

# Chapter 26

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## Rendering Designs

### Learning Objectives

**After completing this chapter you will be able to:**

- Understand rendering and the need to render the objects.
- Attach materials to the models and modify the materials.
- Define new materials and modify new materials.
- Insert and modify light sources.
- Select rendering type and render objects.
- Define, render, and modify scenes.
- Replay and print renderings.
- Define background and fog and apply background and fog.
- Define landscaping objects and attach them to the model.
- Configure, load, and unload AutoCAD Render.

## UNDERSTANDING THE CONCEPT OF RENDERING

A rendered image makes it easier to visualize the shape and size of a 3D object, compared to a wireframe image or a shaded image. A rendered object also makes it easier to express your design ideas to other people. For example, if you want to make a presentation of your project or a design, you do not need to build a prototype. You can use the rendered image to explain your design much more clearly because you will have a complete control over the shape, size, color, and surface material of the rendered image. Additionally, any required changes can be incorporated into the object, and the object can be rendered to check or demonstrate the effect of these changes. Thus, rendering is a very effective tool for communicating ideas and demonstrating the shape of an object.

Generally, the process of giving a realistic effect to the models (rendering) can be conveniently divided into four steps. These steps are given next.

1. Selecting the material to be assigned to the design.
2. Attaching the material to the design.
3. Adding the light effect to the model by assigning lights at different locations.
4. Using the **RENDER** command to render the objects.

## SELECTING AND ATTACHING THE MATERIALS

AutoCAD provides you with number of materials that can be attached to the design. By default, these materials are stored in *render.mli* library. You can also create your own library for storing these materials. Once you have selected the material, you can assign materials directly to the objects. You can also assign the material to the blocks, layers, and to an AutoCAD color index (ACI). The commands that are used to select and attach the materials are discussed next.

### Selecting the Material for the Design

<b>Toolbar:</b>	Render > Materials Library
<b>Menu:</b>	View > Render > Materials Library
<b>Command:</b>	MATLIB



To get the realistic rendered image of the object, it is necessary to assign materials to the objects. Therefore, once you have created the design, you now have to select the material to be assigned to the objects in the design. By default, global material is assigned to all the objects. The color of this material depends upon the color of the object. However, if you want to assign some other materials to the design, you will have to select them from the material library and import them in the current drawing. The material library is invoked by choosing the **Materials Library** button from the **Render** toolbar. When you choose this button, the **Materials Library** dialog box will be displayed as shown in Figure 26-1.

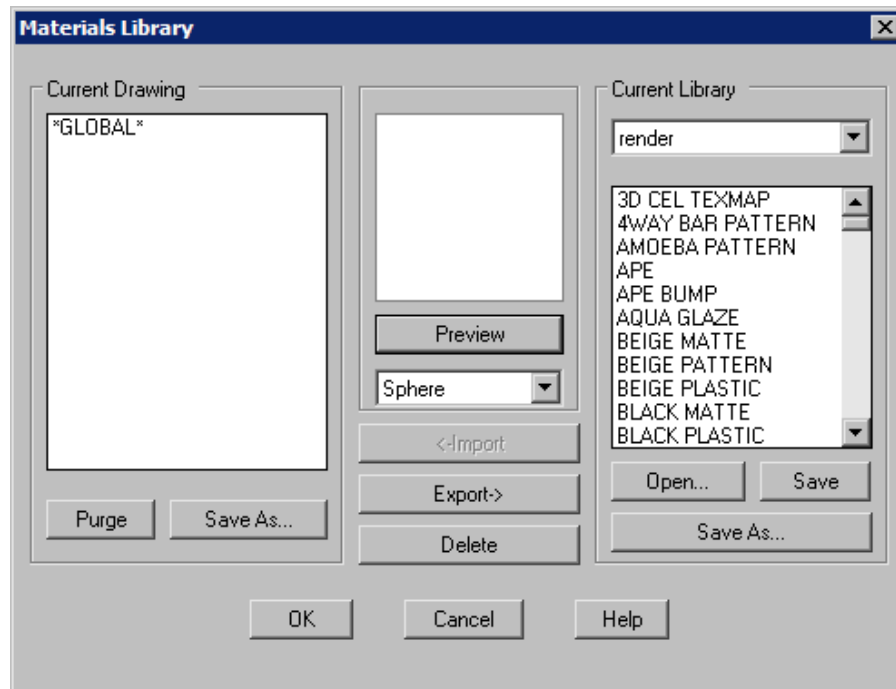


Figure 26-1 Materials Library dialog box

### Current Drawing Area

This area provides you with the options related to the materials in the current drawing. The list box in the area initially displays only one material, **\*GLOBAL\***. This material is by default assigned to all the new drawings. When you select a new material and import, it will be displayed in this list box.

**Purge.** This button is chosen to delete all the unused materials from the current drawing. If the list box displays any material that is not assigned to an object in the current drawing, it will be deleted when you choose this button. The **Confirm Purge** dialog box will be displayed to confirm the deletion of the unused material when you choose this button.

