well of the Project Designer to make it the current view. Now drag the desired object or light from its Resource Palette and drop it into the View Well, on top of the view icon that is already in that Well: that object or light is incorporated into the current view.

To remove an object or light resource, select and drag that resource from the Resource Palette on the View Designer, and release it when it is positioned over the Remove Well; the object or light resource that was selected is removed from the current view. Note that the resource still exists in the project: it has simply been removed from the current view.

Adding Parent and Children Objects to a View

As discussed in the Loading a DXF File topic, wireframe models can be loaded so that different parts of the model are treated as separate objects in Renderize Live. Separate icons are created for each object, and an additional icon is also created to act as the "parent" of all of the objects in a model. This "parent" object, marked with the word "node", is used to manipulate all of the "children" objects in the view as a whole.

To load an entire model into the current view, simply add the "parent" object to the view: you will be asked if you wish to include the children as well as the parent.

Positioning Lights and Objects in a View

Adding lights and objects to a view is only the first step in creating a view: these lights and objects must then be positioned and oriented in relation to one-another to create the desired 3D spatial relationships that make the view meaningful. This is not done in the View Designer. It is done either by defining cartesian coordinates (coordinates on the X, Y and Z axes to define a position in 3D space) in the Light and Object Designers, or by positioning the objects and lights visually in the viewport of the Project Designer. Typing in coordinates allows for extreme precision. Positioning in the viewport provides the visual feedback which lends itself to the understanding of the spatial relationships of the resources in a view.

Note that the position and orientation of objects and lights are properties of those objects and lights: changing the position of an object or light in one view affects the position of that same resource in any other views in which that resource is included. If different views require different spatial relationships of the same resources, it is advisable to make copies of these resources so that different positions and orientations can be defined for different views.

The position of a group of objects relative to one-another can be manipulated quite easily in Renderize Live. This work is greatly facilitated, however, if the objects in complex scenes, such as an office interior, are created in the proper relative scale and position during the original modeling process.

Positioning the Camera in a View

The **position** and **rotation** of the camera in a view is a very important element of the view. Quite often, in a project with multiple views, the position of objects is the same in each view, but the camera position is different.

The View Designer contains type-in boxes to define the cartesian coordinates in a world coordinate system for camera Position and Rotation. These type-ins can be used to define a precise camera viewpoint which is useful in cases where there is an attempt to duplicate a known view from another project or to duplicate the results of some other software. In addition, notice that the Rotation button acts as a toggle; select on this button to express the camera orientation in terms of a **Target** position. Changing the target position of the camera effectively changes the camera's rotation, but does so by expressing a point in space where the camera is pointing.

Another method for setting the camera is to do so visually in the viewport of the Project Designer. This method shows the spatial relationship between the camera and the objects and lights in a view, which makes it quite easy to create a desired viewpoint.

Setting the Camera Lens Optics

Another factor that influences the way objects are displayed in a view is the optics of the camera lens. The focal length, or field of view, determines the amount of perspective distortion the objects will undergo in the camera view. The camera in Renderize Live is designed to act like a normal camera. If the focal length is a high number, the camera is "zoomed" and the perception of depth between objects is reduced; the objects look crowded. If the focal length is a low number, the camera is set to a "wide-angle" display, and those objects that are close to the camera may appear distorted and appear to "leap out" of the scene. The default focal length of about 50 millimeters emulates the view of a standard lens on a camera.

There are actually two different ways of altering the optics of the camera lens: the **Field of View** type-in and the **Focal Length** type-in. These type-ins, described below, represent two different ways of achieving the same goal: changing one of these settings updates the other one.

The aesthetic considerations of camera lens optics in a view are discussed in the View Realism topic.

The Field of View Type-in

The value entered here modifies the optics of the camera lens by defining the angle of the field of view of the camera. The wider the field of view of the camera, the lower the focal length and the greater the perceived distance between objects. The narrower the field of view, the higher the focal length of the camera, making the objects appear closer to one-another.

You can type-in a value here, or click on the arrows beside the type-in to increase or decrease the displayed value.

The Focal Length Type-in

The value entered here modifies the optics of the camera lens by defining the desired lens type. Remember, a 50 millimeter lens, the default lens on most cameras, simulates the optics of the human eye. Any number below 50mm will create a wide-angle, or "fish-eye" effect. Any number above 50mm will create a zoom effect.

You can type-in a value here, or click on the arrows beside the type-in to increase or decrease the displayed value.

Defining a View Background

The Background Well in the View Designer is used to define a background over which a view is created. This background can be either an image or a solid color. A view background does not show any of the effects that objects do: they are not illuminated by light sources nor shaded by shadows: they are simply a backdrop that always exists at the back of the camera's field of view and on the same plane as the camera lens.

Defining a Color Background

The default background color is black. The color in this Well can be set by pointing to the Well and selecting the left mouse button to open up the Color Toolbox, from which a new color can be assigned.

Defining an Image Background

To use an image as the background for a view, the desired image must first be loaded into the images Resource Palette on the Project Designer. This is done using the File, Load Image command on the Menu Bar.

To load an image into the Background Well, drag the desired image icon from the Image Resource Palette and drop it into the Background Well on the View Designer. This image will now serve as the background for the current view, but will not be displayed until the view is rendered.

An image background can also be added directly to a view from the Project Designer. First, drop the desired view resource into the View Well of the Project Designer to make it the current view. Now drag the desired image from the Image Resource Palette and drop it into the View Well, on top of the view icon that is already in that Well: that image is incorporated into the current view as the background image.

Regardless of the aspect ratio of your final-rendered image, the image that you use as a view background should have an aspect ratio of 4:3 (X:Y). This is the aspect ratio of the Project Designer viewport where the image will be displayed. Images that are not in this aspect ratio will be stretched to fit, distorting the image.

Removing an Image Background

To remove an image from a view, point to the image in the Background Well, hold down the **Alt** key on the keyboard and press the left mouse button: the image is removed from the Well.

Setting the Amount of Ambient Light

Ambient light is an indirect light source; light which permeates a view without having a definite source. In the real world, ambient light is a result of the reflection of light off of all the surfaces with which it makes contact. In Renderize Live there is no reflected light so ambient light is controlled independently.

The Ambient Light type-in on the View Designer is used to indicate the desired amount of ambient light for the current view. The higher the number that is entered here, the more ambient light will be available in a view. You can type-in a value here, or click on the arrows beside the type-in to increase or decrease the displayed value.

The effects of the ambient light setting can only be seen when a view is rendered. If a view has a low amount of ambient light, then the areas of the view not illuminated by a direct light source will appear quite dim relative to the illuminated areas. Conversely, if a view has a high amount of ambient light, those areas of the view not illuminated by a direct light source will not appear as dim: the contrast between directly illuminated areas and indirectly illuminated areas will not be as great.

The aesthetic considerations of ambient lighting in a view are discussed in the View Realism topic.

Defining a Depth Cue: The Fog Check Box

Fog is the effect that gives the perception of distance to a view containing objects at various distances from the camera. In reality the space between the viewer and an object is never empty; it contains air, moisture and dust particles which over distance reduce visibility.

When the Fog Check Box is selected, a **Fog Distance** type-in and a **Fog Color** Well appear for defining the thickness and color of the fog. The aesthetic considerations of these fog settings in a view are discussed in the View Realism topic.

The Fog Distance Type-in

Use this type-in to set distance at which fog begins to affect the view. The higher the fog distance setting, the clearer the "air" will be; background objects will look relatively crisp in relation to foreground. The lower the fog distance setting, the hazier the "air" will be; background objects appear less clear than objects in the foreground. You can type-in a value here, or click on the arrows beside the type-in to increase or decrease the displayed value.

The Fog Color Well

The color of the fog is determined by the color in the Fog Color Well. The color in this Well can be set by pointing to the Well and selecting the left mouse button to open up the Color Toolbox, from which a new color can be assigned.

Defining a Clipping Plane

If an object in a view is too close to the camera, the wireframe lines that make up that object may appear to come from every direction, making it difficult to understand what you see. Therefore, Renderize Live allows you to define a "clipping plane" at a distance in front of the camera such that any wireframe lines that occupy the space between the clipping plane and the camera are "clipped", so that they do not appear.

The **Clipping Plane** type-in is used to set the clipping plane. The default value is 0.2, meaning that the clipping plane is located just in front of the camera. Values greater than 0.2 place the clipping plane farther from the camera; values less than 0.2 place the clipping plane closer to the camera; negative values place the clipping plane behind the camera. You can type-in a value here, or click on the arrows beside the type-in to increase or decrease the displayed value.

Creating Multiple Views in a Project

Quite often it is desirable to create an environment of objects and lights, then view that scene from different viewpoints. To do so in Renderize Live, simply create the first view, and after the lights and objects are correctly positioned and oriented, copy the view and change the camera viewpoint and optics to create a new view. To copy a view, simply load that view into the View Designer and save it under a new name. Now the original view continues to exist, and changes to camera properties, ambient light, fog and background can be executed without altering the original. Remember, however, that light and object positions are properties of the lights and objects; changing their positions in one view alters their positions in all views in which they exist. If you need to re-position objects or lights, copy them first and use the copies in subsequent views.

View Realism

Because realism is in the eye of the beholder, realism in rendering is an elusive goal. Rather than achieving a "mechanically perfect" realism, it may be better to work toward a rendering which achieves the purpose for which it is intended. This may mean, in some cases, deliberately degrading an image to avoid too perfect a picture.

When we look around us, we see only the reflected light from the objects in our field of view. Without much trouble, one can imagine that these reflected rays could be totally undecipherable to the brain. There are years of practice and experience which go into training our brains to make sense of the images sent to it by the eyes. The brain extracts information embedded in the images to form clues used to decipher them. If we want to render an image which will look "realistic" to the eye, we must include as many of these clues as possible in our view. Renderize Live provides the tools you need to achieve the degree of realism you desire. These tools include **viewpoint**, **lens optics**, **ambient lighting**, and **fog**. The sections below attempt to address each of these features in terms of achieving view realism.

Views and Camera

Among the most important factors in defining a view are the "camera" viewpoint and optics. The viewpoint establishes which surfaces are visible, from which angle and which surfaces are hidden. The focal length determines the amount of perspective distortion the objects will undergo in rendering.

If we want to "see" a wider area of our view, we can either "back the camera up" (increase the distance from the viewpoint to the nearest object) or "use a wider lens" (increase the angle of view, thereby increasing the perspective distortion). Both of these methods allow us to see a wider area; the visual effect that they produce, however, differs. Each option is valid, depending on the desired effect; the important thing is to understand the effect of each option and choose the correct one.

The proper viewpoint and focal length combination is a matter of experiment. There is no right setting, just as there is no right setting in the placement of a real camera. There are wrong settings, however, but some of them can be easily avoided. Don't use too wide a view angle (too small a focal length). The effect is to make nearby features "leap out" of the scene. Don't place the viewpoint too far away with a very small angle of view (too large a focal length). It will make near and far objects look crowded together. Focal length and viewpoint must be set by experiment, but a good place to start is with a camera focal length of 50mm. That's the standard lens on a camera. After viewing the effect of a 50mm focal length, try 100mm for a more long distance effect or 35mm for a more wide-angle effect.

Views and Lighting

When lighting a view, use whatever methods necessary to achieve the desired effect, instead of trying to imitate the lighting parameters as they would be in the real world. For example, if you are creating an outdoor scene, creating a single light source and placing it way out in space to emulate the sun won't given you the effect you desire: you'll find that shaded areas of the view appear too dark. Instead of trying to solve that by increasing ambient light, you might get a better effect by using one or more well-placed "fill" lights. In other words, when lighting a view, you need to approach it as a film or video lighting designer might.

Realism in rendering requires that there be some ambient light; otherwise shaded areas would appear completely dark. Lower ambient light makes the scene more "contrasty", since the difference between areas in light and in shade is starker. The higher you set the ambient light, the less dramatic the lighting effects become. Creative lighting can be one of your most effective tools in creating realistic renderings. Additional lights are easy to create, and can add interest and focus to the rendering as well as greater realism. The effects of highlights and shadows greatly influence the

3D effect in a rendered image, not to mention the "mood" of that image. The use of attenuated lighting, which becomes dimmer as distance from the light source increases, and fog, which makes images in the foreground crisper than images in the background, also play an important role in view realism.

Remember that the position of a light is a property of that light. If you change a light's position in one view, that orientation is changed in all other views that contain that light. If you have a case where a single light must have different positions in different views of the same project, make a copy of that light (by dropping it into the Light Designer and renaming it) before incorporating it into subsequent views.

Views and Depth Perception

There are two factors that influence the perception of depth in a view: the lens optics and the fog setting.

If the focal length of a lens is set too large (too much of a zoom), the distance between objects (in depth) appears reduced. Objects in the background appear closer to the foreground of the image.

A second factor that influences the perception of depth in a view is the fog setting. Without our realizing it, fog becomes one of the clues we use to judge the distance of an object from our eye. The perceived difference between a small tree in the foreground and a large tree in the distance is partly the amount of fog through which the distant tree must be viewed.

In a rendered view, it is not likely that real distances will be used in all cases. (That building in the distance is not really 2 miles away!) The Fog Distance dial allows the fog effect to be used to whatever degree is necessary for a realistic view. This dial must be set by experiment to achieve the right effect. In rendering, if it looks right, it is right.

"Fog" is usually white or gray (The default fog color is gray). Haze or smog has more yellow. Smoke is blue. The fog color must be set by experiment.

Views and Objects

The speed with which a view is rendered depends in part on the number of objects in that view. To minimize the time required to render a view, remember to include only those objects required for that view. Objects beyond the reach of the camera and objects totally hidden by the foreground must still be computed during rendering. Objects that are in the background or small objects may not need to have to have extreme detail in their material renderings. Use the tools that Renderize Live provides when necessary, but for the sake of rendering time, use only those tools required to produce the result you want.

Remember that the position and rotation of an object is a property of that object; if you change an object's orientation in one view, that orientation is changed in all other views that contain that object. If you have a case where a single object must have different orientations in different views of the same project, make a copy of that object (by dropping it into the Object Designer and renaming it) before incorporating it into subsequent views.

The View Designer

Object Designer Overview

The Object Designer is a window in which properties are defined for the objects in the current project. An object is a wireframe model; this model is created using a modeling program that is independent of Renderize Live, and loaded into Renderize Live using the File, Load Object command on the Menu Bar of the Project Designer. Objects loaded into Renderize Live are represented with icons. The Objects Resource Palette on the Project Designer displays all of the objects that are loaded into the current project.

Objects are the most important part of a project, because they are the "subject" of the scene (or view) that you are creating. Objects are included in views and displayed in the viewport of the Project Designer in wireframe mode so that their position and orientation can be changed easily in relation to the other resources in the view.

An object is independent of any view in which it may be included, and can be included in more than one view of a given project. When an object is changed, that change is reflected in all views that contain that object. Because objects are created in modeling programs outside of Renderize Live, they are stored in external files and can therefore be loaded into multiple projects. However, while the objects themselves are project-independent, the object properties defined in the Object Designer are exclusive to the project in which the settings are defined.

Objects can be positioned and oriented by typing in the X, Y and Z Position and Rotation coordinates using the type-ins provided in the Object Designer. The Scale of the object can also be changed using a type-in. However, because the orientation of an object in a view often depends on the position of the lights and the camera in that view, objects are not usually positioned in the Object Designer, but in the Project Designer after having been added to a particular view.

Objects can be set to Cast Shadows when rendered, or to have shadows cast on them by other objects; you can elect to Render Backfaces if object normals require it. The rendered object can appear Smooth, or Faceted so that the faces of the model are clearly distinguishable.

The way materials are applied to an object can be modified using the Mapping Type and Texture Repeat selections. The object-to-material position, scale and orientation can be determined using the commands relating to the Object Designer viewport. Finally, objects can be Test Rendered to see the texture mapping effects without having to render an entire view.

General Object Properties

In Renderize Live, objects are defined as three-dimensional entities made up of two dimensional facets, or faces. A single object can be made up of subgroups, such as layers, colors and blocks, and imported into Renderize Live such that each of these subgroupings can be treated as separate objects, or as one single object with different material definitions for each of the subgroupings within the object. For the most part, however, an object may be thought of as the basic rendering entity; something that may be individually controlled as to position, surface texturing, etc.

Object Modeling

Modeling involves producing a three-dimensional facet model, positioning and scaling it to fit with other objects with which it has a relationship, and providing for separation of surfaces by color or texture. Individual surfaces may be separated by color, by layer or by block when imported into Renderize Live. Each of these is transmitted by the DXF file format.

There are three kinds of three-dimensional computer models: wireframe or edge models, facet or surface models and solid models. Wireframe models have no information about surfaces and can be used as the basis for rendering only under special circumstances. Generally speaking, Renderize Live requires three-dimensional facet models as object input. The DXF file format can handle both wireframe and facet/surface models. Most solid modelers translate their solids into facet models for transmission via DXF. Before saving a solid model into a DXF file, however, you should mesh them in order to give Renderize Live enough surface information to work with.

Objects which are intended for Renderize Live rendering should be created with rendering requirements in mind. That is, the layer, color or block definitions in an object should be organized with material definitions in mind; if the modeler assigns layers in an object according to the different materials (all entities that have the same material properties are assigned to the same layer), then the rendering process is much easier.

Renderize Live uses "smoothing" algorithms to simulate a smooth geometric surface such as a sphere from a model which consists of some finite number of flat surfaces or facets. When smoothing is not used or not possible, the model should have a sufficient number of facets to hide the unevenness on those edges which will not be smoothed. However, because processing time is directly proportional to the number of faces in an object, once smoothing considerations have been taken into account, the number of facets should be kept to a minimum.

Object Normals

Each face or facet of a surface model has a normal, which determines the direction in which the polygon is oriented. In other words, each polygon has a frontface and a backface.

The importance of the normal is that it is the frontface which is rendered. If a normal is facing in the wrong direction, the rendered effect will be incorrect: texture maps may appear distorted or not at all; color and highlight characteristics may be wrong; objects may appear inside-out. Reversed normals can be identified and corrected using the commands in the Normals Toolbox.

Another way to overcome the problem of reversed normals is to render the backface of a polygon with a reversed normal. This is done by selecting the Render Backface button on the Object Designer. Rendering backfaces will work for those objects whose material definitions are colors, but the effects can be unpredictable for those faces on which textures are mapped. In addition, rendering backfaces increases rendering time by increasing the number of faces that have to be calculated for rendering.

Object Origin

The object origin is determined at the time the object was created. This origin, along with the associated X, Y and Z directions, is known as the object's local coordinate system. Objects can be manipulated in the Project Designer viewport according to their local coordinate system, or in relation to the plane of the viewport display.

Since the object origin is determined at time of model creation, it may or may not be useful in positioning or orienting the object. For this reason, Renderize Live reassigns the object origin to the center of mass of the object. This makes later positioning of the object in a scene much easier.

When multiple objects are included in a single view, each object retains its own origin. The view origin assigned by Renderize Live is an average of all the individual objects' origins, thus "clustering" the objects about the view origin.

Loading Objects

When you enter Renderize Live, there are no objects available for use. Objects are loaded into Renderize Live using the File, Load Object command on the Menu Bar of the Project Designer. Renderize Live imports a number of model file formats, including DXF files with the ability to load by layer, color or block, and SHP files with the ability to load by group or layer. In addition, you can use the File, Load Object (Directory) to load all of the DXF files in a single directory (this feature is used to load DXF files from the PointLine modeling software).

Once an object is loaded in Renderize Live, it appears as one or more icons in the objects Resource Palette on the Resource Manager area of the Project Designer, depending on the way in which it was loaded. In addition, materials are generated from the layers, colors or blocks of the incoming object and displayed as icons in the materials Resource Palette. Once an object is loaded into the current project, it can be dropped into the Object Designer for manipulation.

Copying and Cloning Objects

Objects can be copied and cloned in Renderize Live simply by loading an object into the Object Designer, defining a new name, and saving the object under that new name. The original object continues to exist, and a new object is created under the new name.

At the time you save a new object, you are asked whether that object should be created as a **Copy** or a **Clone** of the original object. If you select Copy, a new object is created and displayed as a resource in the Objects resource list. This object is completely independent of the object from which it was copied. If you select Clone, the new object is created but it remains linked to the original object: no resource icon is created for the clone. Cloned objects share the properties of their master object. However, they can be independently manipulated moved, rotated and scaled by selection in the main Project Designer viewport.

"Parent" and "Child" Objects

Generally speaking, each object in Renderize Live is an independent entity. However, it is possible to load DXF and SHP files into Renderize Live in such a way that their layer, color or block definitions are treated as separate objects. This results in the creation of one object for each layer, color or block definition in the DXF or SHP file.

For example, if a model is imported by layer, an icon is created for each of the layers in the incoming model, depending on the level at which the object is imported, and displayed in the objects Resource Palette. Each of these icons represents a layer, and each one displays the piece of the model assigned to that layer. In addition, an object icon, marked with the word "node", is created for the model as a whole. This resource icon, although it may contain no geometry (because the geometry is distributed among the objects that make up the layers of the model), controls the model as a whole. It is said to be the "parent" of each of the objects that are generated from the layers of the model. These layers are said to be the "children" of the main parent object.

When a "child" object is manipulated in the Object Designer, any changes made to the object affect that object only. None of the other siblings are affected. However, there are cases when each of the "child" objects needs to share the same attributes; in this case it is easier to manipulate the "parent" object, and pass those changes along to the children.

The Object Attributes Options

The Object Attributes area of the Object Designer allow you to select among a variety of attributes that control the way the object appears when rendered.

The Pass To Children Option

Enable this option under the Object Attributes area of the Object Designer when you are manipulating a "parent" object and you wish to pass the changes that you made to the parent along to each of the "child" objects. When you enable this option and save your changes on a "parent" object, the Object Attributes options that are selected for the parent will be assigned to "child" objects as well.

The Render Backface Option

Objects are made of polygonal surfaces, and each polygon has a normal that indicates in which direction the polygon is facing. Polygons that face the camera are rendered; polygons that face away from the camera are not rendered, unless you enable the Render Backface option.

Backfaces are not normally rendered, since they are not usually visible. However, there are cases when an object may contain normals that face in the wrong direction so that polygons that you expect are facing the camera are in fact facing away from it, and are, therefore, not rendered. Enabling the Render Backface option provides a quick method for overcoming the problems associated with backfacing polygons.

The downside of rendering backfaces is the loss of performance and rendering quality. When the Render Backface button is enabled, this effectively doubles the amount of surfaces that need to be rendered for the current object, profoundly affecting rendering performance. In addition, texture maps and spectral effects on shiny surfaces may not appear correctly on a backfacing polygon. An alternative is to correct the direction of the backfacing polygons using the commands in the Normals Toolbox on the Project Designer.

The Render Lines Option

You should create your models using polygons, not lines. However, if you have created objects using lines, these lines can be rendered when this option is enabled. Disable this option when your model contains lines, such as door swings, that you don't wish to render.

The Cast Shadows Option

The Cast Shadows option determines whether or not the current object will cast shadows. Objects may be defined to cast shadows or to be transparent to light regardless of their surface color or texture. In most cases shadow casting is turned on for added realism. An exception would be an object textured to simulate glass. Unless shadow casting is turned off, the object will block all light. Remember that texturing simply determines the surface appearance of an object. It does not affect the substance of the object itself. Thus, a solid object with a surface texture of glass will still behave as a solid when used to compute shadows unless the "glass" object has shadow-casting turned off.

When the Cast Shadows option is enabled, the current object will cast a shadow. If the button is disabled, the object's position will not be taken into account when determining the shadows cast by the lights in a scene: the light beams will "pass through" the object as if the object isn't there.

Even if the Cast Shadows option is enabled, the object will not cast a shadow until two other conditions are met: the light(s) in the scene that shine on the object must be defined to cast shadows (a selection in the Light Designer), and shadows must be enabled globally for rendering (a Rendering Option on the Render Toolbox).

To maximize the quality of the shadow in a view, be sure to enable shadow casting only for those objects that appear in the viewport. If you define a scene such that objects exist in space outside the camera's field of view, the shadow map that is generated has to be expanded to encompass those objects, if those objects are set to cast shadows. If these objects are far enough out in space, this

will affect the quality of the shadow edge in the rendered image.

In addition to the position of objects relative to the camera view, the quality of the shadow that is cast by an object depends on a number of factors, including the type and position of lights used, the size of the shadow map, and the self-shadow bias value. This command simply enables shadows of the current object: the shadow can be fine-tuned in the Light Designer.

The Receive Shadows Option

You can also determine if shadows will be cast on an object. If the Receive Shadow option is enabled, the object will display shadows that are cast on it, whether those shadows come from other objects or from the same object.

This command can be especially useful if an object is shadowing itself too much due to the positioning of a light relative to that object. Instead of altering the self-shadow bias in the Light Designer, you can simply disable this button.

The Smooth Option

Because models are constructed from a series of planar polygons, it is difficult to achieve a smoothly curved surface unless you do so by creating your model out of a large number of very small polygons. This would be very labor-intensive and would result in very large models.

When the Smooth option is enabled, Renderize Live will automatically smooth the edges between polygons during rendering, resulting in a more natural curve. This is desirable for a rounded object, such as a sphere: however, rectilinear objects, such as a table leg, enabling this option will eliminate the sharp edge and therefore make the object appear incorrect.

When the Smooth option is enabled, a Crease option appears as well, to deal with "seams" on objects where two materials meet.

The Crease Option

An object can be made up of more than one material (this depends on how the object is loaded into Renderize Live; see the Project Designer chapter). When this is the case, smoothing causes a blurring of the edges where two different materials meet. If you wish to smooth out the facet edges of an object, but wish to retain a crisp edge between materials on the object, select the Crease option.

Positioning and Rotating an Object

When an object is incorporated into a view, the default position and orientation of the object is based in part on information saved with the model file.

The Object Designer includes a group of Object Location type-ins that define the orientation of an object in cartesian coordinates. The position of an object in a view can be changed by typing in new **X**, **Y** and **Z Position** coordinates. Similarly, the rotation of an object (the object's orientation in 3D space) can also be typed in using the **X**, **Y** and **Z Rotation** coordinates.

While these type-ins allow for extremely precise positioning of objects in 3D space, it is often easier to position objects visually within the viewport of the Project Designer. To position an object in the Project Designer, drag the desired object from the Object Resource Palette and drop it into the Move Well.

Remember that the position of an object is a property of that object; if you change an object's position in one view, that orientation is changed in all other views that contain that object. If you have a case where a single object must have different positions in different views of the same project, make a copy of that object (by dropping it into the Object Designer and re-naming it) before incorporating it into subsequent views.

Scaling an Object

The scale of an object is initially determined by its modeled dimensions. The DXF file format defines entities by vertex coordinates only, so that all entities have only unspecified decimal size.

When an object is placed in a view it may be scaled up or down as necessary. If all objects in a view were created using the same units, scaling is usually not necessary since the objects were probably created in the same relative scale. However, when a scene contains two or more objects modeled in different scale units, the relative scale of each of the objects may be completely different, resulting in one object in the scene being very small, and another object very large. Sometimes, in fact, the size difference between objects in a view are such that a small object may appear as nothing more than a dot in the view, making that object very hard to locate.

For example, if two objects appear together, one of which was modeled in inches and the other in centimeters, the object created in centimeters will appear to be scaled 2.54 times as large as the object created in inches (1 inch equals 2.54 centimeters, thus the scale difference for the two objects is 1:2.54. In this case, the centimeter object may be scaled by 1.24 to convert to inches, or the inch object may be scaled by 0.39 to convert to centimeters.

The **Scaling** type-in allows you to set the scale of an object very precisely. This precision is important and convenient when the relative scales of different objects must be reconciled, as described in the example above. While these type-ins allow for extremely precise scaling of objects, it is often easier to scale objects visually within the viewport of the Project Designer.

Note this it is possible to enter a negative number for an object's scale. Entering a negative scale effectively turns the object "inside-out." It may be desirable to do this if the object was created in a left handed modeler, or if the rendered object appears "inside out".

Remember that the scale of an object is a property of that object; if you change an object's scale in one view, that scale is changed in all other views that contain that object. If you have a case where a single object must have different scales in different views of the same project, make a copy of that object (by dropping it into the Object Designer and renaming it) before incorporating it into subsequent views.

Mapping Textures onto Objects

The Object Designer contains a wide variety of features that dictate how a material is mapped onto an object. Specifically, the commands in this window determine how image maps ("textures") are mapped onto objects.

The material that is associated with the current object is displayed in the Material Well in the Operations area at the bottom of the Object Designer. However, remember that an object can have more than one material associated with it; if this is the case, the commands in this window apply to all of those materials, even though only one of them is displayed in this Well.

There are three kinds of image maps that are used in materials. A **Color Texture** use an image that is projected onto the surface of the object; it defines the material that the object appears to be made of. A **Bump Texture** defines the topography of the surface of an object; it can be used to add topographical texture or create embossed effects. A **Reflect Texture** is used to simulate a reflection in the material.

Mapping Types Options

Renderize Live provides five mapping types: **Orthogonal**, **Spherical**, **Cylindrical**, **Planar** and **Organic**. These five plus the option **Solid Color** make up the buttons in the Mapping Type group. Only one mapping type can be chosen at a time and this mapping type applies to all of the image maps that are used in the material that is currently assigned to the object. The Mapping Type that is selected has a profound impact on the appearance of the material on the rendered object. Selecting the correct mapping type can be facilitated by becoming familiar with each of the types, described below. Ultimately, however, a certain degree of experimentation will help you determine the idiosyncracies and advantages of each mapping type.

The orientation of the image maps in relation to the object can be altered by manipulation in the viewport area of the object designer, using the commands described in the Orienting Texture Maps in Relation to Objects topic.

The Solid Color Option

Select this option to disable texture mapping for the current object. If this button is enabled, no image maps will be used when this object is rendered, even if the material assigned to this object has image maps associated with it.

The Ortho (Orthogonal) Option

Orthogonal mapping is the simplest mapping type. The image map is wrapped onto an object as if the image was projected from a slide projector onto the object. The image appears normal on any surfaces that are completely parallel to the image mapping plane (the projector's lens) at the time of mapping, and is skewed across any surfaces that are not completely parallel to the "projector". Rotate the object in the Object Designer viewport in order to change the orthogonal mapping effect.

Orthogonal mapping is useful to wrap a texture onto a single plane, such as a table top. If this mapping type was used on a cube, one of the faces of the cube would display the map without any skewing (if that face were parallel to the image mapping plane) and the image would appear stretched and skewed on the other faces of the cube.

An Orthogonal mapping type is represented as a rectangle in the viewport of the Object Designer; this is used to position and scale the image map in relation to the object.

The Spherical Option

Spherical mapping projects an image onto a surface so that each pixel of the image is mapped onto the surface along a line normal to the surface at each point. It is as if the texture map is turned into a hollow sphere and shrink-wrapped onto the surface of the object. The "equator" of the sphere contains the central portion of the image, and the "poles" contain the top and bottom edges of the image.

Spherical mapping is useful on objects that are more or less spherical. If this mapping type were used on a cube, the four faces that define the sides of the cube would display the image map in such a way that would make the cube to appear bowed out in the middle: the image would appear in a radial configuration on the top and bottom surfaces of the cube.

A Spherical mapping type is represented as a circle in the viewport of the Object Designer; this is used to position and scale the image map in relation to the object.

The Planar Option

Planar mapping wraps an image map onto each of the faces of the object so that the image is not skewed during application. The normal of each face is determined and the image is mapped onto each face perpendicular to the normal. In other words, each of the faces in the object that share the same normal (are parallel to one-another) are mapped together orthogonally and the mapping plane is reset so that it is parallel to each of the faces on which it is mapped.

With planer mapping, the image map is not continuous along adjoining faces (unless those faces exist on the same plane); the map is repeated from the same starting point for each different plane. Therefore, you generally need to scale your textures relatively small when using this mapping type. To map an image onto an object so that the image continues over different faces of the object, use the Unfold mapping type (described below).

Planar mapping is useful on objects on which the material should look the same on all sides of the object. If this mapping type were used on a cube, all six faces of the cube would appear exactly the same.

A Planar mapping type is represented as a rectangle in the viewport of the Object Designer; this is used to position and scale the image map in relation to the object.

Note: The Planar mapping type impacts rendering time more than most of the other mapping types. It should only be used on rectilinear objects without many different surface planes.

The Cylindrical Button

Cylindrical mapping transforms the mapped image into a hollow cylinder to be projected onto the sides of a cylindrical object. The mapped image is "shrink-wrapped" from the mapping cylinder onto the object.

Cylindrical mapping is useful on objects where the image should appear to continue as it wraps around the object. The image map is orthogonally applied in a 360 degree circle around the object; the texture is extremely stretched at the top and bottom. If this mapping type were used on a cube, the four faces that define the sides of the cube would display the image map unskewed and continuous across the faces of the cube. The top and bottom faces of the cube would display the image map extremely stretched.

The cylindrical mapping icon appears as a hollow cylinder viewed from the side in the viewport of the Object Designer; this is used to position and scale the image map in relation to the object.

The Organic Button

Organic mapping wraps an image map onto each of the faces of an object so that the image is not skewed during application, and the image continues over each face of the object. This method is similar to using wrapping paper to cover the object, if the paper could be contoured to each of the facets of the object.

Thus with Organic mapping, each face in the object is mapped orthogonally, and the mapping plane is reset in such a way that it is parallel to each of the faces on which it is mapped. This mapping type differs from the Planar mapping type described above in that with this method the image is continued over each face of the object, whereas using Planar mapping, faces that share the same normal are mapped together, and the image doesn't necessarily continue from one face of the object to another.

Organic mapping is useful on objects on which the material should look as if it is shrink-wrapped accurately to each facet of the object. If this mapping type were used on a cube, the image would appear to continue without being skewed over all six faces of the cube.

An Organic mapping type is represented as a rectangle in the viewport of the Object Designer. This is used to position and scale an image map in relation to the object. Generally speaking, the texture should be scaled very large in relation to the object when using this mapping type.

Note: The Organic mappping type requires a lot more time to render than any of the other mapping types.

Texture Repeat Options

The scale of an image map relative to an object may be such that the image needs to be repeated in order to fully cover the relevant faces in an object during rendering. There are three methods to handle this case: **Stamp**, **Flip** and **Decal**.

The Stamp Option

A stamped application is one in which the mapped image is repeated over a surface larger than the image. An image suitable for stamped application is cropped so that any repeating pattern in the image is repeated at the edges of the image: when the image is repeated during tiling, the pattern repeats correctly, creating a "seamless" look over the entire mapped surface. An example might be a small image of wood flooring repeated to cover the floor of a room or a brick pattern repeated to cover a wall. When applied, the repeated wood grain or brick pattern should appear to be a single image.

The Flip Option

Flipping an image during mapping is the opposite of stamped application. As the image repeats over a surface, the image is flipped and mirrored such that the edges match exactly. This effect is useful to hide the "seams" when using non-regular patterns (such as granite or stucco).

The Decal Option

Decal application is used when an image map should not repeat as it is mapped on an object; for example, when creating a label. The position of the image map on the object is determined by the position as defined in the Object Designer viewport.

When Decal is selected, the material definition is treated somewhat differently; the Matte color is mapped onto all areas of the object where the image map is NOT positioned. The image map does not take on any of the Matte color characteristics and the image map does not take on any transparency characteristics that are defined for the current material.

Mapping Select Options

Remember that a material can have up to three different maps assigned to it: a Color Texture, Bump Texture and Reflect Texture. Each of these texture maps can be positioned and scaled independently in relation to the object. In addition, Color and Bump Textures can be manipulated in unison in those cases where it is desirable. The Mapping Select option name that you select here is displayed in the Object Designer viewport to remind you what kind of texture map you are currently working with.

The Color Option

Select this option to manipulate the position, location and scale of a Color Texture in relation to an object.

The Bump Option

Select this option to manipulate the position, location and scale of a Color Texture in relation to an object.

The Linked Option

Select this option to manipulate Color Texture and a Bump Texture simultaneously. This is useful in situations where the same image map is being used as a Color Texture and a Bump Texture in order to give the image map more depth. For example, if you use a brick texture as a Color Texture and a Bump Texture in a given material, you can scale and position them simultaneously using this option such that the amplitude generated by the Bump Texture matches the image as described by the Color Texture.

The Reflect Option

Use this option to manipulate the position, location and scale of a Reflect Texture in relation to an object. Note that this option is only valid for Image Reflect maps; environmental reflection maps generated by renderize are controlled automatically and therefore not manipulated in the Object Designer.

Positioning and Scaling Texture Maps in Relation to Objects

The orientation at which an image texture is mapped onto an object has a profound impact on the rendered appearance of that object. The commands discussed in this section all are used to visualize, define and preview the object-to-texture orientations.

The Object Designer viewport displays the relative positions of objects and texture maps. Using the commands that appear below and beside the viewport, you can alter these relationships to determine the way in which images are mapped onto the object.

The viewport displays a wireframe image of the object being edited, and a wireframe representation of the currently selected mapping type. By rotating the object in the viewport, and positioning and sizing the texture map, you can define exactly how the texture is mapped onto that object. You can then perform a test-rendering in the Object Designer viewport to preview your mapping settings.

The commands beside the viewport determine whether you are modifying the texture map, object or view in the Object Designer viewport; this area also contains commands to perform test-renderings and undo your work. The commands that appear below the viewport change depending on whether you are currently manipulating a texture map, object or the view.

Rotating an Object in Relation to a Texture Map

Because a texture cannot be rotated in the viewport, it may be necessary to rotate an object in relation to a texture map to achieve the desired results.

To rotate the object in the viewport, first select the  button beside the viewport. Then select the desired object rotation button from below the viewport, move the mouse into the viewport and drag it to perform the action. The object rotation buttons that appear below the viewport are as follows:

 Rotate the object 90 degrees around its X axis.
 Rotate the object 90 degrees around its Y axis.
 Rotate the object 90 degrees around its Z axis.
 Rotate the object around horizontal and vertical axes.
 Rotate the object around a vertical axis.
 Rotate the object around a horizontal axis.

Any rotation performed here does not change the orientation of the object as it appears in a view.

If after changing the object's rotation you wish to return it to its default orientation, simply press the  button to undo your work.

Positioning and Scaling a Texture Map in Relation to an Object

The size and position of the texture map in relation to the object determines the scale of the image pattern on the rendered image, as well as the point on the object where the image is placed or repeated.

The mapping type that is selected determines how the texture icon appears in the Object Designer viewport. Spherical mapping type displays a circular icon; Cylindrical mapping type displays a cylinder viewed from the side; all other mapping types (Ortho, Planar and Organic) display a rectangle. The aspect ratio of the rectangle reflects the aspect ratio of the image being used as a texture map.

Remember that there are actually three kinds of texture maps associated with a material: Color Textures, Bump Textures and Reflect Textures. The position and scale of each of these texture maps can be manipulated independently. The texture map that is being positioned or scaled in the Object Designer viewport depends on which one is selected in the Mapping Select area of the Object Designer.

To scale or position a texture map in the viewport, first select the  button. Then select the desired texture positioning or scaling button from below the viewport, move the mouse into the viewport and

drag it to perform the action. The texture control buttons that appear below the viewport are as follows:

 Position the texture map horizontally and vertically.
 Position the texture map horizontally.
 Position the texture map vertically.
 Scale the texture map horizontally and vertically.
 Scale the texture map horizontally.
 Scale the texture map vertically.

In addition to positioning and scaling texture maps visually in the Object Designer viewport, you can also position and scale them using the type-ins located below the Object Designer viewport. These type-in are labeled **Pos X** (position in the X plane), **Pos Y** (position in the Y plane), **Scale X** and **Scale Y**.

If after changing the material's position and scale you wish to return it to its default size and location, simply press the  button to undo your work.

Altering the View in the Object Designer Viewport

The location of the viewpoint in relation to the object can be altered so that an object can be test rendered and viewed from different locations.

To change the view in the Project Designer viewport, first enable the  button. Then select the desired viewport control button from below the viewport, move the mouse into the viewport and drag it to perform the action. The viewport control buttons that appear below the viewport are as follows:

 Pan the view horizontally and vertically.
 Pan the view horizontally.
 Pan the view vertically.
 Move the view in and out.
 Rotate the view horizontally and vertically.
 Rotate the view around a vertical axis.
 Rotate the view around a horizontal axis.
 Roll the viewport display.

Note: Changing the viewpoint in the Object Designer viewport does not change the viewpoint in any views that happen to be displayed in the main viewport on the Project Designer.

If after changing the view orientation you wish to return it to its orientation, simply press the  button to undo your work.

Rendering an Object in the Object Designer Viewport

The object in the Object Designer viewport can be test-rendered to visually display the effect of the current texture-mapping settings defined for this object. This allows you to experiment with texture-mapping settings and try them out quickly, without having to render an entire view.

To render the object into the Object Designer viewport, select the  button. After several moments of processing, the rendered object appears in the viewport. The object is rendered with the material that appears in the Material Well, located at the lower-left corner of the Object Designer.

The object in the viewport can also be rendered with a specific background color or image. Simply drag and drop the desired color or image into the viewport before rendering.

The rendering that appears in this viewport is an approximation of the way the current object will appear in the rendered image. For a more accurate rendering, select the  button below the  button; when this button is enabled you will be warned that it increases your memory requirements and rendering speed. Now when you select the  button, the object in this viewport is rendered to a higher quality.

Note: The way a test-rendered object appears in the Object Designer viewport is not necessarily the way it will appear in the actual rendered view. In the viewport of the Object Designer, the entire object is rendered with the material that appears in the Material Well. However, it is quite possible that the current object is actually created of several layers, colors or blocks, and each of these layers, colors or blocks has a different material assigned to it. It is also possible that the object was "clipped" to assign different materials to different parts of the object. Whatever the case, remember that a single object can have more than one material assigned to it, but that only one material is used during a test-rendering.

Blurring a Texture Map

The Blur type-in controls the degree of blur in the mapping of an image texture to an object. As you increase this value a texture will become more blurred as it is mapped into an object.

It may be necessary to blur a texture map to enhance realism when too sharp an image looks unnatural. Another case is when a texture map is scaled up, creating "jaggies" in the image: blurring the image softens the jagged lines. A third case where Blur is useful is to soften the edges on a bump map such that the topography changes a little more gradually.

Important: In order for a blur setting to take effect, the  rendering option must be enabled on the Render Toolbox before the image is rendered.

Setting Bump Map Amplitude

If a Bump Texture has been defined for the material that is assigned to the current object, the amplitude of the bump can be defined using the Bump Height type-in. This type in appears at the bottom of the Object Designer only when the Bump or Linked Mapping Select options are selected.

You can set a positive or negative bump value. Positive numbers define a positive amplitude, and negative numbers define a negative amplitude. If after rendering you feel the effect of a positive bump setting is the opposite of what you desired, then enter a negative bump setting.

Splitting Objects According to Material Definitions

When an object is loaded into Renderize Live, it is assigned one or more materials. The way materials are assigned to an object depends on the way the object is loaded. The texture mapping commands in the Object Designer pertain to all of the materials that are assigned to the current object, regardless of whether these materials are the result of layers, colors or blocks in the object (as defined in the DXF file), or if that object has been "clipped" to assign new materials to a part of that object.

If you have an object with multiple material definitions and these materials have different texture mapping requirements, it may be desirable to split the object up according to the material assignments. This can be done with the  and

 buttons.

 This button creates a new, separate object out of the polygons assigned to the material that is currently displayed in the Material Well. These polygons are no longer a part of the current object; they are contained in an independent object. However, this new object acts as a "child" of the object from which it was split off of so that you can continue reorient the objects in unison if you desire.

 This button creates new objects for each of the materials that are assigned to the current object. The current object continues to exist as a parent to the children that are created using this command, but it is a "null' object; all geometry is contained in the children.

Joining Objects Together

The Join Well in the Operations area of the Object Designer is used to join separate objects together. To join an object to the object that is currently loaded into the Object Designer, drag that object from the objects Resource Palette and drop it into this Well. This command is most often used to join together two objects that were inadvertently split.

The Object Designer

Light Designer Overview

In addition to ambient light (assigned in the View Designer), Renderize Live provides for several types of directional light sources. The Light Designer window is used to create and edit lights for the current project. Lights are displayed as part of a view in wireframe mode so that their position and orientation can be changed easily in relation to the other resources in the view.

Light sources themselves are not rendered. The effects of these light sources on objects (light color, sheen, shading and shadowing) are displayed in the rendered view, but the lights themselves are not displayed.

Each light resource is displayed as an icon in the Light Resource Palette on the Resource Manager area of the Project Designer. Different icons are used to represent different kinds of lights (point, spot, area, area spot), and attenuation and shadow properties are also noted.

A light is independent of any view in which it may be included, and can be included in more than one view of a given project. When a light is changed, that change is reflected in any views that contain that light resource. Lights are saved within projects and not in external files and are, therefore, not transferrable from one project to another.

There are several basic light types that can be defined in Renderize Live. These include the default point light, which shines light in every direction from its point location; a spotlight, which casts a beam of light from its source in a direction aimed at a target; an area light, which is a group of light sources organized together, much like the outdoor lights at a ballpark; and an area spotlight, which combines the characteristics of a spotlight and an area light. Generally speaking, area lights cast flatter light and more diffuse shadows because the light intensity is spread over a larger area.

In addition to assigning the type of light source, the Light Designer is also used to assign a number of properties individually to each light source. A light can be set to cast shadows; a light can be set to attenuate, so that the intensity of light diminishes as it gets farther from the light source; and finally, a color and intensity can be defined for the light.

Lights can be positioned and oriented by typing in the X, Y and Z Position and Target/Rotation coordinates using the type-ins provided in the Light Designer. However, because the orientation of a light in a view often depends on the position of the objects and the camera in that view, lights are usually positioned in the viewport of the Project Designer after having been added to a particular view. When a light resource is added to a view, a wireframe representation of that light appears in the view to represent that light's position and orientation in 3D space. This wireframe light can be manipulated in the viewport of the Project Designer in the same way as other resources.

The Default Light Source

If the Light Designer is opened by dropping the "default" light resource into the Edit Well of the Project Designer, then the properties in the Light Designer are updated to the default settings. The default light source is a point light, which is similar to a bare light bulb in that it shines in all directions from a point in space. The light source casts no shadows, and does not attenuate. The light color/intensity is pure white. The position of the light source is above the default camera position, and located far behind the plane of the camera. The location of the light source far back from the area of interest serves to simulate illumination from the sun.

Point Light

A point light is the simplest light type. It can be likened to a bare lightbulb that shines light equally in all directions from a single point in space.

A point light source appears in the Project Designer as a spherical icon with a tail attached. The tail does not represent direction, since a point light casts light in all directions: instead, it is simply used to find the light in situations where the light icon is located beyond the extants of the current view.