**Save As.** This button is chosen to save the list of the materials in the current drawing in a new material library. You can create your own library of the selected materials using this button. When you choose this button, the **Library File** dialog box will be displayed to save the library. The material library is saved in the *.mli* (materials library) format in the AutoCAD 2004 support directory.

### Preview Area

This area displays a preview window, **Preview** button, and a drop-down list. You can preview the selected material in the preview window before importing it to the current drawing. Select the material from the list box under the **Current Library** or the **Current Drawing** area

and then choose the **Preview** button to preview it. You can preview the material on a sphere or on a cube by selecting it from the drop-down list provided under this area.

### Current Library Area

This area displays the options related to the current material library. By default, the materials saved under the *render.mli* library will be displayed in the list box of this area. All the available material libraries will be displayed in the drop-down list provided under this area. You can display the materials saved under some other library by selecting the library from the drop-down list. The material to be imported can be selected from the list box.

**Open.** Choose this button to open the **Library File** dialog box for selecting the material library file.

**Save.** Choose this button to save the changes made to the current material library. When you choose this button, the **Library File** dialog box will be displayed.

**Save As.** Choose this button to save the current material library with some other name.

### Import

Choose this button to copy the selected material to the current drawing. You have to first select the material from the list box under the **Current Library** area and then choose this button. The material copied to the current drawing will be displayed in the list box of the current drawing area.

### Export

Choose this button to add the material from the current drawing to the current library. If the selected material is already available in the current material library, the **Reconcile Exported Material Names** dialog box will be displayed as shown in Figure 26-2.

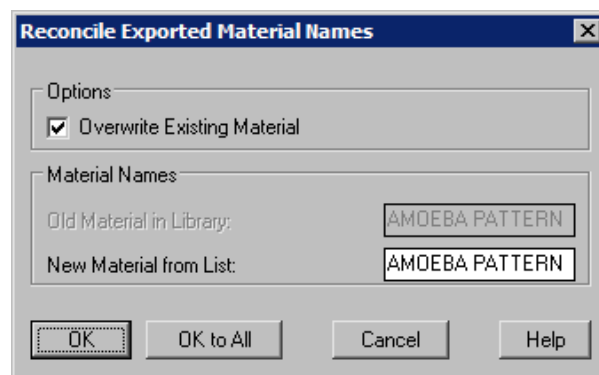


Figure 26-2 *Reconcile Exported Material Names* dialog box

#### Reconcile Exported Material Names Dialog Box Options

**Overwrite Existing Material.** This check box is selected to overwrite the existing material

in the current material library. You can clear this check box to prevent the overwriting of the material.

**Old Material in Library.** This edit box displays the name of the old name of the material in the current material library that you are going to export. This edit box will be available only when you clear the **Overwrite Existing Material** check box.

**New Material from List.** This edit box is used to specify the name by which you want to save the selected material in the current library. Specifying a name in this edit box ensures that the current library now contains two similar materials but with different names.



#### Note

*You cannot export the GLOBAL material that is displayed by default in the **Current Drawing** area.*

### Delete

This button deletes the selected material either from the current drawing or from the current library. If you delete a material from the current drawing that has been assigned to the objects in the drawing, a warning will be displayed that the selected material is attached in the current drawing.



#### Note

*If you choose **OK** without saving the changes made to the current material library, the **Library Modifications** dialog box will be displayed. This dialog box will inform you that the current material library has been changed. You will be given an option to save the changes in the current library, discard the changes, or cancel the closing of the **Materials Library** dialog box.*



#### Tip

*After making the modifications in the current material library, choose the **Save As** button from the **Current Library** to create another library. This way the materials in the current library are not modified.*

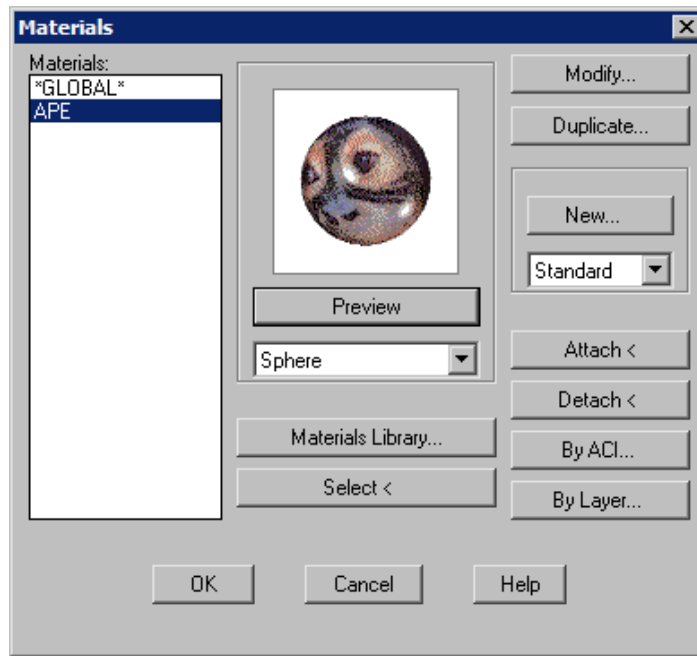
## Attaching Selected Materials to the Objects

<b>Toolbar:</b>	Render > Materials
<b>Menu:</b>	View > Render > Materials
<b>Command:</b>	RMAT



Once you have selected the materials from the materials library, you have to attach them to the objects in the current drawing. This is done using the **RMAT** command. This command is also used to create a new material or modify the existing material. However, creating and editing material will be discussed later in this chapter.