Spotlight

Select this option to create a light that shines in a specific direction. A spotlight creates a cone of light that can be aimed at a given target. The size of the light cone and the intensity of light in the cone can be manipulated to create a variety of spotlight effects. Spotlights speed up the rendering of an image that has shadows, since the area of a view illuminated by a spotlight is limited.

A spotlight appears in the Project Designer viewport as a spotlight icon, with two sets of red lines emanating from the light. These lines indicate the direction of the spot. The inside set of lines represent the Hot Angle of the light, and the outside set of lines represent the Soft Angle of the light. Unlike a point light, which casts light in every direction, a spot light is targeted; therefore the light must be oriented such that it illuminates the desired subject.

When you select the Spotlight option, two dials appear to define the light beam: The **Hot Angle** and the **Soft Angle**. In addition to modifying these values here, you can also set spot angles visually in the Project Designer viewport.

The Soft Angle Dial

This dial defines the spread, in degrees, of the entire beam of light projected by the spotlight. Click and hold down on this dial and move the mouse to change the angle, and release when the desired angle is displayed. A setting of 60 degrees means the beam of light emits from the source at a 60 degree angle. Any objects falling within the arc created by this angle are lighted by this light; objects outside of the arc receive no light.

The area of light emitted by a spotlight depends on 2 factors: the size of the Soft Angle and the distance from the light source to the target. The wider the Soft Angle, the larger the arc of light, and that arc increases as distance from the light source increases.

The Hot Angle Dial

This dial defines the angle of the full intensity beam of light projected by the spotlight. Click and hold down on this dial and move the mouse to change the angle, and release when the desired angle is displayed.

The Hot Angle refers to the area within the Soft Angle in which the light shines at its full intensity. The area between the Hot Angle and the Soft Angle is the "fall-off" area, or the area at which the light graduates from full intensity to zero intensity (or no visible light) as it moves out to the edge of the Soft Angle.

It is not possible to define a Hot Angle that is wider than the Soft Angle. If you raise the Hot Angle above the Soft Angle value, the Soft Angle dial will update so that it equals the highest Hot Angle value. If you reduce the Soft Angle below the Hot Angle value, the Hot Angle dial will update so that it equals the lowest Soft Angle value.

Using the Soft Angle and Hot Angle dials together, different kinds of spotlights can be created. If Soft and Hot Angles are about the same, the result is a spotlight with highly defined edges. If Soft Angle is far greater then Hot Angle, the result is a spotlight that gradually fades to black around the perimeter of the cone.

Area Light

Select this option to create an area light. An area light actually consists of multiple point light sources grouped together to create the effect of one very large light source. Area lights are used to cast soft shadows.

An area light appears as a box in the Project Designer. If the area light is defined using spotlights, the light direction is represented as well.

When this option is selected, a **Sample** dial appears, as well as a set of **Area Scale** type-ins.

The Samples Dial

Use this dial to indicate the number of light sources in the area light. The more lights sources that exist, the better the shadows will appear, but at the expense of rendering time.

Note that increasing the number of samples does not increase the intensity of the light: the intensity, determined in the Light Color/Intensity well, is split evenly among all samples in the area light.

The Area Scale Type-Ins

The dimensions of an area light are defined using the X, Y and Z Area Scale type-in boxes. The larger the scale, the more lights it can contain, and the larger the area of illumination.

Generally speaking, the samples in an area light are all positioned on one plane (defined using the X and Y Area Scale type-ins). However, in some cases it may be desirable to assign depth to an area light: in this case, use the Z Area Scale type-in also.

Area Spotlight

Select this option to create an area light with directional properties and a fall-off area. This option combines the effects of the Spotlight and Area light options.

The Casts Shadow Option

Select this option on the Light Designer if you want the current light to cast a shadow. When shadow casting is enabled for a light, the word "SHAD" will appear on that light source's postage stamp icon.

Even if this option is selected, the light will not cast a shadow until two other conditions are met: the object(s) in the light's path must be defined to cast shadows (a selection in the Object Designer), and shadows must be enabled globally for rendering (a Render Option on the Project Designer).

Shadows are only cast onto objects, and only if the object is defined to receive a shadow (a property defined in the Object Designer). A shadow cannot be cast onto a background image. Therefore, for a light to cast a shadow, there must be two objects: one object onto which the shadow is cast, and another object, located between the light and the first object, which casts the shadow. There are cases where an object can cast a shadow onto itself, due to the shape of the object and/or the self-shadow bias setting (described below).

When the Casts Shadow button is enabled, several additional commands related to shadow casting appear in the Light Designer window. These commands include **Intensity**, **Self Shadow Bias** and **Shadow Map Size**.

The Intensity Dial

Use this dial to control the intensity of the shadow that is cast. The higher the value, the darker the shadow is that is cast; the lower the value, the lighter the shadow.

Shadow intensity can also be affected by changing the amount of ambient light in the scene (ambient light is manipulated in the View Designer window). Raising the ambient light will effectively reduce the intensity of the shadow. However, it will also make the scene appear more flatly lit, and therefore less dramatic.

The Self Shadow Bias Type-in

This type-in is used to determine at which point an object begins casting a shadow. Values here range from 0.0 to 1.0: at 0.0 an object will cast a shadow onto itself; at 1.0 an object will cast no shadows. The default value of 0.1 is correct for most cases, but there are situations where the value may need to be modified.

If after rendering a view, the shadow cast by an object seems to fall in the wrong place or be incorrectly shaped, try decreasing the self shadow bias value. If the object casting the shadow seems to cast a shadow onto itself, or appears with irregularly shaded polygons, try increasing the self shadow bias value.

The Shadow Map Size Type-in

This determines the size of the shadow map that is generated for this light when a view is rendered. The larger the shadow map size defined here, the sharper the shadow will be, but at the expense of rendering speed.

The optimum size for the shadow map depends on the area over which the shadow map must be calculated in relation to the area visible in the camera view. If objects exist outside the camera view, and these objects are set to cast shadows, then a shadow map must be calculated over this entire area, and only a subset of this map is displayed in the camera view. The result may be a shadow with jagged edges. Therefore, be sure to disable shadow casting for any objects that are outside the camera view so that the shadow map is cast over a smaller area, resulting in a finer edge during rendering.

The default shadow map size value is 128. If after rendering a view the shadows appear "jaggy" or pixelated, try increasing the shadow size.

The Attenuate Option

Select this option if you want the current light to be attenuated. An attenuated light is one which loses intensity as the distance from the light source increases. Attenuation also increases the sense of depth in a view, but at the expense of rendering time. An attenuated light is useful to cast light on some objects but not on others. When attenuation is enabled for a light, the word "ATTEN" will appear on that light source's postage stamp icon.

When attenuation is enabled, two dials appear to define the attenuation: the **On Distance** dial and the **Fade Distance** dial. In addition to modifying these values here, you can also set attenuation visually using your mouse in the Project Designer viewport.

The On Distance Dial

Define the distance from the light source at which attenuation begins. If the light should begin losing intensity immediately after emanating from the light source, use a low number here; otherwise use a larger number.

The Fade Distance Dial

Define the distance from the On Distance dial at which the intensity fades to zero, or no light. The light in the area between the On Distance and Fade Distance values will fade in intensity, until it reaches zero intensity at the distance defined by the sum of the Fade Distance and On Distance dials.

When an attenuated light appears in the viewport of the Project Designer, two planes appear associated with that light's "target beam": one at the defined On Distance and the other at the defined On Distance plus the Fade Distance. These planes help you to determine visually whether or not your target object will be illuminated by this light.

The Show All Lights Option

Normally, when working with a view in the viewport of the Project Designer, a light will not appear unless it is dropped into the Edit Well for manipulation. When the Show All Lights option is depressed selected on the Light Designer, the wireframe icons for each of the lights is displayed in the viewport, along with lines that represent their "target". This allows you to see the position of each light in relation to the other, but on the other hand it may add unnecessary clutter to the wireframe view. Of course, the only light whose orientation can be modified is still the light that is loaded into the Edit Well.

Defining a Light's Color and Intensity

The color and intensity of a light are defined using the Light Color/Intensity Well at the lower left corner of the Light Designer. To define a color, move the pointer over this Well and select the left mouse button: the Color Toolbox is displayed, and any changes you make in that Toolbox are reflected immediately in the Light Color/Intensity Well.

The light intensity is controlled using the "value" slider in the Color Toolbox's "hsv" color selection mode. A value of 1 gives you a light at 100% intensity; any values below 1 reduce the strength of the light.

Positioning a Light

The position of a light in a view can be changed by typing in new **X**, **Y** and **Z Position** coordinates. Similarly, the direction in which a light points can also be typed in using the **X**, **Y** and **Z Target** coordinates. Target coordinates are only relevant if the current light source is a spotlight, or an area light made up of spotlights. The direction that a light points can also be expressed in terms of rotation. Select on the **Target** title above the coordinate type-ins and select **Rotation**; the values in the type-in will update to display the direction in which the light faces. Now when you enter values in these type-ins, they are expressing the rotation of that light.

While these type-ins allow for extremely precise positioning of lights in 3D space, it is often easier to position lights visually in the Project Designer viewport. To position a light source in the Project Designer, drag the desired light from the Lights Resource Area and drop it into the Edit Well. The mouse can now be used to position the light within the View.

Remember that the position of a light is a property of that light: if you change a light's position in one view, that orientation is changed in all other views that contain that light. If you have a case where a single light must have different positions in different views of the same project, make a copy of that light (by dropping it into the Light Designer and re-naming it) before incorporating it into subsequent views.

Lighting and Views

The type, position and color of a light all have an important effect on the final results of a rendered view. In addition, the distance that a light is placed from the objects in the view greatly affects the way the view is lit, even if the light is not attenuated. If a light source is placed far from the area of interest in a view, the light generated by this light source is more diffuse, effecting all areas equally. If the light source is very close to an object, that object will appear with hot spots where the object is closest to the light.

While the choice of objects, the materials and textures applied to them and the camera angle and viewpoint determine the contents of a view, it is the lighting that brings it to life. Intricacy of lighting can be the most important element in focusing attention within a view and creating interest. A difficulty with complex lighting is that the results of various combinations of lights is hard to predict with accuracy. Practice and experience can reduce the effort, but experimentation is still the only reliable method of determining optimum lighting. If there is to be a series of views of a similar type, a standard combination of lights may be developed and re-oriented as a group, rather than each light individually.

The Light Designer

Material Designer Overview

Materials determine the display characteristics for objects in a view. Remember that objects exist simply as wireframe models; skeletons that define the shape of each object. Materials are the "skins" that are wrapped over the objects' "skeletons" to make them solid entities. A material is independent of any object or surface to which it might eventually be applied.

Each material resource is displayed as an icon in the Materials Resource Palette of the Resource Manager on the Project Designer. Each icon displays the material attributes associated with the material.

The Material Designer is used to define the characteristics of materials, including the material's illumination type (the "finish" on the material), colors, textures, highlight and opacity. A material can be made of a solid color (eg for plastics) or an image texture; the finish can be matte or glossy; it can reflect a specified image texture; and it can be set to varying degrees of transparency.

Remember that the way a material appears in the rendered view depends on many factors. In addition to the material definition as set in the Material Designer, other factors that influence the appearance of the material include the way the material is mapped to the object (defined in the Object Designer), the type and color of the light being cast on the material (defined in the Light Designer), the shadows, etc. The Material Designer defines only the characteristics of the material. The way the material is used and the environment in which it is used have a profound impact on the appearance of the material.

Materials are created by default when an object is loaded into Renderize Live (models are loaded under the File, Load Object command on the Menu Bar of the Project Designer). For DXF files, materials are created and assigned to the incoming object according to that object's layer, color or block definitions. For OBJ files, materials are created according to the existing material definitions.

Therefore, materials are assigned by default to specific objects, or subgroups (layers, colors, blocks) of objects. The material-to-object relationships can be modified as needed, or completely re-assigned if necessary, using the Select Toolbox on the Project Designer.

The Materials Resource Icon

The material resource icons update each time a material definition is saved to display that material's look, including the color and/or texture, shininess, and transparency defined for the material. Therefore you can see a material's properties simply by looking at the icon for that material.

The default icon for a material is a rectangular box with rounded edges. If this icon does not have enough shape to display a material's characteristics, you can change the material's resource icon. To do so, point to the material whose icon you wish to change, hold down the Shift key, and press the left mouse button: the icon is displayed as a human head until you release the mouse button.

The Default Material

When no object resources have been loaded into Renderize Live, only one material exists in the Materials Resource Palette: the "default" material. This material is a gray matte color, with no shininess or reflective qualities.

When an object is loaded into the current Renderize Live project, a resource icon representing the object is displayed in the Objects Resource Palette. In addition, one or more material resource icons are created and displayed on the Materials Resource Palette. Material names are assigned according to the way the object was loaded: objects in the DXF or SHP file formats can be loaded by layer, color or block. This layer, color and block information is assigned to the object in whichever modeling program was used to create the wireframe. If a layer, color or block is empty (has no geometry assigned to it), no material will be created for that layer.

For example, if an object is loaded by layer, one material will be assigned for each layer in the incoming object, and each material will take on the name of the layer that it is assigned to.

Although a new material is created for each layer, block or color in an object, the initial properties for each material are the same as that of the default material. To assign new properties to a materials, drag and drop the desired material icon into the Edit Well of the Project Designer.

The Material Designer Viewport

The Material Designer window includes a viewport (located below the current resource name), in which the material being created or edited may be previewed as applied to an object.

To view a material on an object, drag the desired object from the Objects Resource Palette on the Project Designer and drop it into the Material Designer viewport. The object will be quick-rendered and displayed with the current material settings. Note that the settings used are the current settings in the Material Designer, regardless of whether or not these settings have been saved.

After viewing the quick-rendered object, you can change the material definitions and click on the viewport again to re-render the object with the updated settings. In this way you can quickly and iteratively work towards the desired material effect. Remember to save your changes once the desired effect has been reached.

The quick-rendered object in the viewport shows an approximation of material characteristics. This quick render doesn't display lighting or shadow characteristics, and doesn't take into account the mapping type. All of these factors affect the final rendered look.

After an object has been dropped into the viewport and quick-rendered, an image can be dropped into the viewport and displayed as a background behind the quick-rendered object. To add a background image to the viewport, drag that image from the Images Resource Palette of the Project Designer and drop it into the viewport. Similarly, a color can be dropped into the viewport as a background for the object.

Constant Illumination

Constant illumination means that the color assigned to a material does not vary with lighting or angle, but remains constant over the entire surface. This is also known as "flat shading," because none of the depth of a flat-shaded object can be perceived. A sphere rendered using constant illumination will appear as a circle: the "roundness" of the sphere will not be visible.

When you select this illumination type a Constant Color Well is displayed. The color that appears here determines the color of the material.

Matte Illumination

Light from a material with matte illumination is totally diffuse. It has no reflective spot, but the color value of the material varies with the angle of intercept with light vector. A material with matte illumination shows shading effects from the lighting environment. A sphere rendered using matte illumination can be likened to a basketball: it has color and texture, but because the ball is not shiny, it has no specular highlights or reflective characteristics.

When you select this illumination type, a Matte Color Well is displayed. The color that appears here determines the color of the material.

Shiny Illumination

A shiny surface reflects cast light. Its color at any given point depends on its own basic color and the color of the reflected light. Shininess also implies sheen, which is the degree of reflectiveness of the material. A sphere rendered using shiny illumination can be likened to a bowling ball: the surface of the ball is shiny, reflecting a certain amount of light and generating specular highlights on those areas of the ball that reflect light into our eyes. When defining a shiny material, a Shiny Color Well is displayed to allow you to define the color if the specular highlight, and a HiLite Size dial allows you to set the size of the specular highlight.

The location of a highlight on an object is determined by several factors, including the positions of the light and the object in relation to the camera. Therefore setting highlights can be tricky. Renderize Live supplies a simple method for positioning a light so that a highlight will appear at a specified location. This is done using the  mouse button when a light is loaded into the Move Well.

Image Reflect Illumination

Image Reflect is the simplest reflective technique. This uses any image as a reflection map: therefore, the reflection that appears on an object mapped with this material is not necessarily a true reflection of the environment around that object. In many cases this is acceptable because the reflect texture is needed simply to create a polished effect for a material. For example, a grey scale image of large black and white vertical stripes makes a good reflect texture for gold, copper and other metallic materials.

When you select this illumination type, a Reflect Color Well is displayed. The color that appears here determines the color of the reflected image. In addition, a Refect Texture Well appears, in which you drop the image that you wish to use as the reflect map.

Floor Reflect Illumination

When this illumination type is selected, Renderize Live will generate an image based on the surrounding environment in a view and use this image as a reflect texture. Floor Reflect is exclusively for use in creating reflections on completely flat surfaces such as floors or tabletops. In order to work properly, the reflective material must only exist on one plane: for example, if you are working with a desk, the reflective material must be unique to the desktop: the sides (edges) and bottom of the desk must not share the reflective material.

See the Generating Environmental Reflect Maps topic for more information.

Spherical Reflect Illumination

As with the Floor Reflect illumination type discussed above, when this illumination type is selected Renderize Live will calculate an image based on the environment around the object on which this material is mapped.

Spherical Reflect is used to create environmental reflection maps for non-planar objects. The material for which the reflection map is generated must be assigned to adjoining polygons: a reflection map can only be correctly calculated if the material is wrapped around a single object. In addition, the object on which the material is assigned should be smoothed using the Smooth command on the Object Designer in order for this reflective mapping type to work.

See the Generating Environmental Reflect Maps topic for more information.

Cubic Reflect Illumination

This illumination type is used to create highly accurate environmental reflection maps for non-planar surfaces. For still frame rendering purposes, you can use either Spherical Reflect or Cubic Reflect. The former will calculate far faster but will not be as accurate as the latter. If you are designing a view for animation purposes, use the Cubic Reflect illumination type if you wish the reflections to update accurately through the course of the animation.

Note that the Cubic Reflection illumination type is very time-intensive: six environmental reflection maps must be calculated when this illumination type is used, as opposed to only one environmental reflection map when the Spherical Reflect illumination type is used.

See the Generating Environmental Reflect Maps topic for more information.

The Matte or "Constant" Color Well

The color that appears in this Well determines the underlying color of the material. The name of this Color Well, "Matte", changes to "Constant" if the Constant illumination type is enabled.

Constant illumination materials will appear flat-shaded in this color. Matte illumination materials will appear this color when fully lit; partially shaded areas will appear at some degree of luminance below this color. Shiny and Reflect illumination materials also use this as their underlying color, but reflection colors and highlights, in addition to light shading, will largely influence the final look.

A material can be defined with a matte color alone, or with an accompanying Color Texture. A Color Texture is an image that is assigned as a material texture. When rendered, the material displays the selected color texture, but "tinted" with the selected Matte Color.

The Shiny Color Well

The color in this Well determines the color of the specular highlight on a material of Shiny or Reflective illumination (this Well does not appear if the Constant or Matte illumination settings are selected).

If a Shiny or Reflect illumination type is selected, the material will act as a shiny material, reflecting the light that hits it. Therefore a "sheen," or specular highlight may appear over an area of the object that is rendered with a shiny or reflective material. The location of the specular highlight is a factor of the position of the light, the object, and the viewpoint.

The degree of shininess that you define for a material will have a significant influence on the material's appearance. Using the Shiny Color in conjunction with the HiLite Size, you can create realistic sheen characteristics.

The HiLite Size Dial

The degree of shininess, as expressed using the HiLite Size dial, determines the diffusion with which cast light is reflected from the surface. The shinier the surface, the smaller the specular highlight is: it reflects from the surface in a bright "pinpoint". The less shiny a surface, the larger the specular highlight is. You can think of a highly polished surface reflecting light in a tightly focused beam and a duller surface reflecting more widely and more diffusely. For practical purposes, the shinier the material the smaller the spot, and therefore the lower the value you would set here.

In the real world, the intensity of the highlight diminishes as the highlight area becomes larger (the material becomes less polished). However, in Renderize Live the area and intensity of the highlight are independently controlled to give you a greater degree of flexibility in defining materials. To enhance realism, you may wish to reduce the brightness of your Shiny Color as you increase the HiLite Size.

The Reflect Color Well

The color in this Well determines the underlying color of an image texture being used as a reflection map. This Well appears only if a Reflect illumination type is enabled.

The reflect color only affects the appearance of the Reflect Texture. If no Reflect Texture is defined for a material, the affect of the Reflect Color is not taken into account during rendering.

The Color Texture Well

The Color Texture essentially determines what the material is made of. If the image in the Color Texture Well is a picture of black marble, then the material is black marble; if the image in the Color Texture Well is a picture of wood grain, then the material is wood.

Images to be used as Color Textures are usually small swatches of a texture. These swatches are repeated as they are mapped over an object during rendering, so they are often cropped in a way that the pattern repeats correctly as the image is repeated, creating a "seamless" material. The appearance of a Color Texture during rendering depends on the orientation of the material vis-a-vis the object on which it is being rendered, and on the mapping type that is selected.

The color displayed in the Matte Color Well influences the way that the rendered texture appears. In this way it is possible to modify a basic Color Texture to create a variety of materials. For example, a single wood grain texture can be used to create a variety of materials of different wood types: a red matte color can be used in conjunction with the wood grain color texture to simulate cherry, light yellow for white oak, etc. If you don't want the hue of the Color Texture to be changed, define a Matte Color of white.

The Bump Texture Well

The Bump Texture Well uses an image as a "bump map." The contrast of colors in the image is used create a topography on the material. Areas of high contrast create a well-defined bump; areas of low contrast create an effect that is less sharp. For example, a polka dot pattern can be assigned as a bump texture so that when the material is mapped to a sphere, the result resembles a golf ball.

The degree of amplitude (the amount of bumpiness) is a property of the object being rendered with this material, and is therefore controlled in the Object Designer. If the amplitude is a positive number, then dark areas on the bump map appear on the rendered object as bumps, and light areas appear as depressions. This can be reversed, however, by setting a negative amplitude. The appearance of bumps and indentations depends to a great degree on the lighting conditions under which the material is rendered.

To create an embossed effect, use an image in which the letters or figures to be embossed in the material are drawn in solid black on a pure white background.

To add to a textured effect to a material, use the same image map for both the Color Texture and the Bump Texture. For example, if you are defining a stucco material, using the same image of stucco as both the Color Texture and the Bump Texture gives the material the look of stucco, with a surface topography that matches the Color Texture exactly. The Linked Mapping Select option on the Object Designer allows you to orient and scale the Color and Bump Textures in concert.

The Reflect Texture Well

The Reflect Texture uses an image as a reflection map. The image appears in the rendered view as a mirrored reflection on the object that is mapped with this material. Whereas the Color Texture defines the material that the rendered object is made of, the Reflect Texture appears as if it exists in the environment and its reflection is being seen in the rendered object. Therefore the texture appears mirrored, and somewhat diffuse or obscured depending on the other material properties defined for the material.

The way a Reflect Texture appears when rendered depends on a variety of factors, including the Reflect Color that was selected, the shape of the object being rendered, and the position of the lights in relation to that object and the viewpoint (camera).

If you have selected the Image Reflect illumination type, then you must drop a texture map in this Well to use as the Reflect Texture. However, if you have selected one of the environmental reflection types (Floor, Spherical or Cubic), the Reflect Texture must be calculated.

Generating Environmental Reflect Maps

If you have selected the Floor Reflect, Spherical Reflect or Cubic Reflect illumination types, the image for the Reflect Texture Well must be calculated, based on the view in which this material exists.

When you select one of these reflect types, a **Calculate** button appears, as well as a **Percent Reflect** dial. The Calculate button is used to render an environmental reflection: the Percent Reflect dial determines how strong the reflection will be. The process of generating an environmental reflection map for these reflect types requires several steps, as outlined below.

Before you can create an environmental reflection map, the view for which you wish to create the environmental reflection map must be loaded into the View Well and its camera, object and light positions set. If you reposition any of these entities, you will need to recalculate the environmental reflection map.

After you have set up the desired view, select the **Calculate** button on the Material Designer to generate an environmental reflection map for the current material. When you select this button, Renderize Live performs a rendering to generate the reflect image. All Rendering Options that are selected at this time will be taken into account in the generation of the reflection map, and the image will be rendered to a 1:1 aspect ratio at the resolution currently defined in the **X Res** type-in on the Render to File area of the Render Toolbox. Therefore, you will probably want to set this resolution relatively low while defining the reflection (for example at 320 instead of 640), then increase this value and re-calculate the environmental reflection map at a higher resolution before executing the high resolution final render.

The calculation of an environmental reflection map may take some time, but once the image is generated you do not need to recalculate it again unless you change the current view significantly. Once the environmental reflection map is generated, you can set the strength of the reflected image using the **Percent Reflect** dial. You do not need to re-calculate the reflect image as you change this value.

Be sure to save your material definition after generating an environmental reflection map, so that the material updates to take into account this reflect texture.

Reflection Mapping Tips

Whenever you use reflection maps on an object, be sure that object is not set to Render Backface by selection on the Object Designer. This will make the reflect map appear incorrectly when rendered onto the object.

When using Floor Reflect, be sure that the material for which the reflection map is defined is applied to one single plane, and that the polynormal of this plane is pointing in the correct direction.

When using Spherical or Cubic Reflect, be sure that the object to which this material is assigned is smoothed during rendering (the Smooth button is enabled for this object on the Object Designer).

If a Cubic Reflect map does not seem to accurately represent its environment, you may need to change the Hither setting in the View Designer window to modify the clipping plane for the view.

The way a reflective material appears on a rendered object depends on a number of parameters including the Matte Color, Shiny Color, HiLite Size and the Percent Reflect setting. Generally, the Percent Reflect setting and the Matte Color together determine the color and strength of the reflection. The highlight tends to wash out the reflection, so a bright Shiny Color or a large HiLite Size may obfuscate your results. You may find that Shiny colors with very low color values (intensity) will offer the best results.

A material's Matte Color has a unique function when defining reflective materials. The higher the color value (intensity) of the Matte Color, the less reflective the material will appear. The shiniest material, chrome, is actually created using a black Matte Color. Colored reflective materials such as gold are created using a balance between similar Matte and Shiny colors to achieve the required "lustre".

Setting Material Opacity

The Opacity dials are used to create transparent materials. Opacity is the degree to which a surface blocks or passes light. Wood is 100% opaque. Glass is much less opaque. Nothing has 0% opacity (completely transparent).

There are actually three different opacity settings for each material: **General**, **Edge**, and **Hilite** opacity.

General Opacity

General Opacity defines the degree of transparency of the material as a whole. Select this button to enable it, then dial in the desired opacity.

Edge Opacity

Edge Opacity is used to make an object more or less opaque at its edges than over the rest of its surface. The default value of zero gives the edges an opacity as defined by the General Opacity level. If you dial in a value greater than 0 the edge will become more opaque; if you dial in a value less than 0 the edge will become more transparent.

As an example of a more opaque edge, think of a flat plate of glass or a bubble. These two objects have very little opacity. At their edges, however, both the glass plate and the bubble are more visible, because of the thickness of the glass and/or the finish of the edges. To simulate this effect, set the Edge Opacity to a value above zero so that the edges will appear more opaque than the rest of the object. The correct settings depend on experiment. In rendering, when it looks right, it is right.

As an example of a less opaque edge, think of a flame. A flame is more opaque at the center, and more transparent at the edges. To simulate this effect, set the Edge Opacity to a value below zero so that the edges will appear more transparent than the rest of the object.

Hilite Opacity

Hilite Opacity is used to add realism to a rendered object by making an object more or less opaque at its highlights (areas of specular highlight) than over the rest of its surface. An example might be a glass bowl. Over most of its surface, the bowl has very little opacity. Its highlights, however, reflect almost as brightly as they would on an opaque surface. Increasing the opacity of the highlighted spots gives the surface more credibility. The correct settings depend on experiment. In rendering, when it looks right, it is right.

Defining a Matte Drop Out (Transparent) Color

Renderize Live gives you the ability to load or define a "transparency matte" for a specific color on an image and perform a transparency drop-out on this color. This is extremely useful when you wish to populate a view with 2D bitmap images such as people or trees, or if you wish to create material effects for wickers or other loose weaves where there are holes in the material.

The **Matte Drop Out** button enables transparency matte drop-out for the Color Texture currently loaded in the Material Designer, assuming a matte exists for that image. When this button is enabled, an area of the Color Texture image will appear transparent when rendered onto an object.

Before you can press the **Matte Drop Out** button and get the desired effect, you must define a "matte" or drop out area: this is the area of the image that will become transparent when it is rendered. Mattes are defined for images using the  operation in the Image Designer. Using this command, you can choose a color on the image that will drop out during rendering. Although any color can be chosen, most bitmaps use black as this "key" color. For example, a bitmap image of a person may appear as the person's likeness over a black background. You can define a matte for the black color such that it drops out when rendered, and all that appears is the figure of the person. This matte drop-out capability is extremely powerful.

Viewing and Changing Material-to-Object Assignments

Remember that materials are assigned to specific objects or parts of objects (layers, color or blocks), and that the materials are created when the object is loaded into the project. To view and change material assignments (which materials are assigned to which parts of the object), use the Select Toolbox in the Project Designer. The Select Toolbox, discussed in full in the Project Designer Window chapter, is used to manage the object-to-material relationships in a project.

Another way to change a material-to-object assignment is to drag and drop an object into the Move Well on the Project Designer, then drag and drop the desired material on top of the object in the Move Well.

A third way to change a material-to-object definition is to save one material resource using a material name that currently exists: when you do this, the newly saved material replaces the existing material, and takes over that material's object assignment. This method is useful when you have defined a material for one object, and you wish to use that same material definition for other objects in a project.

Creating New Materials

New materials can be defined in two ways. First, a new material can be copied from an existing material by changing the material's name in the Material Designer and saving under the new name. The new material appears as an icon in the Materials Resource Palette. However, this material is not assigned to any objects. To use this new material it must be assigned to an object using one of the methods described in the Changing Material-to-Object Assignments topic.

The other way to create new materials is to create new material assignment areas on an object. This method is described in the Select Toolbox topic.

Controlling the Appearance of Materials in a View

While the basic characteristics of a material are defined in the Material Designer, there are other factors that strongly influence the appearance of that material in a rendered view.

Lights and Materials

The amount of light cast on a material in a rendered view, and the direction from which that light comes, profoundly affects the appearance of that material. If the material is defined with a Shiny or Reflect illumination, the location of the sheen, or specular highlight on the material depends on light placement.

If a material appears too bright due to lighting conditions, the lights can be re-positioned, or the material can be darkened in the Material Designer by changing the color in the Matte and /or Shiny Color Wells.

Self-Illuminating Materials

You can define a material so that it appears to be self-illuminating. To do so, point to the Matte Color Well, then hold down the Alt key and press the left mouse button. The Color Well is replaced by a series of type-ins, from which you can set color values numerically. Setting the RGB values greater than 1, or setting the HSV's Value greater than 1, will create a self-illuminating effect.

Objects and Materials

There are many ways that a material can be mapped onto an object. In the Object Designer, a number of mapping-related commands allow you to choose among six different mapping techniques and three different ways of replicating a texture swatch over the mappable area. In addition, the position and scale of the texture swatch can be adjusted. Each of these options is a property of the object, so different objects can use different mapping techniques for a single material.

The Material Designer

Image File Types

Renderize Live can load or save images in any one of the following file formats:

TGA	16, 24 or 32-bit Targa image file
BMP	8 or 24-bit Microsoft Windows bitmap
TIF	8 or 24-bit Tagged image file format
GIF	8-bit CompuServe graphic interchange format
RAS	8 or 32-bit Sun raster file
RAW	24 bit Renderize Live image format

Images may be displayed on your graphics card with a **color depth** of 8-bits (256 colors). However, these images may actually exist with a color depth of 24-bits (16.7 million colors). When this is the case, any image operations that you perform may be displayed in 8-bits, but the manipulation will be executed for the 24-bit image.

Images can be stored in any size, or **resolution**. Resolution is defined as the amount of horizontal and vertical pixels that make up the image. An image of 1000x800 pixels has 1000 pixels horizontally and 800 pixels vertically.

After manipulating an image, you can save that image as a project resource by selecting the **Save** command at the upper-left area of the Image Designer. However, the image is not saved to disk until you save that image using the **Write Image** or **Write Image As...** command from the **File** pop-down menu of the Image Designer.

Unlike other project resources, image files exist completely independent of a project file. When a project contains images, the project "eye" file contains information that references these images. Therefore when you modify an image to use in one project, the image will appear modified in all other projects containing that image, unless you save that image out to a new name after modifying it.

The Image Designer Viewport

The Image Designer includes a 640x480 pixel viewport in which the current image is displayed. If the resolution of an image is larger than the viewport, the viewport displays the upper-left portion of the image. Using the viewport slider bars beside and below the viewport, you can scroll down and right to view other portions of the image.

When you execute commands to modify an image, the effects of those commands are displayed on the image in the viewport.

The Sample Color Well

The Sample Color Well is located below the viewport. A color from the current image in the viewport can be chosen for display in the Sample Color Well by placing the pointer in the viewport, holding down the Shift key on your keyboard, and selecting the left mouse button (if you have a 3-button mouse, the middle mouse button will execute this operation): the color displayed in the Sample Color Well changes to match the color of the individual pixel under the cursor. A dynamic description of pixel color in terms of RGB and HSV is displayed to the right of the Sample Color Well.

Reading and Writing Images

Images can be read into Renderize Live using the File, Load Image command on the Project Designer. In addition, images can be loaded and saved using the **File** pop-down menu in the Image Designer.

Reading an Image

Select the **Read Image** command under the **File** pop-down menu, and a Load Browser appears. Use this browser to indicate the image type that you wish to load, the directory where the image is located, and the name of the desired file. The use of the Load Browser is described in full in the "Using the File Browser" section of the Project Designer Window chapter.

Writing an Image

There are two commands under the File pop-down menu that are used to save an image: the **Write Image** and **Write Image As...** commands. Note that you must save an image as a project resource using the **Save** command on the Image Designer before you can write that image to disk file.

Use the Write Image command to save the current image to disk file under the filename that it was last saved under. Use the Write Image As command to save the modified image under a new name. When you select this command a Save Browser appears, and you can assign an image name by selecting from the File List or by typing in a name. The file type that is saved is determined by the filename extension that you type in. If you don't specify a filename extension the image is saved according to the currently selected file type. After you select the OK button, another menu will appear to prompt you for the desired color depth and compression, if applicable.

Note that the default image file type, color depth and compression settings that appear when you save an image can be changed using the Options, Preferences command on the Menu Bar of the Project Designer window.

Copying Images to and from the Windows Clipboard

Images can be copied to and from other Windows applications through the Windows Clipboard. Renderize Live copies only device-independent bitmaps into the Clipboard, and similarly, accepts only device-independent bitmaps from the Clipboard.

The Edit, Copy command in the Menu Bar of the Image Designer copies the current image resource, including that image's color map, into the Windows Clipboard. Note that regardless of the actual color depth of the original image resource (8 bit, 16 bit or 24 bit), the color depth of the image copied to the Clipboard will depend on the color depth of your display card.

The Edit, Paste command on the Menu Bar of the Image Designer copies a bitmap from the windows Clipboard into the Image Designer in Renderize Live, and makes that bitmap an image resource.

Executing Image Operations Over a Part of the Image

Many of the operations discussed below can be executed over the entire image, or over only a portion of that image. To perform an image operation over an area of an image as opposed to over the entire image, you must draw a bounding box. To do so, move the pointer over the image in the Image Designer viewport and press the left mouse button to define a corner of the bounding box. Now with the left mouse button depressed, drag the pointer to expand and define a rectangle. Release the mouse button to complete the rectangle. The rectangle can now be moved to another location by pointing to the lower-right corner of the bounding box, holding down the Shift key on the keyboard, and pressing the left mouse button (use the middle mouse button instead, if you have a 3-button mouse), or it can be re-sized by pointing to the lower-right corner of the bounding box and pressing the right mouse button.

The following image operations can be executed in a bounding box: Contrast/Gamma, Brighten, Saturate, Hue, Blur, Focus, Normalize, Recolor, Posterize, Monochrome, Invert, Mirror and Emboss.

The Contrast/Gamma Operation

Make an image lighter or darker by adjusting the contrast of the image. Contrast can be altered for all of the colors of the image together, or independently for the red, green and blue elements of the image.

The **Linked** button is enabled by default, meaning contrast is altered for all of the colors of the image together. When this is the case, a single **Contrast** dial appears. A contrast value of 1.0 is the default value for the image. Reducing contrast below 1.0 will make the image brighter; raising contrast above 1.0 darkens the image.

Enable the **R/G/B** button to alter the contrast of each of the color components independently. When this button is enabled, three dials appear; one each for the red, green and blue elements of the image. Values are dialed in as described in the paragraph above.

After setting the desired contrast values, press the **Execute Contrast** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Brighten Operation

Adjust the brightness of an image by increasing or decreasing the color value of each pixel by a constant factor. Brightness can be altered for all of the colors of the image together, or independently for the red, green and blue elements of the image.

The **Linked** button is enabled by default, meaning brightness is altered for all of the colors of the image together. When this is the case, a single **Brighten** dial appears. A value of 1.0 is the default value for the image. Reducing brightness below 1.0 will make the image darker; raising it above 1.0 brightens the image.

Enable the **R/G/B** button to alter the brightness of each of the color components independently. When this button is enabled, three dials appear; one each for the red, green and blue elements of the image. Values are dialed in as described in the paragraph above.

After setting the desired values, press the **Execute Brightness** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Saturate Operation

Adjust the saturation of an image by increasing or decreasing the color saturation of each pixel by a constant factor. Use the **Saturate** dial to change the saturation number: values above 1.0 increase the color saturation of the image, making it appear more vivid; values below 1.0 reduce saturation, making the image appear more monochromatic.

After setting the desired value, press the **Execute Saturate** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Hue Operation

Adjust the hue of an image by changing the color hue of each pixel by a constant value. Use the **Hue** dial to change the hue of the image among the three primary colors (red, green and blue).

After setting the desired value, press the **Execute Hue** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Blur Operation

Blur an image: make it appear "fuzzier". Press the **Execute Blur** button to modify the image. The image in the viewport will update to display the effect of your changes.

The Focus Operation

Focus an image: make it appear "sharper". Press the **Execute Focus** button to modify the image. The image in the viewport will update to display the effect of your changes.

The Resize Operation

Resize an image in terms of the number of horizontal and vertical pixels. The horizontal and vertical dimensions can be resized independently, therefore, this command can change the aspect ratio (the height to width ratio) of the image as it resizes it. Since none of the image is discarded and nothing can be added, changing the aspect ratio of an image will distort that image.

Use the **X Res** and **Y Res** type-ins to enter the desired image size. The values that initially appear indicate the current number of pixels horizontally (X Res) and vertically (Y Res). If no aspect ratio has been specified (select "Any" using the **Aspect Ratio** pop-down menu described below), then the X Res and Y Res values can be typed in independently. However, if an aspect ratio is set, modifying the X Res will automatically update the Y Res to maintain the horizontal-to-vertical aspect ratio that has been selected.

To select the desired aspect ratio for the resized image, select on the **Aspect Ratio** pop-down menu. Use "Any" when you want to manipulate the horizontal and vertical resolutions of an image independently; use "Same" to resize the image without changing its aspect ratio. Otherwise, select one of the ratios listed here, and the system will automatically maintain the selected aspect ratio when you type in new X or Y resolutions.

The **Fast** and **Smooth** buttons are mutually exclusive selections that determine how the image is resized. If Smooth is enabled, the resizing process takes longer, but the quality of the image is better. However, the image is "smoothed out" during resizing, so some detail may be lost. If Fast is enabled, the resizing process is quicker, and the resulting image is sharper. However, the sharpness of the image may reveal limitations inherent in the resizing process.

After setting the desired value, press the **Execute Resize** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Crop Operation

Crop an image: define a rectangle on the image, and discard everything outside the rectangle. Use crop to isolate an "area of interest" on an image from the rest of the image.

To crop an image, you need to define a rectangular area on the image to be cropped. Move the pointer into the viewport, position the pointer at the location where you wish the crop rectangle to begin, then press the left mouse button to fix that corner. Holding the mouse button down, drag the pointer to expand the rectangular and define a crop area. Release the button to complete the bounding box. Press the left mouse button again to re-define the box.

Once a rectangle is defined it can be moved. Point to a spot on the rectangular bounding box, then hold down the Shift key and press the left mouse button: now as you drag the pointer, the bounding box moves accordingly. Release the mouse button to place the box.

The rectangle can also be re-sized. Point to the right edge of the bounding box, press the right mouse button and drag the pointer to resize the bounding box along the horizontal dimension. Point to the bottom edge of the bounding box, press the right mouse button and drag the pointer to resize the bounding box along the vertical dimension. Point to the lower right corner or the bounding box, press the right mouse button and drag the pointer to resize the bounding box horizontally and vertically simultaneously.

After defining the desired crop area, press the **Execute Crop** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Normalize Operation

Normalize the brightness over an image. Using Normalize, you can select an area of the image, and adjust the brightness of the rest of the image to normalize it against the area you selected. This command is especially useful in normalizing the brightness of images to be used as texture swatches, such that when the image texture is repeated, there is no blatant difference in brightness where the texture ends and is repeated.

To select a rectangular area to normalize from, move the pointer into the viewport, position the pointer at the location where you wish the normalize rectangle to begin, then press the left mouse button to fix that corner. Holding the mouse button down, drag the pointer to expand the rectangular and define an area. Release the button to complete the bounding box. Press the left mouse button again to re-define the box.

Once a rectangle is defined it can be moved. Point to a spot on the rectangular bounding box, then hold down the Shift key and press the left mouse button: now as you drag the pointer, the bounding box moves accordingly. Release the mouse button to place the box.

The rectangle can also be re-sized. Point to the right edge of the bounding box, press the right mouse button and drag the pointer to resize the box along the horizontal dimension. Point to the bottom edge of the bounding box, press the right mouse button and drag the pointer to resize the box along the vertical dimension. Point to the lower right corner or the bounding box, press the right mouse button and drag the pointer to resize the box horizontally and vertically simultaneously.

The **Bias** dial allows you to determine the degree of normalization. The higher the number that is dialed in here, the stronger the normalization effect will be.

After defining the desired area, press the **Execute Normalize** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Recolor Operation

Change the hue of a set of colors in an image. The Recolor command allows you to "swap out" one set of colors with another set of colors. Use the pop-down button in this image operation to indicate whether you wish to perform the Recolor operation by **Hue** or by **Intensity**.

The Recolor command set includes a **Source** Color Well and **Destination** Color Well. The color displayed in the Source Well is the color that is going to be altered. To choose a Source color from the image in the viewport, move the pointer to the place in the image where you wish to select a Source color, then hold down the Shift key and press the left mouse button: the color at this point is displayed in the Sample Color Well at the bottom-left corner of the Image Designer. Now you can drag this color from the Sample Color Well and drop it into the Source Well.

The color in the Destination Well is the color that the Source color will be changed to. Select the desired color using the **Color Slider Bar** that appears on this command set. As you slide the color bar slider, the color in the Destination Well updates accordingly. The color in the Destination Well can also be selected using the Color Command Set in the Project Designer.

Use the **Delta Hue** (or Delta Intensity) dial to determine the amount of color values that will be affected by this operation. The higher the number that you dial in here, the more color hues to each side of the selected Source color will be affected. When this command is executed, the Source color is replaced with the Destination color, and all colors that fall within the Delta Hue of the Source color are replaced by the equivalent "delta hue" of the Destination color.

After setting the desired values, press the **Execute Recolor** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Monochrome Operation

Monochrome changes an image to a single color hue with variation only in saturation and value.

The **Color Scale** pop-down menu allows you to select the color hue to use. A monochrome image doesn't necessarily have to be shades of gray: it can be shades of red, green, blue, yellow, magenta and cyan as well.

After selecting the desired color scale, press the **Execute Monochrome** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Posterize Operation

Produce a stylized look by reducing the number of colors in the image. Existing image colors are modified to produce an image with fewer colors. Remember that the image you are modifying is displayed in 256 colors, but it may actually exist in up to 16.7 million colors.

First, select the **Color Palette** to use in posterizing the current image: you can posterize in **Primary** colors, or you can use the **Original** colors in the image as the base palette for posterization.

Select the **# of distinct colors** pop-down menu to select the number of colors the modified image is to contain. When the command is executed, the colors in the image will be assigned to the posterization color that it most closely resembles.

After selecting the desired number of colors, press the **Execute Posterize** button to modify the image according to your changes. The image in the viewport will update to display the effect of your changes.

The Invert Operation

Invert the color hue of each pixel, changing each to its complementary color. This command effectively creates a "negative" of the current image. Press the **Execute Invert** button to modify the image. The image in the viewport will update to display the effect of your changes.

The Rotate Operation

Rotate an image on its center. The image will rotate clockwise by **90** degrees, **180** degrees or **270** degrees, depending on which of these mutually exclusive buttons is enabled. Press the **Execute Rotate** button to modify the image. The image in the viewport will update to display the effect of your changes.

The Mirror Operation

Flip an image from one side to the other to produce a mirror image of the original. Select the **Direction** pop-down and select **Right/Left** or **Top/Bottom**, depending on the direction in which you want the current image to be mirrored. When you press the **Execute Mirror** button, the image in the viewport will update to display the effect of your changes.

The Composite Operation

Combine several "smaller" images together on a large background. This command is used to make one big image out of several smaller images to create a collage image.

Before using this command, load into the Image Designer the image that is to be used as a background. This should be a relatively high resolution image. Next, drag from the Images Resource Area of the Project Designer an image that you wish to composite into the background image, and drop it into the image **Source** Well. Now a rectangle appears representing this image's resolution. Move this rectangle over the part of the background image where you wish to place this image, then select the **Execute Composite** button to paste the image down in this location. If you don't like the location at which the image is pasted, move the rectangular box to another location and select Execute Composite again: the image will be moved to this new location. When satisfied with the location of the pasted image, use the Save command at the upper-left of the window to save the composite image.

If the **Use Matte** button is enabled, the alpha channel of an image is "dropped out" as it is composited. That is, if you generate a rendering with a solid color background, that background is not displayed in the composite image: only the rendered objects are visible. When you perform a rendering over a solid color background, that background color is automatically defined as the "transparent matte" (it is the area of the alpha channel definition). However, this matte only remains active if the image was saved directly from the Project Designer viewport using the "Save as Test #" button, or if was saved to disk as a 32 bit image (32 bit images save 24-bit color plus an 8-bit alpha channel; Renderize Live supports 32-bit output to TGA or RAS files). In addition, you can define a matte for any image using the Matte Image Operation.

You can repeat this operation with as many different Source images as you wish until the composite image is complete.

The Matte Operation

Create a transparent "Matte" definition over the current image using the 8-bit alpha channel. When this image is used as the Color Texture in a material definition, the area over which the matte is created will appear transparent when rendered onto an object.

This image operation is extremely useful in several circumstances. First, materials that have some "see-through" areas (such as a loose wicker weave) can be accurately represented by creating the transparent matte over the "see-through" sections of the image. Or, this command can be used to populate a view with 2D images of people or plants. A matte can be defined over the image of a person such that the solid color background becomes transparent, leaving only the person's form. In the former application, the resulting image is part of a material that is mapped onto an existing piece of geometry. In the latter example, it may be necessary to generate a new piece of geometry on which to map the person. Renderize Live supports this through the ability to create simple 3D planes on which these images are rendered.

Creating an alpha channel matte for an image and using that image in a material requires several steps. First you must define the alpha channel matte; this determines which parts of the image will become transparent during rendering. Next, this image must be included as the Color Texture in a material definition. And finally, the Matte Drop Out toggle on the Material Designer window must be enabled so that the alpha channel is used to create the drop-out effect.

To create a transparency matte, first select the color that you wish to make disappear during rendering. This is usually the background color of the image, and in many cases it is black. To choose the color, point to that color in the Image Designer viewport, then hold down the Shift key and select with the left mouse button: the color that you chose now appears in the color well at the bottom-left of the Image Designer. Now drag this color from this color well and drop it into the **Background Color** well. Next, use the **Delta** dial to indicate the range of colors over which to set the matte. A low Delta value limits the operation to the single color value that you chose. As you increase the Delta value, more colors of similar value to the color you chose will be affected.

After you have assigned the drop-out color, select **Create Matte** to generate an alpha channel transparency matte for the current image. This command may take several moments to execute, and nothing will change on the image as it is displayed. To view the location of the transparency map you created, select the **Show Matte** toggle: those areas of the image that will appear transparent during rendering are displayed in black; those areas of the image that will show during rendering are displayed in white. After viewing the matte definition, select the Show Matte toggle again to return to normal display of the image.

In addition to creating a matte definition for an image, it is also possible to copy onto the current image the matte definition created for another image. To do this, drag the image that contains the matte definition you want to use and drop it into the **Source Image** well. A rectangular box appears in the viewport representing the size of the source image. This box can be repositioned (using Shift+left mouse button) or resized (using the right mouse button): the alpha channel matte associated with the image is repositioned and resized accordingly. When the source image is positioned and resized as desired, press the **Copy Matte** button to copy the matte definition from the source image onto the image that is currently displayed in the Image Designer viewport.

Saving Alpha Channel Matte Information

If you wish to save an image's matte definition to disk along with the image, you must save that image in a 32-bit image format: either TGA or RAS. Only 32 bit image files can save alpha channel information.

Populating a View with 2D Images (People and Landscaping)

If you wish to populate your view with 2D images (such as people, trees and plants), you must not only set a transparency matte as described above, you also need to create a new piece of geometry for each 2D image. Renderize Live simplifies this process with the **Create 3D Object** button. After

defining a matte, select this command and a simple rectangular 3D object will be generated for the current image, and added to the current View in the Project Designer viewport. The proportions of the object will match those of the image. In addition, a new material will be created using this image as the Color Texture, and the material definition will have the **Matte Drop out** button enabled. This material will be assigned to the new object with orthogonal texture mapping perpendicular to the face of the object.

In other words, selecting Create 3D Object automates all of the steps involved in using a 2D image as an object in a View. It creates a rectangular face on which the image will be mapped, and sets up the material and mapping definitions accordingly. All you have to do is orient and scale the object in the View: treat the 3D rectangle on which the image will be mapped as you would treat any other 3D objects.

Remember that this kind of object is really only 2D. It is the image, not the object that is the desired form here, and that image only exists in 2 dimensions. Therefore, you want to position the rectangular object to which the image is assigned such that it faces the camera directly; otherwise the lack of depth may be apparent. In addition, remember that shadows and other lighting effects will be affected by the lack of dimensionality of this object.

The Emboss Operation

Use the color value information (Intensity) to create an embossed effect from the current image. When you execute this command, the current image is converted to grey scale, and areas of the image with marked contrasts in intensity appear to be embossed.

Before executing the command, select the **Emboss From** pop-down and choose the direction from which the "embossed" image is illuminated: the direction you indicate here, **Above**, **Left** or **Diagonal**, determines the way the image is shaded.

The Print Operation

Print the current image using the Windows Print Manager. When you select this command, you are prompted to select how you wish the image to be formatted on the page.

Stretch to Page scales the image up or down to cover the entire area of the page that you are printing.

Best Fit prints the image without scaling it, and will rotate the image, if necessary, to fit it onto the page. If your image file size is 1200 pixels horizontally (X resolution), and you are printing on a 300dpi printer, the image will print out to a size of 4 inches across (1200/300=4).

Scale allows you to select a specfic X and Y Scale at which the image should be printed. A value of 1 indicaes no change of scale. Values below and above 1 will reduce or increase the size of the printed image.

The Print to Screen Operation

Display the current image over the entire screen display, temporarily replacing the Renderize Live interface. When an image is printed to the display monitor, it is done with no re-scaling to fit the image onto the screen. Instead, the screen becomes a "view window" to the image. If that image is larger than the screen resolution, the view window can be panned to view other parts of the image. For example, if your display resolution is 1024x768 and your image is 2000x1500, the entire image is printed, but only a 1024x768 area of that image is visible at one time.

When you print an image to the screen, that image fills the entire screen, replacing any application windows that are currently open. To pan the view around other parts of the image, press the left mouse button and drag the mouse to control the direction of the pan. When you have finished viewing your image and you wish to remove it from the screen display, press the right mouse button.

The Image Designer

The Project Designer Window Layout

The Project Designer is the "main", or controlling window of Renderize Live. This window controls the management and assembly of project **resources** into renderable **views**. Object, light and camera resources are displayed and re-positioned as wireframes in the Project Designer **viewport** to define their spatial relationships. The view in the viewport can then be rendered according to the material characteristics that were assigned to each object.

A project is a savable set of information that organizes all the resources needed to perform one or more renderings. A project usually contains one or more views. A view is a collection and arrangement of **object** and **light** resources viewed as if through a selected **camera** lens. The characteristics of the objects in a view is influenced by the use of **material** and **image** resources.

The Project Designer contains several different areas that control the management and assembly of project resources.

The Menu Bar

Located at the top of the Project Designer are five pop-down menus: File, Edit, Toolboxes, Options and Help.

The Command Bar

Located below the Menu Bar, the Command Bar contains several sets of buttons:

The Project File buttons control the loading and saving of projects.

The Toolbox buttons control the display of commands in the Toolbox area of the Project Designer.

The Viewport Display buttons change the viewport between a camera view and orthographic views.

The Viewport Zoom buttons control the zoom of the viewport display.

The Wire/Render toggle changes the viewport display between a wireframe and rendered display.

The Wireframe Update buttons determine the way wireframes are redrawn in the viewport.

The Frontface and Backface buttons determine how polygons are displayed in the viewport.

The Viewport

Floating in the area below the Toolbox, the Project Designer Viewport displays wireframes of objects, lights and the camera in 3D space. When an image is rendered to screen, it is also displayed in the viewport.

The Resource Manager

Located to the left of the viewport, the Resource Manager is used to catalogue and manipulate project resources. This area of the Project Designer contains the View Well, The Move Well, The Edit Well and the Resource Palettes.

The Toolboxes

The Toolboxes are displayed directly below the Command Bar. There are 5 different Toolboxes: Render, Move, Select, Normalsand Colors.

Project Resources

A project is made up of the following resources: views, objects lights, materials and images. These resources are the building blocks from which renderings are created.

Resource Types

Views are the renderable resource in Renderize Live. A view is made up of objects and lights, and includes information for a camera orientation and focal length. A view can also include an image as a background, and has settings for the alteration of ambient light and depth perception. The Creating Views topic explains how resources are combined into views for rendering.

Objects are the rendered resource. They are 3D wireframe models imported into Renderize Live using the Load Object command on the File menu. The way in which objects appear when rendered depends on the attributes defined for the object, as well as the material resource that is assigned.

Lights define the illumination of objects in a view. The position, orientation and intensity of the lights, to name a few factors, affect the way a view appears when it is rendered.

Materials are assigned to objects, or parts of objects, to define the way the wireframe object will appear when it is rendered in a view. Materials properties include color, reflectivity, and transparency; in addition, materials can include images to define texture maps for rendered objects.

Images are assigned to materials to define texture, bump and reflection maps for objects. In addition, images can be loaded as backgrounds in views.

Resource Icons

All resources are represented in Renderize Live as "postage stamp" icons: each visually describes the type of resource it represents, and in many cases the icon will update to reflect changes in the definition of the resource. Resource icons are displayed in Resource Palettes on the Resource Manager.

There are several ways to manipulate a resource:

Resources may be manipulated by dragging a resource icon and dropping it into a Command Well on the Resource Manager, or into a Resource Well located on a Toolbox or Resource Designer window. To "drag and drop" a resource, move the on-screen pointer to cover that resource's postage stamp icon, then select and hold the left mouse button to pick up that resource. Now as you move the pointer, the resource icon moves along with it: position it so that the pointer covers the desired target Wells, then release the mouse button to drop that resource icon into the Well.

Resources can also be manipulated from a resource menu. To display a menu for a resource, cover that resource icon with the pointer, then select and hold the right mouse button: a pop-down menu will appear at that position. Some commands are common to all resources, but other commands only appear for specific resource types. These commands are:

Edit: Load the resource into its Resource Designer Window for editing (same as dropping a resource into the Edit Well).

Copy: Copy the resource to a different name (same as renaming a resource in a Resource Designer Window.

On: Turn on the resource, assuming that has been turned off.

Off: Turn off the resource so that it is not displayed in the viewport or calculated during manipulation and rendering.

Delete: Remove the resource from the project.

Move: Activate the resource for movement in the viewport (view, object and light resources only).

Assign: Assign the material resource to the object that is currently activated in the Move Well (materials only).

Add: Add the resource to the current view (objects, lights and images only)

Activate: Make this view the current view in the viewport (views only).

Default Resources

When you execute Renderize Live, no object or image resources exist: these resources must be loaded from disk. However, Renderize Live contains "default" resources for views, lights and materials. These default resources give you a starting point when you wish to create a new view, light or material.

Default resources cannot be changed. Therefore, when you load one of these resources for manipulation, Renderize Live automatically copies that resource to a new name "default_1". This new resource can be used to define the desired view, light or material characteristics, then it can be saved either under the system generated name of "default_1", or you can assign a name that better describes the nature of the resource you are working with.

Editing Project Resources

All resources are edited in Resource Designer windows. A different Resource Designer exists for each of the six different resource types: views, objects, lights, materials, images and animations .

To edit a resource, you must load that resource into its Resource Designer window. There a several ways to open Resource Designer windows:

Drag the resource that you wish to alter and drop it into the Edit Well on the Resource Manager: this opens the appropriate resource Designer window and puts that resource in the window. For example, if you drag a material icon from the Material Resource Palette and drop it into the Edit Well, the Material Designer window is opened and the material you dragged is loaded into the window.

Select on the icon of the resource that you wish to alter with the right mouse button to display the resource menu, then highlight the Edit option from that menu and release the mouse button.

Select the desired Resource Designer window from the Edit pop-down menu on the Menu Bar at the top of the Project Designer. If you have not used this window previously, it is empty, and you must drag and drop a resource into this window before you can use it. However, if this window was used previously, the window opens up to display the contents as they existed the last time you used the window. This method of opening a Resource Designer window is faster when you wish to re-open it using the same resource that you last dropped into the window.

Note that more than one Resource Designer Window can be opened at one time. You can continue to work in the Project Designer while other windows are open.

Turning Resources Off and On

Project resources can be "turned off" in Renderize Live so that when a view is rendered, these resources will not be rendered. It is useful to disable resources in this way to speed rendering during the iterative design process. For example, when you are perfecting the material definition on one object, you can turn off all the other objects in the view, or if you are concentrating on shadow location, you can turn off all the materials in the view.

To turn a resource off, move the pointer to cover that resource in the Resource Palette and press the right mouse button to display an icon menu, then select the Off option from that menu: the word "OFF" now appears on that resource icon. When a resource is turned off, it behaves as if it isn't in the current project, but it can be turned back on by selecting the On option from the same icon menu.

Resources can also be turned off and on globally by selecting on the resource pop-down button directly above the Resource Palette. For example, if the Object Resource Palette is currently displayed in the Resource Manager, pop-down on the Objects pop-down button and choose the Turn All Off option. This way you can turn all of a particular resource type off, then selectively turn on only those resources that you wish to work with at a given time.

Resources that have been turned off can also be removed from the current project by selecting the Delete OFF Items command on the Files pop-down menu. Once a resource is deleted, it cannot be recovered.

Creating and Manipulating Views

The purpose of Renderize Live is to create and render **views**. A view is defined as a group of **objects** (wireframe models) positioned in 3D space, illuminated by one or more **lights**, and displayed according to a **camera** setting.

Populating a View

A view is created by populating it with object and light resources. Before a view can be rendered, it must contain at least one object and one light. There are several ways to populate a view.

Drag a view resource and drop it into the Edit Well on the Resource Manager to open the View Designer window, then add the desired object and light resources by dragging and dropping them into the Add Well on the View Designer.

Drag a view resource from the View Resource Palette on the Resource Manager and drop it into the View Well. This is now the active View in the viewport (or select on the view icon with the right mouse button and select the Activate option to load that view into the View Well) Next, drag the desired objects and lights from their respective Resource Palettes and drop them into the View Well on top of the view (or select on the object or light icon with the right mouse button and select the Add option to add that resource to the current view.

You can also drag view, object and light resources and drop them directly into the Project Designer viewport: this has the same effect as dropping them into the View Well, as described above.

When an object or light resource is part of the current view, the name of that resource is highlighted in yellow.

As soon as an object and a light exist in the current view, that view can be rendered. However, there is more to creating a view than simply populating it with objects and lights. The objects or camera may need to be repositioned to display the objects in the desired orientation; material colors and textures can be defined for the objects; the location, color, intensity and type of lights can be defined; the camera lens properties can be set. All of these factors affect the look of the rendered scene.

Positioning Object, Light and Camera Resources in a View

Object, light, and camera positions can be altered visually in the Project Designer viewport. However, before you manipulate a resource in the viewport, the view containing that resource must be the current view in the View Well.

Once a view is current, the objects and lights in that view, as well as the camera, can be moved and rotated independently. To manipulate a particular resource, drag that resource's icon and drop it into the Move Well on the Resource Manager: the wireframe representation of that resource now appears highlighted in yellow in the viewport.

As soon as you drop a resource into the Move Well, the Move Toolbox is displayed. The commands that appear in this Toolbox allow you to move and rotate the resource in 3D space, and these commands depend in part on the kind of resource that you are manipulating. In addition to the commands on the Move Toolbox, you can use the viewport display buttons and the Zoom buttons on the Command Bar to alter the viewport display in order to facilitate the re-positioning process.

Note that in addition to manipulating resources dynamically in the viewport, you can also manipulate lights, objects and the camera in the Light, Object and View Designers, respectively, by typing in the desired cartesian coordinates.

Positioning Lights in the Viewport

To manipulate a light, drop that light's icon into the Move Well.

Lights resources are not visible in the camera view. They can only be seen and positioned in the Top, Front or Side views: the viewport can be toggled among these three orthagonal views and the camera view using the viewport display commands on the Command Bar. Lights are represented in the viewport as wireframes: the shape of the wireframe depends on the type of light you have selected (point, spot, or area). Lines emanate from the light icon representing the "directional" beam of the light Although point lights have no direction (they shine light in all directions), they also include a directional beam, so this line can be used to locate the light if it gets "lost in space". The color of the beam turns from yellow to blue if the light is in front of the camera plane, creating a backlit effect.

When a light is added to a view, its default position is usually far away from the camera, and therefore hard to locate. To find a light, you can center it in the view, or set the target of the directional beam in the view so that the location is known.

Refer to the Move Toolbox topic for a complete description of the commands that are used to manipulate a light in the viewport.

Positioning Objects in the Viewport

To manipulate an object, drop that object's icon into the Move Well.

Objects should be manipulated using all of the viewport views. The **camera** view displays the view as it will be rendered; however, because the computer monitor is a 2D display area, it is difficult to get a sense of the relative depth-positions of objects when looking the camera view. Use the orthographic viewport displays to look at the view from other angles.

When an object is added to a view, it assumes a position in 3D space according to the scale and orientation that were assigned to it when it was created in the modeling software. Therefore it is often the case that when an object is loaded, it is located somewhere outside of the camera view. To view the object you may need to center it in the camera view, or center the camera at the object's location.

The position of a group of objects relative to one-another can be manipulated quite easily in Renderize Live. This work is greatly facilitated, however, if the objects in complex scenes, such as an office interior, are created in the proper relative scale and position during the original modeling process.

Refer to the Move Toolbox topic for a complete description of the commands that are used to manipulate an object in the viewport.

Manipulating "Parent" and "Child" Objects

When a DXF file is imported by layer into Renderize Live, it is possible that all the objects generated from that DXF are related to each other in a hierarchical family tree structure. When this is the case we refer to the higher level objects (level 0 is the highest level in the DXF file) as "parents" of the lower level objects.

When you change the position, rotation or scale of a parent object, all of the children below this parent are changed accordingly. This is extremely convenient when you wish to position all of your objects in concert. However, you can also manipulate the "child" objects independently of the parent, to change the spatial relationship between the parent and child.

Manipulating Instanced (Cloned) Objects

If you define a geometric entity in your CAD package and assign it multiple instances, those instances appear in Renderize Live. However, if you import your geometry from the DXF file by block, only one object icon is created to represent all instances, and when you manipulate the object using that icon, only the first instance of the object is affected. To manipulate other instances of an object, you must select those instances by pointing to them in the viewport. To do so, point to the instanced object that you wish to manipulate, and while holding down the Alt key on the keyboard, press the left mouse button: the object that you were pointing to is now displayed in yellow, indicating that it is the object/instance to be manipulated.

Positioning the Camera in the Viewport

To manipulate the camera, drop the view icon into the Move Well.

When you manipulate the camera position from the camera view, you will see the objects panning in the viewport as the camera is moved or rotated. When you manipulate the camera in the orthographic views, you will see a wireframe icon of the camera, as well as lines emanating from the camera which indicate the field of view.

Refer to the Move Toolbox topic for a complete description of the commands that are used to manipulate the camera in the viewport.

Rendering Views

One a view has been populated and its object, light and camera resources satisfactorily oriented in 3D space, the view can be rendered. Views are rendered in the Project Designer viewport during the iterative creation process, then rendered to disk file (usually at high resolution) once the image in the viewport achieves the desired effects. The commands in the Render Toolbox are used to perform viewport and disk file renderings.

Modifying Material Relationships

When you load an object in renderize live, materials are created by default and assigned to each of the objects. The relationships between materials and objects can be modified using the commands of the Select Toolbox.

Modifying Object Normal Directions

Object normals determine which side of a polygon will be rendered. In some cases geometry can be created such that the direction of normals is reversed, resulting in unexpected results during rendering. The direction of object normals can be modified using the commands on the Normals Toolbox.

Loading and Saving Files

The creation of a project in Renderize Live involves the use of a variety of different files. Object files, containing 3D wireframe models, are created in modeling software products and loaded into Renderize Live from the DXF, OBJ and GED file formats. Image files, used as material textures or view backgrounds, can be loaded from and saved to the TGA, TIF, GIF, BMP, RAS or RAW file formats. Project files, with the EYE file format, contain a list of all of the resources associated with a given project. The loading and saving of each of these file types is discussed in full below.

All file operations are executed in Renderize Live using a Windows 3.1 **File Browser**. The File Browser appears anytime a file is to be loaded or saved.

Using the File Browser

The File Browser appears whenever a command is issued which requires loading or saving a file. To load a file, point to the desired filename on the list of filenames to highlight it, then select the **OK** button to load that file. Or, double-click on the desired filename on the list. You can also click in the **Filename** type-in, type in the desired filename and press the **OK** button.

To change directories, select on the desired directory name in the list of directories for the current drive. To change drives, click on the **Drives** pop-down menu and select from the list of valid disk drives.

The Files List

The Files List displays a list of all files in the current directory matching the pattern (filename extension) that is displayed in the **List Files of Type** type-in.

The List Files of Type Pop-down Menu

Select this pop-down menu to display a list of valid file types for the current load or save operation. For example, when you are loading an object, the list of filetypes that appear in this pop-down menu are DXF, OBJ and GED.

Note: When saving image files, the filename extension that appears in the Pattern type-in area will be assigned to the image filename, if no filename extension is specified in the Save this File type-in.

The Directories List

This list displays the directories on the selected disk drive. To change directories, either select the desired directory on the list to highlight it and press the **OK** button, or simply double-click on the desired directory.

The Filename Type-in

The Filename type-in permits direct entry of the filename to be loaded or saved. If you select a filename by highlighting it in the File List, that filename appears here. Otherwise, you can enter the desired filename directly using this type-in. When typing in a filename, be sure to include the filename extension.

The Cancel Button

Closes the File Browser window and returns to the previous command level without loading or saving any file.

Loading and Saving Projects

A project consists of all of the light, object, view, material and image resources loaded or defined in Renderize Live at a given moment. Projects are loaded and saved under the **File** pop-down menu, located at the top of the Project Designer.

A Renderize Live project actually consists of a group of files. The main file, with the .EYE filename extension, contains a list of all of the resources in the project, and the attribute definitions for these resources. In addition, this file refers to object and image files that are included in the project. If you ever need to move a project to a different location, use the Export Project command to make sure that all of the relevant resources are taken into account.

When you save a project, an .EYE file is created with all of the project resources. In addition, files with a .GED filename extension are generated for each of the objects in a project, and saved into a subdirectory that is created using the project name. For example, if you save a project named TOWER, the project file TOWER.EYE is created. A directory named TOWER is also created in the same directory as the project file, and each of the object resources in the TOWER project are saved into the TOWER subdirectory. Therefore, after you import geometry and save the project file, the project no longer refers to the original geometry, but instead to the "project-specific" .GED file that it creates when the project is saved.

In addition to these object files, there may be one or more image files associated with a project. Image files are not duplicated as object files are to make them project-specific. Instead, the .EYE file references the relevant image file names and directory paths. Therefore a single image file can be referenced in multiple projects. Keep this in mind when editing image resources and saving those changes.

When you load a project, you do so by choosing the desired .EYE file. After reading the .EYE file, Renderize Live locates and loads all of the object and image files that are referenced in the project.

When a project is loaded, it is added to any resources that currently exist in Renderize Live. Therefore is it possible to combine projects simply by loading them one after the other. This offers a convenient method for creating material resources and sharing them among projects. If you don't wish to combine projects, use the New command under the Files pop-down menu to clear away any existing projects before loading a new project.

Loading and Saving Objects

Objects are wireframe model files, created in CAD software packages and loaded into Renderize Live. They are created external to Renderize Live and loaded into projects for manipulation. Regardless of the kind of object file that is loaded, Renderize Live saves all objects as .GED files at the time a project is saved (see the Loading and Saving Projects section above).

When an object is loaded in Renderize Live, one or more materials are assigned to that object. The object that is loaded appears on the Object Resource Palette on the Project Manager, and any materials associated with that object appear in the Material Resource Palette.

To load an object into the current project, select the File, Load Object command from the Menu Bar. You can load objects in the .DXF, .GED, .OBJ or .SHP file formats. If you are using the PointLine modeling software, use the File, Load Object (Directory) command, as this allows you to load all of the separate DXF files in a directory as related objects.

DXF, the data exchange format, is a common format for wireframe files. Renderize Live can load DXF files from AutoCAD releases 10 and above. Materials are assigned to DXF objects during the loading process according to that object's layer, color or block information.

OBJ is a Wavefront file format. Materials are assigned to OBJ objects according to a definition in the OBJ file.

GED is the Renderize Live object file format. This is the format that objects are saved into when a project is saved. The material definitions for a GED file depend on the definitions as they existed when this object file was saved as part of a Renderize Live project.

SHP is the Visual Model file format. Materials are assigned to SHP objects during the loading process according to that object's group or layer information.

OBJ and GED files are loaded directly from the Load Browser. DXF files are selected in the Load Browser, but loaded according to selection in a special DXF File Reader menu, which appears after a DXF" file type is selected. SHP files, like DXF files, are also loaded according to selection in a SHP File Reader menu.

Loading a DXF File: The DXF File Reader

Renderize Live supports both standard ASCII and binary DXF file formats, as defined by Autodesk's DXF standards. However, when creating models for use in Renderize Live, keep the following points in mind:

Renderize Live will read DXF files containing solid modeling entities, such as those created with the AutoCAD AME. However, you must mesh your solids (for example, use the SOLMESH command in AutoCAD) before exporting your solid model to DXF file.

Renderize Live only imports those layers in a DXF file that are not frozen. Renderize Live cannot load DXF files in which the highest level "0" layer has been frozen.

Renderize Live does not properly import DXF objects created using a "donut" command.

DXF files do not treat "voids" as special entities, and therefore the imported geometry will not contain a void at the desired location.

When a model is loaded into Renderize Live, you may specify how to break the model up into objects. A model can be loaded by layer, color or block, and the hierarchical level at which the objects are loaded can be set. For example, if a model consists of multiple layers, you can elect to load the model such that all of the layers are lumped into a single object; or you can load the model such that each of the layers in the model are treated as separate "children" objects and controlled with an additional "parent" object that maintains the spatial relationships among the children.

In addition to specifying how to generate objects from a model, you must also specify whether materials will be assigned by layer, color or block. For example, if you load materials by layer, a different material is created for each of the layers that are loaded from the model. The material definitions selected here are completely independent of the object definitions described in the previous paragraph.

The flexibility available in loading a DXF file depends entirely on how the original model file was created. If the original model file was created with all objects on a single layer, no blocks and all one color, there will be no way for Renderize Live to separate the entities into separate objects. It is important in complex projects that the eventual rendering be considered when producing the models upon which the project will be based. Objects or parts of objects that are intended to be separate should be created on different layers, be created as separate blocks or have unique colors. Objects and parts can be separated in Renderize Live, but it is a task which could have been done more easily at time of model creation.

The Entities List

On the right side of the DXF File Reader, an entities list displays the levels into which the current model is broken down. The entities that appear depend on the "**Create Objects From**" option that is selected. If you are creating objects by **Layer**, then this list displays all of the layer information for the current model.

The entities on this list that are highlighted indicate how this model will be loaded. If the "**Set by level"** type-in (discussed below) is set to "0", then only the top line in this window is highlighted. This line, indicating level 0, represents the model as a whole. When a model is loaded this way, only one object is created in Renderize Live, and it contains all of the entities of this model. If "Set by level" is "1", then all of the lines in this list representing level 0 and level 1 are highlighted, and a different object will be created in Renderize Live for each of the lines highlighted here. In this case, all of the level 1 entities contain the geometry that makes up the object: the level 0 entity contains no geometry, but acts as the "parent" of the level 1 entities. This parent object can be used in Renderize Live to manipulate the level 1 entities as a whole. This is especially important when you wish to re-orient the model in 3D space. Instead of trying to move the entire model by manipulating each of its object entities separately, you can move the "parent" object and the position of the children (the level 1 entities) will move accordingly to preserve the spatial relationship between these entities.

If you don't wish to load all of the layers indicated here, you can point to and select on a highlighted layer to take it out of the list of entities to be loaded. If you load by level 1 and take one of the level 1

entities out of the list of entities to load, the geometry associated with that entity will be assigned to the parent entity. You can also select on the parent level (level 0) to turn it off. Then, only those objects that are selected will be read in.

The Set By Level Type-in

Use this type-in to determine the number of objects to create when loading the current model. Level 0 is the DXF level that represents the model in its entirety. If level 0 is chosen, only the entity at level 0 is highlighted in the entities list of the DXF File Reader, and all entities in the DXF file will load as a single object.

Levels below Level 0 represent sub-groupings of layers or blocks (depending on which "**Create Objects From"** option is selected). When you load objects by level 1, a different object is created in Renderize Live for each of the level 1 entities. In addition, Renderize Live generates an object that represents the model as a whole. This object, marked with the word "node", generally contains no geometry, but it can be used to globally control the sub-groupings of the model.

Using this type-in, you can determine how many entities you wish your model to be broken down into when it is loaded into Renderize Live. Regardless of the level you choose, the entire model is loaded into Renderize Live (unless you specifically exclude entities, as described in the section above titled "The Entities List"). This type-in simply allows you to load the entire model as a single object, or load it as a group of objects. When you load a single model as a group of objects, each of the objects can be manipulated independently in Renderize Live, or they can be manipulated as a whole by manipulating the "parent" object of these entities.

The Material Source Buttons

The material definitions for the imported model can come from **Layer**, **Color** or **Block**. Selecting one of these options under the "**Create Material from:**" area determines how the entities of the DXF model will be grouped into materials in Renderize Live. When the DXF file is loaded, one material will be created for each of these groups. These materials will be displayed in the Material Resource Palette under the same names that defined the entities. The way you group entities for material definitions depends entirely on how the DXF file was created.

The material source that you choose is completely independent of the object source. For example, it is entirely possible to load by layers but to assign materials by blocks.

The Object Source Buttons

The object definitions for the imported model can come from **Layer**, **Color** or **Block**. Selecting one of these options under the "**Create Objects From:**" area determines how the entities of the model are grouped into objects in Renderize Live. When the DXF file is loaded, objects will be created according to the group chosen here. The number of objects created depends on the "**Set by level**" number and the entities that are highlighted on the **Entities List.** Basically, one object is created for each entity that is highlighted in the Entities List.

The default setting for this command option can be set in the Renderize Live startup file. Note that frozen layers are neither displayed nor read in Renderize Live.

The Save Caps on Extrusion Button

If an entity is created in the modeling software by extrusion (sometimes called 2-1/2 D models) there are often no caps on entities; that is, a square extruded into a cube has no top or bottom cover. Enabling this button caps these entities with a renderable face.

The default setting for this command option can be set in the Renderize Live startup file (discussed in the Renderize Live Interface Overview chapter).

The Read Views From DXF Button

Enable this button, and any DXF views that exist in the incoming file will be used to generate view

resources in Renderize Live. These view resources are displayed as icons on the View Resource Palette.

The Read Button

Executes the loading of a DXF model according to the object and material definitions that you set in the DXF File Loader menu. Object and material resource icons are generated and displayed in the Resource Palettes on the Project Designer.

The Cancel Button

Cancels the DXF file load command and returns to the previous level of command.

Loading an SHP File: The SHP File Reader

SHP files are similar to DXF files in that they contain the group and layer information that was defined in the original model. This information can be used to determine how objects are broken up and materials assigned when the model is imported.

The SHP File Reader is similar in functionality to the DXF File Reader.

Loading and Saving Images

Images are used in Renderize Live as textures in material definitions and as backgrounds in views. In addition, once a view is rendered to disk in Renderize Live, that rendered view becomes an image file on disk. Renderize Live can load and save TGA, TIF, GIF, BMP, RAS and RAW files.

Images can be read into Renderize Live using the File, Load Image command on the Project Designer, or from the File pop-down menu on the Image Designer window.

With the exception of renderings, which are saved to file at the time they are generated, images are saved from the File pop-down menu on the Image Designer window. Renderize Live can save images in a variety of bit-depths (number of colors), depending on the file being saved. The saving of image files is discussed in detail in the Image Designer Window topic.

The File Menu

New

Clear all resources from the Project Designer to start fresh. You may wish to save your work before executing this command. This command can also be executed by selecting the  button on the Command Bar.

Open Project

Load a project from disk file. This loads the .EYE file that defines a project, as well as all object and image files associated with that project. This command can also be executed by selecting the  button on the Command Bar.

Save Project

Save the current project, updating the .EYE file, as well as any associated object files, if necessary. In addition, if any image resources have been edited but not saved, you will be asked if you wish to save them at this time. This command can also be executed by selecting the  button on the Command Bar.

Save Project As

Save the current project under a new name, also saving new object files into a directory of the new project name.

Save Project Exported

Save the current project so that it can be easily archived or moved to a different system. When you select this command a window appears on which you can select the filename and directory to which the file will be exported. An EYE file is created in this directory, and all of the image resources associated with the project are duplicated and saved in that directory. In addition, a subdirectory with the same name as the EYE file is created in the same directory in which the EYE file is stored, and all the object files are copied to this directory. Finally, all object and image references in the EYE file are set so that as long as the EYE and image files exist in the same directory, and the object files exist in a subdirectory of the same name as the EYE file, Renderize Live will find all resources when the project is loaded.

After using this command, you can use the XCOPY command to copy the EYE and image files, as well as the object files and their subdirectory structure to another location.

Load Image

Load an image from disk to include as a resource in the current project.

Load Object

Load an object from disk to include as a resource in the current project.

Load Objects (Directory)

Load all of the DXF files in a directory. As soon as you select one file in the directory and load it, all DXF files in that directory are loaded, and a "parent" object is created to control these objects in unison. This command is designed for the importation of PointLine DXF files.

Delete all Off Items

Delete all resources that have been tagged as Off.

Mark Unused

Mark as Off any objects or lights that are not included in views, any materials that are not assigned to objects, and any images that are not used in material definitions or as view backgrounds.

Exit

Exit Renderize Live. You may wish to save your work before executing this command.

The Edit Menu

Use the commands on this menu to open up each of the Resource Designer windows. There are Resource Designers for each of the project resources: views, objects, lights, materials and images. In addition, there is an Animation Designer window used to define and generate animations.

With the exception of the Animation Designer, Resource Designer windows can also be opened by dragging a resource and dropping it into the Edit Well on the Resource Manager, or by pointing to a resource and selecting the right mouse button to display the icon menu, then selecting the Edit option from this menu.

The Toolbox Menu

Use the commands on this menu to open up one of the Toolboxes: Render, Move, Select, Normals and Colors. These Toolboxes can also be opened by selecting the  ,
 ,
 ,
 and
 buttons, respectively, on the Command Bar.

The Options Menu

The Options Menu allows you to define Batch rendering processes, and to define Renderize Live system Preferences.

The Batch Command

Renderize Live supports the ability to define multiple views, then final-render them to files on disk in an unattended batch process. when you select this command, a window appears on which views can be identified for rendering. Rendering options and parameters can be set individually for each view.

To include a view in the batch rendering process, drag and drop that view into the **Add** Well in the Batch Render window. To remove a previously included view, drag that view and drop it into the **Delete** Well in the Batch Render window.

To set the rendering options for a particular view, first add that view to the list of views to render, then drag it and drop it into the **Edit** Well on the Batch Render window. Any options already set for that view in the Batch Render window will be displayed. Once the view is in the Edit Well, you can select the rendering options by selecting the  ,

 ,

 and

 buttons (these buttons are described in the Rendering Options topic). You can also enter the desired output resolution and filename for each view. Be sure that each file is assigned a unique filename, and that none of these names already exist in the directory in which the images are to be rendered. If a duplicate filename is found, the batch process will be interrupted and you will be prompted to assign a new filename or approve the replacement of the existing file. When you are done selecting the parameters for a view, select the

 button to save that information for the current view.

Rendering options and parameters can also be set globally for all of the views in the batch render process. When you select the  button the current rendering options, as well as the resolution, are saved to all views currently loaded into the Batch Render window.

Note that you cannot set the aspect ratio in this window. That is because whenever you set an aspect ratio at anything other than the viewport ratio of 4x3, the viewport shape changes and you must use scroll bars to center the area that you wish to render in the viewport. Therefore, to define a batch rendering with an aspect ratio other than 4x3, load the desired view into the View Well, then from the Render Toolbox select the desired aspect ratio and position the markers in the viewport to the desired location. Then enter the Batch Render window and drop that view into the Edit Well. Finally, select the  button, and the aspect ratio and rendered location will be copied from the current settings on the Render Toolbox and in the viewport. All views in a given batch render operation must render using the same aspect ratio information.

Once you have defined the views to be rendered here, use the type-in area on the window to type in a directory path where you wish to save the image files as they are rendered. Select  if necessary to examine your disk's structure. When all is set, select the

 button to begin the batch process. Results will be displayed in the status area of this window as the views are rendered.

The Preferences Command

Select this command to open the Preferences window, in which you can view current memory usage and customize some default Renderize Live settings. The selections you make here are active until you exit the software. To save these selections to the EYES.CFG file so that they become the default options whenever you load the software, select the Save command on this window.

File Type Options

Select the default image file type. The file type you select here will appear as the selected file type whenever you save an image. Choices here are TGA, TIF, GIF, BMP, RAW, RAS and RGB.

Output Format Options

Bit/Pixel: Select the desired color depth at which image files are saved. The color depth you select here will appear as the default whenever you save an image file.

Compress: Enable or disable this option to determine whether a file will be compressed when saved. The Compress setting here determines the default Compress setting whenever you save an image file.

Query on Write: Enable or disable this option to determine whether or not to prompt for a pixel depth and compressionn setting whenever an image file is saved. When this option is enabled, image files are automatically saved according to the Bit/Pixel and Compress settings in this window.

Drawing Options

Up Axis: Select the desired nomenclature for the screen coordinate system. If Up Axis is set to **Y**, then the Y axis runs vertical on the screen, and the Z axis represents depth. If you select Up Axis as **Z**, then the Z axis runs vertical on the screen. and the Y axis represents depth. The selection you make here doesn't re-orient objects in your View: it simply establishes the naming convention for the screen coordinate system.

Max Polys: Choose the maximum number of polygons to re-draw for an object while that object is being positioned, rotated or scaled in the Project Designer viewport. When you manipulate an object in the Project Designer viewport, the polygons that make up that object must be redrawn on the screen during manipulation (unless you are moving objects with the bounding box option enabled) to update to the object's new position. The number that is entered here determines the number of polygons that are redrawn during object manipulation: the lower the number you enter here, the fewer polygons are redrawn, and thus the more quickly this particular function will perform. However, this speed will come at the expense of object detail. The object is represented with fewer polygons, and therefore less detail is visible.

Bounding Box: Choose the default position for the  button on the Command Bar. When this option is enabled, the bounding box toggle is enabled by default.

Lock Draw: Choose the default position for the  button on the Command Bar. When this option is enabled, the lock toggle is enabled by default.

Interface Options

Color Popup: Colors are defined from the Color Toolbox, located directly below the Command Bar. When this option is enabled, the Color Toolbox "floats" in a window above the Project Designer. To make the Color window appear, point to the Color Well for which you wish to define a color and press the middle mouse button (or hold down the Shift key and press the left mouse button).

3 Button Mouse: When this option is selected, the Renderize Live interface changes to take advantage of a 3 button mouse. Specifically, all icons on the Move, Select and Normals Toolboxes that control mouse functionality in the Project Designer viewport change into 3-button mouse definitions, consistent with previous versions of Renderize.

Floating Tools: When this option is selected, the entire Toolbox area of the Renderize Live interface

floats in a separate window.

Floating Resource: When this option is selected, the entire Resource Manager area of the Renderize Live interface floats in a separate window. This window displays all Resource Palettes simultaneously.

Message Prompts

The selection you make here determines in which situations Renderize Live will write messages to the screen. Messages appear whenever the execution of a command may be mitigated by external circumstances. For example, when you load a DXF file in which certain layers cannot be resolved, messages may appear describing the problems. There are four levels of message prompts: **All**, **Most**, **Some** and **None**.

Confirm Prompts

The selection you make here determines in which situations Renderize Live will ask you to confirm you command selections. Confirmations appear whenever you are about to do something that could result in lost work. For example, when you exit Renderize Live, you are asked to confirm your intentions. There are four levels of confirm prompts: **All**, **Most**, **Some** and **None**.

The Save Button

Save the current Preference settings to disk file. When you select this button, the current Renderize Live default Preferences are saved to a file called EYES.CFG located in the \EYES\CONFIG directory. Whenever you launch Renderize Live, the program reads the configuration information in the eyes.cfg file, and sets the Preferences accordingly.

The Help Menu

Access On-line Help, or learn about the current release of Renderize Live.

The Project File Buttons

These buttons are used to manage projects.

 The New Project Button clears any existing work from the Project Designer, so that you may begin fresh with a new project. This is the same as selecting the File, New command from the Menu Bar.

 The Open Project Button loads a project from disk file. This is the same as selecting the File, Open Project command from the Menu Bar.

 The Save Project Button saves the current file to disk. This is the same as selecting the File, Save Project button on the Menu Bar.

The Toolbox Buttons

These buttons are used to open the different Toolboxes, displayed below the Command Bar. Only one of these buttons can be selected at a given time, because only one Toolbox can be displayed at a time.

 Displays the Render Toolbox, from which renderings are generated.

 Displays the Move Toolbox, from which object, light and camera resources are positioned in the viewport.

 Displays the Select Toolbox, from which the relationships between materials and objects can be modified.

 Displays the Normals Toolbox, from which object normal directions are modified.

 Displays the Color Toolbox, from which colors are assigned for materials, lights and view backgrounds.

The Viewport Display Buttons

These buttons are used to set the viewport display. The viewport can display a single view angle, which is determined by selecting the **Camera**, **Top**, **Front** and **Side** buttons. Or it can display all four views simultaneously when the **4-Up** button is enabled.

The Front, Top and Side views display the entire view, as well as the camera defined for that view. This way you can see not only the spatial relationships among the lights and objects in the view, you can also see the orientation of the camera in regards to these resources. In addition to the camera position and rotation, the field of view of the camera (the focal length) is represented in the view as lines emanating from the camera lens.

 The **Camera** button displays the view from the camera's perspective. The position, rotation and focal length (or field of view) of the camera are taken into account when the Camera view is displayed. Camera view is the only rendered view. This view displays the resources as they are "composed" in the rendered view. The Front, Top and Side views are used to facilitate the positioning of resources in 3D space.

 The **Top** button displays a view from a position directly above the current camera location.

 The **Front** button displays a view from a position directly behind the camera, but it differs from the camera view in that it doesn't take into account distortion caused by camera lens properties, and this view includes the camera itself.

 The **Side** button displays a view from a position directly to the left of the current camera location.

 The **4-Up** button displays all four views described above. The camera view is located in the lower-left quadrant of the viewport, followed by the top, side and front views as you move in a clockwise direction. Note that this button is only available when the Move Toolbox is opened: it is not a relevant selection in any other cases.

The Viewport Zoom Buttons

These buttons are used to zoom the viewport display in or out. When orienting objects, lights or the camera in the Project Designer viewport, it may be desirable to zoom in on a particular area of the view in order to work more accurately. Renderize Live supports several zoom methods. You can perform a zoom on any viewport display, and that display will remain zoomed until you reset it. If you perform a zoom from the Camera viewport display, the view will render in its zoomed state.

 The **Zoom Box** button allows you to zoom into a specific area of the viewport, defined by drawing a rectangular box. Select this button, then move the pointer into the viewport and drag the left mouse button to define a zoom box. The viewport display will be zoomed to this area. If after pressing this button you perform any other action besides defining a bounding box in the viewport, the zooming operation will be canceled.

 The **Zoom In** button incrementally zooms in the current viewport display. Each time this button is pressed, the viewport display zooms in another notch.

 The **Zoom Out** button incrementally zooms out the viewport display. Each time this button is pressed, the current view zooms out another notch.

 The **Zoom Reset** button undoes any zooming commands that were previously executed. This command resets the viewport to its default zoom factor.

The Wire/Render Toggle

 The **Wire/Render Display** button determines whether the viewport is currently displaying your view in wireframe or rendered mode. When this button is depressed, the viewport displays in wireframe mode. When this button is released, it displays the most recently generated rendering. The position of this button updates automatically depending on what Toolbox you are in (for example, when you change the Move, Select or Normals Toolboxes this button automatically toggles to the wireframe mode), but sometimes you may wish to change the display manually.

The Wireframe Update Buttons

The speed at which objects can be manipulated in the Project Designer viewport depends in part on the complexity of the object being moved. An object that is made up of many polygons is going to move more sluggishly than an object that is made up of fewer polygons, because the additional polygons will take more time to redraw to the screen. These buttons allow you to improve response time by controlling the wireframe redraw process.

 The **Bounding Box** toggle allows you to manipulate objects as bounding boxes. When this toggle is selected, objects are displayed as bounding boxes during manipulation. Whenever an object is positioned, rotated or scaled in the viewport, a bounding box appears in place of the object: this bounding box can be manipulated more quickly than the actual object wireframe because the number of lines that need to be redrawn is greatly diminished. If this button is deselected, the object wireframe itself is redrawn during manipulation according to the Maximum Polygon setting selected on the Preferences window: the lower this number, the fewer polygons are redrawn during manipulation, thereby speeding the screen redraw process. The default position of this button can be set in the Preferences window.

 The **Lock Draw** toggle determines if a wireframe is redrawn in its entirety after it has been manipulated in the viewport. If this button is enabled, the wireframes are not redrawn after manipulation. For example, if they were manipulated in a bounding box mode, they will remain as bounding boxes after you release the mouse button. If this button is disabled, wireframes are redrawn in their entirety after manipulation in the viewport. The default position of this button can be set in the Preferences window.

The Frontface and Backface Buttons

These buttons determine which faces of an object are displayed in the viewport. One or both of these buttons may be selected at any given time.

When the  button is selected and the  button is deselected, only those polygons that are facing the camera will be visible in the viewport: these are the faces that will be rendered.

When the  and  buttons are both selected, all polygons that make up an object are displayed, whether or not these polygons are facing the camera.

When the  button is deselected and the  button is selected, only those polygons facing away from the camera are displayed in the viewport.

Usually, you will want to work with the  button selected and the  button deselected. However, in cases where you need to pick specific polygons for editing in the Select or Normals Toolboxes, it can be beneficial to select the other display alternatives, because changes executed in the Select and Normals Toolboxes only effect those polygons that are displayed in the viewport at the time a command is executed.

The Project Designer Viewport

The Project Designer viewport is the main viewport for the display of project resources in a view. It is scalable in size from a maximum of 640x480 pixels to a minimum of 256x192 pixels. As you resize the viewport the resources displayed in the viewport are resized as well.

The viewport display can be toggled from the camera view (the view that is rendered) and 3 orthographic views which show not only the location of objects, but also that of lights and the camera. In addition, when the Move Toolbox is displayed, the viewport can be divided into quadrants so that all four views are displayed simultaneously.

The view that is displayed in the viewport is referred to as the "current" view, because it is the view that will be rendered. To make a view current, drag the desired view resource icon and drop it into the View Well on the Resource Manager, or drop it directly over the viewport itself. All the object and light resources that are in the current view now have their names highlighted in yellow.

The viewport has two display modes: wireframe and rendered. You can toggle among these display modes using the  button on the Command Bar. However, Renderize Live changes display modes automatically depending on what you are doing, so you usually shouldn't need to change display modes manually. For example, when you drop a resource into the Move Well (to activate that resource for spatial manipulation in the viewport), the display mode will automatically change to wireframe.

The View Well

The View Well is the "doorway" to the Project Designer viewport. Use this Well to combine resources into a view, and display that view in the viewport. When a view resource is dropped into this Well, it becomes the current project view: any objects and lights in this view are displayed in the viewport as wireframe models. The way the view appears in the viewport is a factor of the camera focal length that is set for the view.

In addition to view resources, object, light and image resources can be dropped into the View Well, but only if a view already exists in the Well. When you drop an object or light resource into the View Well after a view has been dropped in, that resource is added to the view. When you drop an image resource into the View Well, it becomes the view background.

The Move Well

The Move Well is used to reposition resources in 3D space. The resource that is dropped into this Well can be re-oriented independently in the current view, assuming that it exists in that view.

Light, object and view resources can be repositioned in 3D space. When one of these resources is dropped into the Move Well, the viewport display changes to wireframe mode and the Move Toolbox is displayed so that the current resource can be manipulated in 3D space. In addition, the wireframe of the resource that is being repositioned is displayed in yellow. Objects and cameras can be manipulated in any of the viewport displays, but lights can only be manipulated in one of the orthographic displays (Side, Front or Top).

In addition, when an object is displayed in the Move Well, you can drop a material resource over the object in that Well to assign that material to the object.

The Edit Well

The Edit Well is the "doorway" to the Resource Designer Windows. There are different Resource Designer windows for each of the five project resources: views, objects, lights, materials and images. There is also an Animation Designer window used to define animations; however, this designer Window can only be accessed by selection from the Edit pop-down command on the Menu Bar.

When you drop a resource into the Edit Well, the Resource Designer for that resource type is opened, and that resource is dropped into the window for manipulation. For example, if you drop an object resource in the Edit Well, the Object Designer appears, loaded with the object that you dropped into the Well.

In addition to opening Resource Designer windows by dropping the icons into the Edit Well, you can also select on the desired resource with the right mouse button and choose the Edit option from the icon menu that appears.

The Resource Palettes

The Resource Palettes list the resources that are available for the current project. A separate Resource Palette exists for each resource type, and the Resource Palette that is currently displayed is determined by the resource button that is pressed on the Resource Manager:

 This button displays the View Resource Palette;
 This button displays the Object Resource Palette;
 This button displays the Light Resource Palette;
 This button displays the Material Resource Palette;
 This button displays the Image Resource Palette.

Each resource is displayed as a "postage stamp" icon in its respective Resource Palette. Each resource icon visually displays the attributes of the resource it represents. If there are more resources than can be displayed in one of the Resource Palettes, the slider bars on the left of each Resource Palette may be moved to scroll the icons and show a different set of resources.

A button above each Resource Palette is marked with the name of that resource type. This button is used to enable or disable resources globally.

To employ or process a resource, the resource icon may be dragged and dropped into one of the Command Wells (described above), or you can point to the desired resource icon and press the right mouse button to display a menu of options.

Rendering Views: The Render Toolbox

The Render Toolbox controls the functions necessary to perform renderings, both into the Project Designer viewport and directly to high resolution file on disk. The Toolbox contains three distinct areas: Render to Screen, Options, and Render to File.

The Render Toolbox is displayed by pressing the  button on the Command Bar, or by selection from the Toolbox pop-down on the Menu Bar. The Render Toolbox also appears automatically as soon as you load a view into the View Well.

The Render to Screen Buttons

Normally, views are rendered in the viewport until they appear as desired, and only then are they rendered to disk file. This is because rendering to the viewport is faster and more conducive to iterative work than rendering to disk.

Remember that the viewport display may only be 8 bits (256 colors), but that the image is output to 24 bits (16.7 million colors) when it is rendered to disk file. In addition, the maximum viewport size is only 640x480 pixels, but the rendered file can be output to any resolution.

High Quality Renderings: The Render Image Button

This button renders the current view into the viewport, using the same high quality rendering method that will be used when the final image is rendered to disk. The resolution quality of the rendered view is determined by the **Test** pop-down menu, described below. In addition to resolution quality, the way in which a rendering appears depends on the Options that are enabled on the Render Toolbox; these options are also discussed below.

The resolution at which the view is rendered depends on the size of the viewport. The default viewport size is its maximum size, 640x480 pixels. Reducing the size of the viewport will speed rendering time, but at the expense of quality.

After an image is rendered into the viewport, the button can be used to "quick-save" the rendering as an image resource. This command is described in full below.

Setting the Viewport Render Resolution: The Test Pop-Down Menu

The **Test** pop-down determines the resolution quality of the rendering, where "1" is full quality. The higher the value set here, the clearer the rendered view will appear, but the longer it will take to render that view.

Select on this pop-down, and a list of rendering quality choices appears. Highlight the desired value on the list and release the mouse button to select this value.

Rendering a Part of the View: The Render Area Button

The Render Area button performs a high quality rendering at "Test:1" in a specified area in the viewport. Use this command to "spot-render" those areas of the view that have been changed; it is faster than rerendering the entire view. If no area has been defined in the viewport, this command will not work.

To define an area to render, first make sure that the Render Toolbox is displayed. Move the pointer into the viewport, then click and hold down the left mouse button at a point that represents a corner of the area that you wish to render. Now as you drag the pointer, a rectangle expands with your cursor movements. When the desired area is enclosed by the rectangle, release the left mouse button to complete the area definition and select this command to render the defined area.

The area you define is remembered and used each time you select the Render Area command, until you define a new area.

Iterative Rendering: The Render Quick Button

This button performs a "quick-render" for the current view. The rendered image is of lower quality, but the rendering speed is a bit faster. Use this command to perform "quick and dirty" renderings when you are involved in iterative processes such as color studies. When a quick-rendered image approaches your goal, use the button to perform a viewport rendering that more accurately approximates the quality you can expect of the image when it is rendered to disk.

The speed that this option offers comes at a price: a quick-rendered image does not display shadows, bump maps or reflection maps. Spot lights and attenuated lights are treated as normal point lights. Anti-aliasing, texture mipping and texture sampling are disabled. In addition, texture maps may not appear as expected, depending on the position of objects in relation to the camera.

Saving Viewport Renderings: The Save Button

Press this button to save the rendering that appears in the viewport as an image resource. This

provides a convenient method for saving iterative renderings of a view for comparison purposes, such as during light or color studies.

When you press this button, an image resource is created out of the current contents of the viewport, and given the name "Test1". This image now appears as a postage stamp icon in the Image Resource Palette on the Resource Manager. If an image resource named "Test1" already exists, this command will automatically name the new image "Test2".

Note that these images are not automatically saved to disk. If you wish to save a test image to disk file, drop that image into the Image Designer and select the Save Image command from the File pop-down menu. In any case, if you attempt to exit Renderize Live without saving these images to disk, a warning message will appear.

The Rendering Options Buttons

The rendering options affect the quality of the rendered view in different and significant ways. The position of these buttons are taken into account during renderings generated with the and commands.

Each of these buttons affects rendering speed, and therefore should be used selectively. For example, if you are rendering to review texture mapping changes, you may not need to cast shadows. If you don't need to see your texture maps at their highest quality, you may not need to Mip and Sample your textures.

The Compute Shadows Button

Globally toggles shadows off and on. When this button is disabled, no shadows will appear when the model is rendered, even if shadows are enabled for lights (in the Light Designer) and objects (in the Object Designer). To compute shadows into the rendered view, this button must be enabled.

The Anti-Alias Button

Toggles anti-aliasing off and on. Anti-aliasing is the graduation of color between contrasting areas used to avoid the "stairstep" effect of angled lines in a digital image. This toggle allows test renderings to be made without the time-consuming computation of anti-aliases.

When you select Anti-Alias, a related button appears.

The Mip Textures Button

This button improves the texture quality of a rendered texture, but does so at the expense of rendering speed and memory usage. When this button is enabled, the system generates additional texture maps for each of the image textures when the view is rendered. These additional maps are used to create a more accurate representation of a texture as that texture is mapped onto an object. Specifically, if the texture size is reduced, either through the scaling of the texture (in the Object Designer), or because the texture recedes from the camera in a rendered image, enabling this button may improve the appearance of that texture.

Note: Mip Textures must be enabled for a **Blur** command (defined in the Object Designer window) to have an effect.

The Sample Textures Button

This button improves the resolution quality of a rendered texture, but does so at the expense of rendering speed. When this button is enabled, texture maps will appear less pixelated as their scale increases.

The Refine Textures Button

Select this button to enable anti-aliasing of the image textures as they are mapped onto objects. This option maximizes the quality of a texture during very high resolution renderings, but does so at the expense of system speed.

The Render To File Commands

Generally, a view is rendered to file only after that view appears correctly in a viewport rendering. This is because a view rendered to disk file is often rendered in high resolution, which is a time-consuming process.

The resolution at which the view is rendered to disk is set using the **X Res** and **Y Res** type-ins located in the Render To File area of the Render Toolbox. The aspect ratio of the rendered view is determined using the **Aspect** pop-down menu, located directly above the X Res and Y Res type-ins. These commands are described below.

Final renderings are generated in full color (24 bit); the color depth at which the image is saved depends on the file type and color depth selected in the File Browser. These file types are discussed in full in the Image Designer Window chapter.

The resolution at which you render a view to file should depend on the kind of hard copy output device that you will use to print the resulting image. The higher the resolution, the slower the rendering, so it makes sense to choose an appropriate final output resolution. For example, if your hard copy output device is a full page thermal dye-sublimation printer with a maximum addressable resolution of 1280x1024 dots, there would be no reason to render to a resolution higher than 1280x1024 pixels: the extra information would not improve the quality of the hard copy output. However, if the hard copy output device is a 35mm film recorder, which is capable of up to 4000 (or even 8000) lines of resolution, then you'd definitely want to increase the resolution for the final render (2048x1366 is a recommended output resolution for 35mm slide).

When a final render is executed, an image file is created and sent to disk. The way a view is rendered here (displaying shadows, anti-aliasing, etc), and the speed with which the view is rendered, is determined by the **Rendering Options** buttons.

The Render Final Button

When you select this button, a File Browser appears, and you can define a file type, color depth, path and filename for the final rendering that you are about to perform. The view can be saved out to one of a number of image file formats.

The Aspect Pop-Down Menu

The **Aspect** pop-down menu is used to determine the aspect ratio of the image that is rendered out to disk file. The selection in this menu affects the numbers that are entered into the **X Res** and **Y Res** type-ins.

The default selection for aspect ratio is "4x3", which is the same aspect ratio as the viewport on the Project Designer. If the aspect ratio is set to anything other than "4x3", the size of the viewport changes to represent the selected aspect ratio. Using the slider bars located directly below or directly to the left of the viewport (depending on the selected aspect ratio), you can position the rectangle over the desired area of the view. The area that is enclosed in the rectangle is the area of the current view that will be rendered to file. In other words, changing the aspect ratio may force you to "crop" your view to fit the desired aspect ratio in the rendered image.

The X Res and Y Res Type-ins

These type-ins allow you to select the output resolution of the file that contains the final-rendered view. The values here determine the number of pixels horizontally (X Res) and vertically (Y Res).

If "Any" is the aspect ratio that was selected from the Final Aspect pop-down, then the X Res and Y Res of the rendered image can be set to any value. If one of the other aspect ratios is chosen, then typing in the desired resolution for X Res will automatically set the correct Y Res value according to the selected aspect ratio, and vice versa. Remember that the higher the resolution, the slower the view is rendered, and the more disk space required for the image. Doubling output resolution effectively quadruples rendering time and required disk space. Although there is no maximum resolution, the largest image you render will be a factor of your system memory, disk storage space

and time.

Orienting Project Resources in a View: The Move Toolbox

The Move Toolbox provides for orientation of camera, object and light resources in the viewport. The Move Toolbox is displayed by pressing the button on the Command Bar, or by selection from the Toolbox pop-down on the Menu Bar. The Move Toolbox also appears automatically as soon as you drop a view, object, light or animation resource into the Move Well.

The specific movement and rotation buttons that appear on the Move Toolbox depend on the resource that is currently loaded in the Move Well. Lights, objects, views, and animations each have a unique set of movement and rotation buttons.

Note that the Move Toolbox can be configured in the Preferences window so that instead of displaying a set of buttons that determine the functionality of the left mouse button, you can display a Mouse Command Bar, a pop-down menu that allows you to select a set of commands for the left, middle and right mouse buttons on a 3-button mouse.

The Center Position Button

Press this button to center resources in the camera view. If the current resource in the Move Well is an object, that object is repositioned so that it now appears in the camera view. If the current resource in the Move Well is a view, pressing this button repositions the camera so that all of the geometry in the view appears within the camera's field of view. If the current resource in the Move Well is a light, that light is repositioned at the camera.This button is very useful if you can't locate an object or light in 3D space.

The Save Position Button

Press this button to save the current position, rotation and scale information for the resource that is currently displayed in the Move Well. If after saving the resource's position you re-orient that resource and wish to return it to its previous position, you can do so using the Reset button, described below.

The Reset Position Button

Press this button to re-orient the current resource to the position, rotation and scale settings that were most recently saved using the command above.

Mouse Buttons for Light Manipulation

If a light resource is currently displayed in the Move Well, the available mouse button settings are as follows.

The following commands, displayed in the Light Location area, are used to position the light source.

 Move the light vertically and horizontally in the viewport.
 Move the light horizontally in the viewport.
 Move the light vertically in the viewport.
 Move the light in and out in the viewport.
 Move the light toward and away from the light's target.

The following commands, displayed in the Target Location area, are used to position the light's target. This is important with directed lights such as a spotlight.

 Target the light at the current pointer positionin the viewport.
 Move the light's target horizontally in the viewport.
 Move the light's target vertically in the viewport.
 Move the light's target in and out in the viewport.

The following commands, displayed in the Attributes area, control not the position of the light, but the attributes of spot and attenuated lights.

 Select this button, then select a polygon on an object in the viewport, and the light will be repositioned such that when the view is rendered a spectral highlight will appear at that location (assuming that the object has a shiny material assigned to it).
 Reposition the "On" marker for an attenuated light.
 Reposition the "Off" marker for an attenuated light. Always be sure to define the "On" marker position first, as this influences the "Off" marker position.
 Change the Hot and Soft angles for a spotlight.

Mouse Buttons for Object Manipulation

If an object resource is currently displayed in the Move Well, the available mouse button settings are as follows.

The following commands, in the Screen Space area, are used to move and rotate objects along axes as defined by the viewport.

 Move the object vertically and horizontally in the viewport.
 Move the object horizontally in the viewport.
 Move the object vertically in the viewport.
 Move the object in and out in the viewport.
 Rotate the object vertically and horizontally in the viewport.
 Rotate the object around a horizontal axis in the viewport.
 Rotate the object around a vertical axis in the viewport.
 Roll the object in the viewport.

These buttons, in the Object Space area, are used to manipulate an object according to that objects own local coordinate system.

 Move the object along its X axis.
 Move the object along its Y axis.
 Move the object along its Z axis.
 Rotate the object around its X axis.
 Rotate the object around its Y axis
 Rotate the object around its Z axis.

The following command, in the Scale area, is used to resize the object in the viewport.

 Change the scale of the current object.

Mouse Buttons for Camera Manipulation

If a view resource is currently displayed in the Move Well, the available mouse button settings to reposition the camera are as follows.

These buttons, in the Move/Rotate Camera area, determine the movement and rotation of the camera independently.

 Move the camera vertically and horizontally in the viewport.
 Move the camera horizontally in the viewport.
 Move the camera vertically in the viewport.
 Move the camera in and out in the viewport.
 Pan the camera up/down and left/right.
 Pan the camera left/right.
 Pan the camera up/down.
 Roll the camera.

These buttons, in the Move Around Target area, position and rotate the camera around a selected target point.

 Select a target point.
 Rotate the camera freely around the target point.
 Rotate to camera-left and camera-right around the target point.
 Rotate to camera-up and camera-down around the target point.

This button, in the Lens area, controls the lens optics for the camera.

 Change the focal length of the camera in the viewport.

Mouse Buttons for Animation Manipulation

If an animation resource is dropped into the View Well, and also dropped into the Move Well, then you can manipulate the camera animation path in the viewport, and even preview an animation in wireframe mode.

 The Step Back button moves the camera position one step back in the animation path each time you select in the viewport.

 The Step Forward button moves the camera one step forward in the animation path each time you select in the viewport.

 The Fast Forward button moves the camera forward or backward in the animation path as you drag the pointer in the viewport.

 The Play Animation button plays the animation from beginning to end.

 The Select Keyframe button allows you to move among keyframes in the animation path.

 The Move Keyframe Button moves the current keyframe position. You can also drop a keyframe into the Move Well to move it using complete camera movement functionality.

 The Target Keyframe button changes the target of the current keyframe.

 The New Keyframe button inserts a keyframe at a selected point in the animation path. Select this button, then select a point in the animation path where a new keyframe should be inserted.

 The Full Tangent button changes the curve of the animation areound both sides of a selected keyframe.

 The Half Tangent button changes the curve of the animation path around one side of a selected keyframe.

The ,

 and

 buttons are used to change the animation path. However, they only affect those frames in the animation path that are highlighted on the Keyframe List of the Animation Designer window.

Defining Material-to-Object Relationships: The Select Toolbox

The manner in which materials are assigned to an object when it is loaded into Renderize Live depends on the kind of object that was loaded, and the way that object was loaded. In some cases an object has only one material associated with it. In other cases a single object can have many different materials associated with it.

The Select Toolbox enables you to view and change the object-to-material relationships. The commands in this Toolbox are used to see where on an object each material is assigned, and to change those definitions, break an object up into different material areas, or assign a single material to what used to be two separate material areas.

Note that an object that has multiple material assignments can be Split into multiple objects according to those material assignments.

Press the  button on the Command Bar to open the Select Toolbox. The commands in this Toolbox allow you to determine which material you are working with, then to define the objects or polygons that you wish to assign the material to. You can even move objects or the camera to get a better perspective on the polygons that you wish to pick.

When the Select Toolbox is displayed, the words TEMP MODE appear at the bottom of the Project Designer viewport. This means that any changes you make to the position of objects in the viewport will not affect their position for rendering purposes. This enables you to re-position objects and the camera as necessary to view and edit the material assignments.

Viewing Material-to-Object Relationships: The Materials Area

Picking Polygons vs Repositioning Objects: The Mode Area

Picking Polygons to Add and Remove Polygons from a Material Definition

Selecting Front-facing and Back-facing Polygons.

Applying Your Changes

Changing the Viewport Display During the Select Process

Viewing Material-to-Object Relationships: The Materials Area

Use the Materials area on the left side of the Toolbox to select the material that you wish to work with. You can select a material by dropping a material resource into the Current Resource Well on the Select Toolbox, or by selecting the material name from the pop-down list in the Materials area.

When you select a material, all of the polygons to which that material is assigned are highlighted with yellow polygons and green facets. This highlighted area indicates the parts of the object that will take the current material definition during rendering.

If you wish to create a new material while in the Select Toolbox, you can do so by typing in a new material name in the pop-down list and pressing the  button: a new material by that name is created, and loaded into the Current Material Well.

Picking Polygons vs Repositioning Objects: The Mode Area

The Mode area of the Toolbox determines the function of the mouse in the viewport: picking polygons, or moving objects.

 Displays the Polygons Selection commands on the right side of the Toolbox.

 Displays the Viewport Control commands on the right side of the Toolbox.

Picking Polygons to Add and Remove Polygons from a Material Definition

To change a material area definition, first highlight the name of the material you want to change in the Materials area. The polygons associated with that material are now highlighted in the viewport. Now you can select polygons to be added or subtracted from the current material definition. To do so, use the Polygon Selection buttons on the right side of the Toolbox. Select the desired buttons as described below, then draw a bounding box around the polygons whose material assignment you wish to alter. After you have selected the desired polygons, you must select the button on the Change area of the Toolbox to effect those changes.

Before picking polygons, select the Mode button to display the Polygon Selection commands on the Toolbox. Then, choose whether you wish to add or subtract polygons from the current material:

Clears all polygons from the current material definition.

Add polygons to the current material.

Remove polygons from the current material.

Then choose how polygons are to be selected in the bounding box:

Select all polygons that are surrounded or clipped by the bounding box.

Select only those polygons that are completely surrounded by the bounding box.

Once you have selected the desired buttons on the Polygons Selection area of the Toolbox, move the pointer into the viewport and depress the left mouse button to drag a bounding box. The polygons defined by the bounding box (either wholly contained in the area, or partially contained in the area, depending on whether the or

button is enabled) will be added to or removed from the current material definition, depending whether the

or

button is enabled.

Another way to add to or remove polygons from a material definition is to point to the face that you wish to remove or include, then select and immediately release the left mouse button. If the face that you selected on was previously part of the material, it is now removed; if it wasn't part of the material, now it is.

After executing your changes, you must select the on the Change area of the Toolbox, to execute the change.

Each polygon and facet in an object can only belong to one material definition. Therefore, including a polygon in one material definition means removing it from the definition with which it was previously associated.

Selecting Front-facing and Back-facing Polygons.

What you see in the viewport is what you are selecting. If the  and  buttons are both enabled on the Command Bar, you are selecting backfacing polygons and frontfacing ones.

If you remove polygons from a material definition and Apply the change, these materials are assigned to the "default" material definition until such time as they are added to a different material definition.

Applying Your Changes

None of your work assigning polygons to materials is recorded until you press the  button in the Change area of the Select Toolbox to apply your changes. When you select this button, the current matieral will be assigned to the polygons that are highlighted in the viewport.

Changing the Viewport Display During the Select Process

If you are working on a large or sophisticated wireframe model, it may not be easy to isolate polygons for selection. Therefore, Renderize Live gives you the ability to move and rotate objects or the camera so that the desired polygons can be isolated in the viewport display.

Note that the words TEMP MODE appear in the viewport at all times when the Select Toolbox is enabled. This means that any changes that are made to the viewport display (moving, rotating or zooming in the viewport display) are only temporary. As soon as you exit the Select Toolbox the display will return to the state it was in before you entered it.

Before you move an object or the camera, the desired resource must be loaded into the Move Well on the Resource Manager. Next, you must select the  Mode button on the Select Toolbox to display the Viewport Control commands.

To move a resource in the viewport, first select the desired Viewport Control command, the move the pointer into the viewport and drag the left mouse button to manipulate the resource. The button definitions here are the same as described for object and camera movement.

In addition to moving resources, it can be useful to zoom the viewport display in order to more easily distinguish individual polygons for selection. The zooming buttons on the Command Bar can be used for this.

Finally, note that the polygons selection process is greatly facilitated as the number of objects in the viewport display is reduced. Therefore, use of the ability to turn objects off so that only those objects whose material definitions you wish to edit are displayed during the selection process.

Viewing and Changing Object Normals: The Normals Toolbox

The Normals Toolbox is used to view and change polygon normal directions as needed. Normals can be viewed and changed globally for all the polygons in the current view, or by material, or on a polygon-by-polygon basis. Select the  button on the Command Bar to display the Normals Toolbox. Use the commands in this Toolbox to pick the polygons whose normal directions you wish to view or change.

What is a Normal?

A polygon is a planer surface defined by a series of lines. This polygon faces in only one direction. Unlike planes in the real world, which are two-sided, a polygon only has a "front" side: when viewed from behind, the polygon is not visible. The "Normal" or "Polynormal" can be visualized as a line emanating on a perpendicular from the front face of the polygon: it is a line that indicates the direction in which the polygon is facing.

Polygons are referred to as being front-facing or back-facing. If the normal is directed toward the camera, the polygon for which it designates direction is front-facing. Back-facing polygons are those whose normals are directed away from the camera.

Unless you specify otherwise, Renderize Live only renders the front faces of polygons. It is possible to render the backfaces of polygons as well, but backface rendering increases rendering time, and doesn't always compensate for texture mapping, illumination and other effects that may appear incorrectly on a backfaced polygon.

The direction of the normal is established by the modeler. Because normal directions are unimportant in modeling, most modeling applications devote little or no time explaining how the normal will be aligned and how the normal direction is dependent on the technique used to create the model. For instance, if you create a piece of geometry using a surface of revolution command, that geometry's normals may be rightside-out or inside-out depending on the direction in which you executed the revolution.

Why is the direction of the normal important?

Unlike modeling, in which the direction of a polygon's normal is unimportant, in rendering the direction of the normal is of extreme importance. The direction of the normal is the clue the rendering engine uses to choose which surface to render and which to ignore. If a polynormal is reversed (its normal is pointing in the wrong direction) it may render incorrectly.

Note that a polygon may be backfacing, but still be correct. Remember that a backfacing polygon is pointing away from the camera. In fact, at any given time up to about 50% of the polygons in your model may be backfacing. As long as these are the polygons on the "backside" of the object (when viewed from the camera), then there is no problem. Backfaced polygons become an issue only when a polygon that *should* be facing the camera is actually facing away from it.

If you are working with a model that has reversed polynormals, you may notice that those polygons appear as "holes" when rendered. You can fix this simply by loading the Object in question into the Object Designer and selecting the Render Backface button so that both sides of the polygon will be recognized and rendered. While this method causes backfaced polygons to be rendered, it has several drawbacks. First, it increases rendering time. Second, shiny and reflective illumination characteristics may appear incorrect, as if the light is coming from a different direction. And third, texture mapping definitions may not appear as you would expect.

Picking Polygons vs Repositioning Objects: The Mode Area

The Mode area of the Toolbox determines the function of the mouse in the viewport: picking polygons, or moving objects.

 Displays the Polygons Selection commands on the right side of the Toolbox.

 Displays the Viewport Control commands on the right side of the Toolbox.

Picking Polygons for Normals Editing

You can choose the polygons whose normal directions you wish to view or change either globally, by material, or on a polygon-by-polygon basis. Before picking polygons, select the mode button to display the Polygon Selection commands on the Toolbox.

These commands allow you to select polygons either globally or by material.

Selects all of the polygons in the current view.

Deselects all of the polygons in the current view.

Selects all the polygons assigned to the material that is currently displayed in the Materials area of the Normals Toolbox. You can change the material that appears here by dropping another material resource into the Current Resource Well on the Normals Toolbox, or by selecting the material name from the pop-down list in the Materials area.

The commands described below allow you to select polygons on a selective basis. First, choose the desired buttons as described below, then draw a bounding box around the polygons whose normal directions you wish to alter.

To determine whether polygons are being selected or deselected:

Add polygons to the current material.

Remove polygons from the current material.

To determine the nature of the bounding box:

Select all polygons that are surrounded or clipped by the bounding box.

Select only those polygons that are completely surrounded by the bounding box.

Once you have selected the desired buttons on the Polygons Selection area of the Toolbox, move the pointer into the viewport and depress the left mouse button to drag a bounding box: the polygons in this area (either wholly contained in the area, or partially contained in the area, depending on whether the or

button is enabled) will be added to or removed from the current material definition, depending whether the

or

button is enabled.

Another way to add to or remove from a material definition is to point to the face that you wish to remove or include, then select and immediately release the left mouse button: if you selected on was previously part of the material, it is now removed; if it wasn't part of the material, now it is.

Selecting Front Facing and Backfacing Polygons.

What you see in the viewport is what you are selecting. If the  and  buttons are both enabled on the Command Bar, you are selecting back-facing polygons in addition to front-facing ones.

Viewing Polygon Normal Directions

After you have selected the desired polygons, you can view their polynormal direction by selecting the  button on the Polygon Selection area of the Normals Toolbox. A colored line emanating from the center of each polygon will indicate that polygons normal orientation. **Red** lines indicate normals that are facing the camera; **blue** lines indicate normals facing away from the camera. If only the  button is enabled on the Command Bar, then only the polygons facing the camera (those with red normal lines) will be displayed; if only the  button is enabled, only the polygons facing away from the camera (those with blue normal lines) will be displayed; if both the  and  buttons are enabled on the Command Bar, all selected polygons display their normal direction.

Changing Normal Directions

After selecting the desired polygons, there are two commands that you can use to change normal directions.

 This button reverses the normal direction of all selected polygons. Polygons that were back-facing are now front-facing: in addition, polygons that were front-facing are now back-facing. This command is the surest way of reversing the direction of a specific normal.

 This button analyzes all of the selected polygons and reverses the normals of only those polygons that it believes are incorrect. This command is useful when an object is mostly correct with only a few backfacing polygons. However, this is a "best guess" command, and it may not necessarily choose the correct polynormals to reverse. Sometimes, selecting this buttons two times in a row can achieve the desired changes.

Changing the Viewport Display During the Polygon Selection Process

If you are working on a large or sophisticated wireframe model, it may not be easy to isolate polygons for selection. Therefore, Renderize Live gives you the ability to move or rotate objects or the camera so that the desired polygons can be isolated in the viewport display.

Note that the words TEMP MODE appear in the viewport at all times when the Normals Toolbox is enabled. This means that any changes that are made to the viewport display (moving, rotating or zooming in the viewport display) are only temporary. As soon as you exit the Normals Toolbox the display will return to the state it was in before you entered it.

Before you move an object or the camera, the desired resource must be loaded into the Move Well on the Resource Manager. Next, you must select the  Mode button on the Normals Toolbox to display the Viewport Control commands.

To move a resource in the viewport, first select the desired Viewport Control command, then move the pointer into the viewport and drag the left mouse button to manipulate the resource. The button definitions here are the same as described for object and camera movement.

In addition to moving resources, it can be useful to zoom the viewport display in order to more easily distinguish individual polygons for selection. The zooming buttons on the Command Bar can be used for this.

Finally, note that the polygons selection process is greatly facilitated as the number of objects in the viewport display is reduced. Therefore, use the ability to turn objects off so that only those objects whose material definitions you wish to edit are displayed during the selection process.

Defining Colors: The Color Toolbox

There are many cases in which a color needs to be defined. Renderize Live allows for the definition of a background color for the view, a fog color, a light color, and colors for the matte, shiny and reflect properties of a material. In all cases, colors are defined using the same set of commands.

To access the Color Toolbox select the  button on the Command Bar. The Color Toolbox is also opened automatically whenever you select in a Color Well with the left mouse button. When you do this, the Color Well is dynamically linked to the Color Toolbox so that any changes made in the Color Toolbox are immediately reflected in the Color Well that you selected.

The Color Toolbox can also be configured to appear as an independent window that "floats" above the Project Designer, thereby reducing the need to toggle between Toolboxes. To make the Color Command Deck an independent window, enable the Free Color Window button in the Preferences Window.
The Color Well on the left side of the Color Toolbox displays the "current" color definition. The central area of the Toolbox displays colors. Selecting in this area changes the current color definition. The way a color definition is changed depends on the selected color mode, and there are three modes: rgb, hsv and image. Finally, there is a black color box and a white color box, so that these two colors can be selected quickly.

The numeric values of the current color are displayed in both rgb and hsv at the bottom of the Color Toolbox.

Defining a Color in RGB Mode

RGB, which stands for Red-Green-Blue, is an additive color method. Using varying amounts of red, green and blue, any color may be produced.

The central portion of the Toolbox displays three color bars, one each for red, green and blue. By selecting on the slider bar and moving it left or right, you are subtracting or adding a color to the color definition. The changes you make are reflected dynamically in the sample color box on the left side of the command area.

Defining a Color in HSV Mode

HSV, which stands for Hue-Saturation-Value, is an alternative method for defining a color. Hue defines the shade or color of the equation. Saturation defines the amount, or purity, of the color. Value defines the brightness of the color from black, no brightness, to white, 100% brightness.

The central portion of the Toolbox displays three color bars, one each for hue, saturation and value. By selecting on the slider bar and moving it left or right, you are decreasing or increasing the hue, saturation or value: the changes you make are reflected dynamically in the sample color box on the left side of the command area.

Defining a Color in Image Mode

In this mode, six scrollable images of the color space are available from which to pick colors. Scroll bars are available to look at additional areas of the color maps.

Renderize Live Screen Display

Renderize Live appears as a series of windows on your color computer monitor. When you first launch the software, the main window, the Project Designer window, appears. All Renderize Live Resource Designer windows are accessed from this main window.

Your monitor may only display 256 colors at a time (8 bits). However, remember that Renderize Live renders color images in 24 bits, or 16.7 million colors. Therefore, what you see on the screen during rendering may only be a pale representation of the color depth of the final image that is rendered to disk.

Renderize Live Project Resources

Projects are made up of a variety of resources: resource types include **views**, **objects**, **lights**, **materials** and **images**. It is through the manipulation of these resources, and their selective combination, that "scenes" are defined for rendering.

All of the resources available in Renderize Live at one time are displayed as "postage stamp" **icons** in **Resource Palettes** on the Project Designer window. Each of these resources is manipulated in a separate **Resource Designer** window: an Object Designer window is used to define and manipulate objects, a View Designer window is used to define views, and so on.

Resource Designer Windows

Renderize Live is comprised of six separate Resource Designer windows. The specific commands in each of these windows is described in the Reference Manual. The use of these windows in general is described in a section below titled "Using and Controlling the Resource Designer Windows".

The **Project Designer**, the "main" window of Renderize Live, is used to define the relationships and orientations of the different resources in order to combine them into a view and render that view.

The **View Designer** is used to define views. Views are made up of object and light resources, as well as a camera definition and other effects. The rendering of views is the purpose of Renderize Live.

The **Object Designer** is used to define the rendering properties of objects. An object is a group of polygon entities defined as a **wireframe** model using a modeling software package such as AutoCAD. An object is included into a view for rendering.

The **Light Designer** is used to define light sources. Light sources are included into views to determine the lighting environment in which objects are rendered.

The **Material Designer** is used to define material properties. Materials are assigned to objects, or parts of objects, defining the color or texture with which an object will be rendered.

The **Image Designer** is used to manipulate images. images may be created in imaging software packages outside of Renderize Live, then loaded into a project for use as part of a material definition, or as a background in a view.

The **Animation Designer** is used to define camera animation paths and render them. An animation is a series of views that are "strung" together to define a motion path.

Mouse Conventions

The Renderize Live interface is designed for control using a mouse or similar pointing device. Moving the mouse causes an on-screen **pointer** to move accordingly. The location of this pointer determines which window or command is being used.

The **left** mouse button is the most commonly used button. It is used to drag and drop resource icons, highlight and select command options, enable buttons and type-ins, etc. In specific situations, the **right** mouse button has its own unique functionality. In very rare situations, a **middle** mouse button definition exists: if you are using a two-button mouse, you can emulate a center mouse button by holding down the Shift key on your keyboard and pressing the left mouse button. If you have a one-button mouse, use Shift + mouse button to emulate a center mouse button, and Ctrl + mouse button to emulate a right mouse button. Any discussion of Renderize Live control in this manual refers to the use of the left mouse button unless specifically stated otherwise.

In this manual, the term **drag** refers to the act of holding down the left mouse button while moving the mouse to change the location of the pointer on screen. Dragging is used to move resources, turn dials, and define rectangles in Viewports.

The term **drag and drop** refers to the act of picking up of a project resource or color and dropping it into a Drop-in Well for use. To drag a resource, point to that resource and hold down the left mouse button. Now with the left mouse button depressed, move the pointer to move the resource. When the resource is dragged to the desired new location, release the left mouse button to drop the resource at its new location.

The term **click** or **select** refers to the act of depressing the left mouse button and releasing it immediately. This is the method for enabling buttons or type-ins, or selecting points in a Viewport.

Interface Entities

Although each of the Resource Designer windows has a distinct and separate set of commands, the entities (buttons, type-ins, dials) in each window are operated in the same way.

Resource Icons

Each of the resources in a project is represented with a "postage stamp" icon: a visual representation of the resource. These resource icons are displayed in Resource Areas on the Project Designer. To manipulate a resource, cover that resource with the mouse pointer, then drag the resource icon out of its Resource Palette and drop it into the Drop-in Well that represents the action that you wish to execute. Different types of Drop-in Wells are described below.

Drop-in Wells

A Drop-in Well is a rectangular area in Renderize Live in which resource icons or color swatches are dropped. Color Wells and Texture Wells contain color or texture definitions that are being used for a given purpose. Command Wells are used to manipulate resources.

Viewports

A Viewport is an area where the work you are doing can be displayed visually. When a mouse pointer is placed over a Viewport, the mouse buttons may take on definitions specific to that Viewport.

There are Viewports in four areas of Renderize Live:

The Viewport in the Project Designer is the "main" work area of Renderize Live. Views are displayed and can be organized spatially in the Viewport in a wireframe mode, then rendered into the Viewport to view a scene before rendering it to an image file on disk.

The Viewport in the Material Designer is used to preview the current material when it is rendered onto a specific object.

The Viewport in the Object Designer is used to preview the current object when rendered according to the settings in this window.

The Viewport in the Image Designer is used to view images during manipulation.

Pop-Down Menus

Pop-down menus are used to select a command option from a finite list. To open a pop-down menu, move the mouse pointer to cover the pop-down menu button, then press and hold the left mouse button. A list of command options now appears below the pop-down menu button, and as you drag the pointer down the list, each of the commands is highlighted in turn. When the desired command is highlighted release the mouse button to select that command.

Buttons

Buttons are used to enable command options and to execute commands. To operate a button, simply point to that button and click. If the button is a command option, it remains depressed until you click on it again, or click a different command option that is mutually exclusive of the current command option. If the button is a command execution, the button remains depressed until the command is completed, then automatically returns to its original state.

Dials

Dials present an intuitive way to enter numeric information. To use a dial, point to the dial and depress and hold the left mouse button. Now drag the pointer in a circular motion around the dial to "dial in" the desired value and release the mouse button to set that value.

When dragging the pointer to dial in a value, you can move the pointer farther away from the dial and drag in a circle of larger circumference. This way, the pointer must be moved a greater distance to dial in a value, making it easier to dial in a precise value.

Dials can be easily reset to their Renderize Live default values. To reset a dial, point to it and click the middle mouse button: that dial now returns to the system default value.

Note that any dial can be turned into a type-in, in case you wish to enter a precise value. To change a dial into a type-in, point to the dial name (which appears above the dial) and click the right mouse button: the dial disappears and is replaced by a type-in. Turn this type-in back into a dial by pointing to the type-in name and clicking the right mouse button again.

Type-ins

A type-in is a recessed area on a window where information can be entered from the keyboard. To activate a type-in, move the pointer to cover that type-in area and click the left mouse button: a vertical line appears as a cursor, indicating the position where typed characters will appear. After typing information into a type-in, press the **Enter** key on the keyboard to complete the action.

If a type-in already displays information, the position of the pointer when you click on the type-in determines where in the string of characters the cursor will appear. This way, existing information can be edited with ease.

To completely replace the information in a type-in, you can click and drag the left mouse button to highlight all of the characters in the type-in, then begin typing new information. The characters that were highlighted are replaced with the new input.

Note that any type-ins that appear with up and down arrows to either side of them are "spin boxes". This kind of type-in can be changed to a dial, if desired, by pointing to the type-in name and selecting the right mouse button.

Using Command Wells

There are three Command Wells, all located on the Project Designer. Drag and drop a resource icon into a Command Well to manipulate that resource. The way a resource is manipulated depends on the Command Well into which the resource was dropped.

The **View** Well combines resources together in a View.

The **Move** Well activates a resource for spatial re-orientation within a View.

The **Edit** Well opens up a Resource Designer window in which the definitions associated with a resource can be altered.

Using Color Wells

In any situation where a color must be defined (light colors, fog color, background color, a material's matte, shiny and reflect colors, etc.) a Color Well is used. All of these Color Wells are used in the same way. There are three methods that can be used to assign color to a Color Well.

The "hard" way is to click on the button on the Command Bar of the Project Designer to display the Color Toolbox, select a color from one of the palettes, then drag the color from the Color Well on the Toolbox into the Color Well.

The "easy" way to change the color in a Color Well is to click on that Well with the left mouse button. This automatically opens up the color palette on the Project Designer, and dynamically links the color palettes to the Color Well. Now when you select a color from the palette, the change is reflected immediately in the Color Well.

The color in a Color Well can also be determined by directly setting an RGB or HSV value. To do so, hold down the **Alt key** on the keyboard and press the **left mouse button**: the Color Well is replaced with a set of type-ins and buttons. The buttons allow you to toggle between RGB and HSV as the color values to set; the type-ins reflect the button settings. An advantage to this method of defining a color is that with these type-ins, negative values can be entered. For example, a light can be defined with a negative intensity, resulting in the light casting a "dark" beam, or with an intensity greater than 1.0 to brighten a scene. Materials can be defined with negative color values for the Matte, Shiny or Reflect colors, to mute the brightness of that material or create other interesting effects.

Press the OK button to turn the type-ins back into a Color Well.

Using Image Wells

In any situation where an image can be used (textures in the Material Designer, backgrounds in the View Designer, select commands in the Image Designer), an Image Well is provided.

To place an image into an Image Well, drag that image from the Image Resource Palette on the Project Designer and drop it into the desired Image Well.

To Remove an image from an Image Well, point to that Image Well, then hold down the **Alt key** on the keyboard and press the **left mouse button**. The image is removed from the Well, but it continues to remain in the Image Resource Palette as a resource for the current project.

Using and Controlling the Resource Designer Windows

All work is done in Renderize Live using a group of Resource Designer windows. The Project Designer window, the "main" Renderize Live window, is used to organize resources together for rendering. In addition, there are five windows for the manipulation of each of the five resource types: Views, Objects, Lights, Materials and Images.

Multiple windows can be opened at one time within Renderize Live: the window that is currently active is the one where the mouse pointer is located.

Opening a Resource Designer Window

To open a Resource Designer window, drag a resource icon from one of the Resource Areas on the Project Designer, and drop it into the Edit Well. The Resource Designer window for that particular resource type is opened, and its settings reflect the properties of the resource that was dropped into the Edit Well. Or, you can click on the resource icon with the right mouse button to display a menu of options for that resource, and select the Edit option to load it into the appropriate Resource Designer for editing.

Alternatively, a Resource Designer window can be opened by selection from the **Edit** pop-down menu in the Project Designer. If you are loading the resource that was most recently loaded into the Resource Designer window, this method is a much faster way of opening the window.

Defining Properties for a New or Existing Resource

Before any properties can be defined for a resource, that resource must be loaded into its Resource Designer window. If the Resource Designer window was opened by dragging and dropping the resource into the Edit Well of the Project Designer (or by selecting the edit option for a resource), then that resource is loaded into the Resource Designer window, and displayed in the Current Resource Well. If the Resource Designer window was opened using the Windows pop-down menu in the Project Designer, then there may be no resource loaded into that window.

To **load** a resource into its Resource Designer window when the window is already opened, you can use the two methods described above for opening a Resource Designer window. Or you can drag the resource icon from the Resource Palette of the Project Designer and drop it into the Current Resource Well of the open Resource Designer window. Finally, you can pop-down on the resource name in the Resource Designer window, and choose the desired resource from the pop-down list that appears.

To **edit** an existing resource, load that resource into its Resource Designer window, change the resource properties as desired, and save the resource. To **create** a new resource, load an existing resource into the Resource Designer window, change the resource properties as desired, then change the name of the resource and save it. A new resource is created under the new name, and displayed in the appropriate Resource Palette on the Project Designer, along with the original resource that was used.

To **copy** a resource, drop that resource into the Edit Well to open up that resource's Resource Designer window, then change the name for this resource and press the Save button: the original resource continues to exist, and a new resource is created under the new name.

For view, light, and material resources, new resources are always created from existing resources. If no resources have been defined, begin by loading the "default" resource icon into its Resource Designer window. As soon as the "default" resource is loaded, its name is changed; this is because the "default" resource cannot be altered. Instead, use this "default" resource as the starting point for defining new resources.

Current Resource Well

This Well, located at the upper-left of each Resource Designer window, contains the "postage stamp" icon for the resource whose properties are currently being defined. A resource can be placed into

this Well by dragging the desired resource icon from the appropriate Resource Palette of the Project Designer and dropping it into this Well, or into the Edit Well of the Project Designer.

Pointing to and clicking on this Well undoes all unsaved changes and returns all settings to the state at which they were last saved, just as if the Revert button was pressed.

Resource Name Type-in

Located directly below the Current Resource Well, this type-in area contains the name of the current resource. To create new resources, change the name that appears here before saving the resource.

You can also load different resources into a Resource Designer window by selecting on the button beside this type-in to display a pop-down list of all the resources of that type which currently exist in the project.

The Save Button

Saves the currently defined properties under the name that appears in the Resource Name type-in. If the resource name already exists, you will be asked if you wish to replace the existing resource with the new, updated properties (if you don't want to be asked for confirmation, this and other confirmation messages can be disabled under the Preferences command on the Project Designer). If the resource name does not already exist, a new resource is created with the currently defined properties, and a new resource icon bearing this name appears in the appropriate Resource Palette of the Project Designer.

The Undo Button

Undo the most recently changed property in this window. As long as a particular resource is loaded into its designer window, you can press Undo to toggle between the last two saved definitions for that resource. As soon as you load a new material into the designer window, or if you press the Revert button, the undo information is cleared and there is nothing to undo until you save the resource.

The Revert Button

Undo all unsaved changes and return all settings to the state at which they existed at the time the current resource was last saved.

The Message Area

Renderize Live displays status and command response messages on a grey line near the top of the window.

Bringing a Window to the Front

When multiple windows are opened in Renderize Live, these windows will probably overlap. To bring a Resource Designer window to the front, simply position the pointer in that window and select: that window will be brought to the front.

Note that the Project Designer window, the "main" Renderize Live window, cannot be placed in front of any of the Renderize Live Resource Designer windows. If you wish to leave your Resource Designer windows open and still have an unhindered view of the Project Designer window, you can move the Resource Designer windows so that they are partially off-screen, freeing up your screen space for the Project Designer.

Moving a Window

To reposition a window, click and hold down on the title bar at the very top of the window; now as you move the mouse the window moves accordingly. Release the mouse button to let go of the window when it is properly positioned.

Resizing a Window

With the exception of the Project Designer, the "main" Renderize Live window, Resource Designer window sizes are fixed in Renderize Live and cannot be changed.

Minimizing a Window

To minimize a window, simply click on the Minimize button on the upper-right corner of that window. The window is minimized to an icon, and can be re-opened by double-clicking on that icon.

If you minimize the main Project Designer window, all Resource Designer windows are closed as well, and a Renderize Live icon appears in your workspace. Double-click on this icon to re-open Renderize Live as it existed at the time it was closed to an icon.

Closing a Window

To close a Resource Designer window, point to and double-click on the System Menu Box on the upper-left corner of the window. The window is closed, but it continues to contain the information that existed at the time it was closed.

Note: Closing the main Project Designer window exits Renderize Live, discarding all changes that have been made since the last time you saved your work.

If after closing a Resource Designer window you wish to re-open it and work on the resource that was current at the time the window was closed, the fastest way to do so is to open it from the Edit pop-down menu on the Project Designer. This way, the window is opened immediately: if the window is opened by dropping the resource into the Edit Well of the Project Designer, the properties must be re-initialized, which increases the time needed to open the window.

Renderize Live Interface Overview

The Renderize Live interface is designed to offer a comfortable, intuitive environment in which an operator can create **projects**. A project is a savable work session that contains all of the elements required to define and render scenes.

A scene, or **view**, is defined through the manipulation and combination of the various **resources** that make up a project.