This command can be invoked by choosing the **Materials** button from the **Render** toolbar. When you choose this button, the **Materials** dialog box will be displayed as shown in Figure 26-3.



*Figure 26-3 Materials dialog box*

### Materials Area

The list box provided under this area displays all the materials that are imported from the **Materials Library** dialog box. In addition to the imported materials, the default material is also displayed in this list box.

### Preview Area

Using the options provided under this area you can preview the selected material. You have to first select the material from the list box provided under the **Materials** area and then choose the **Preview** button to preview the material. You can use a cube or a sphere to preview the material by selecting either of the two from the drop-down list provided under this area.

### Attach

Choose this button to attach the selected material to the object in the current drawing. You have to first select the material from the **Materials** list box and then choose this button to attach the material. When you choose this button, the **Materials** dialog box is temporarily closed and you will be prompted to select the object from the drawing window to which the material has to be attached. Once you have selected all the objects to which the current material is attached, the **Materials** dialog box will be redisplayed.

### Detach

This button detaches the selected material from the objects. You have to first select the material to be detached from the list box under the **Materials** area and then choose this button. The

**Materials** dialog box will be temporarily closed when you choose this button and you will be prompted to select the object from which you want to detach the selected material.

### By ACI

Choose this button to assign the material using the AutoCAD Color Index numbers. This means that you can assign a particular material to an object of a specified color. Once a material has been assigned to a particular color, all the objects with that particular color will be rendered using the specified material. When you choose this button, the **Attach by AutoCAD Color Index** dialog box will be displayed, see Figure 26-4.

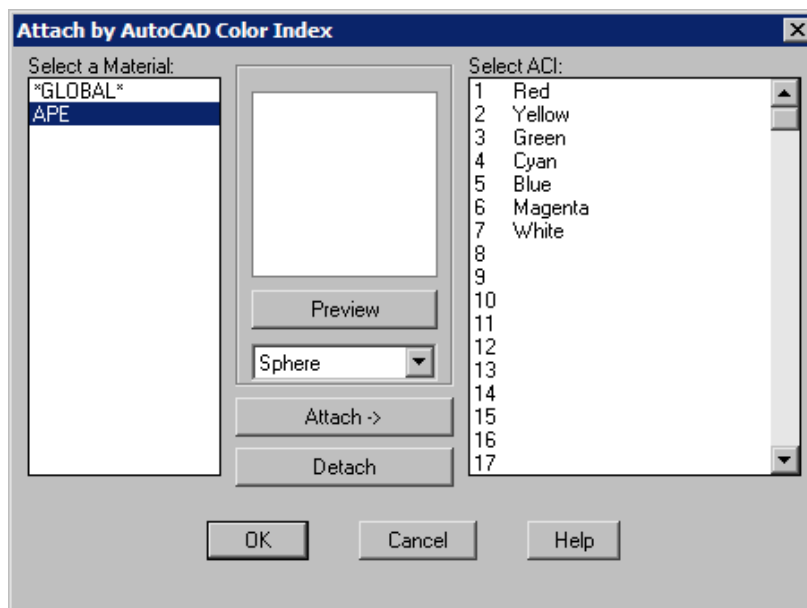


Figure 26-4 Attach by AutoCAD Color Index dialog box

This dialog box displays the materials in the current drawing under the **Select a Material** list box and all the 255 colors under the **Select ACI** list box. Select the material to be assigned from the **Select a Material** list box and the color to which the material has to be assigned from the **Select ACI** list box, and then choose the **Attach** button. The **Select ACI** list box will now display the color along with the material assigned to the color. Similarly, you can detach the material using the **Detach** button. You can also preview the material before attaching it to a color using the **Preview** area provided in this dialog box.

### By Layer

This button is chosen to assign a particular material to a selected layer. This means that all the objects that are placed in the selected layer will be rendered using the specified material. When you choose this button, the **Attach by Layer** dialog box will be displayed as shown in Figure 26-5. This dialog box displays all the materials in the current drawing under the **Select**

a **Material** list box and the layers in the **Select Layer** list box. To assign a particular material to a layer, select the material from the **Select a Material** list box and the layer from the **Select Layer** list box, and then choose the **Attach** button. All the objects placed in the selected layer will now be rendered using the specified material. Similarly, you can detach the material from the selected layer. You can also preview the material before attaching it to the layer using the options provided under the **Preview** area.

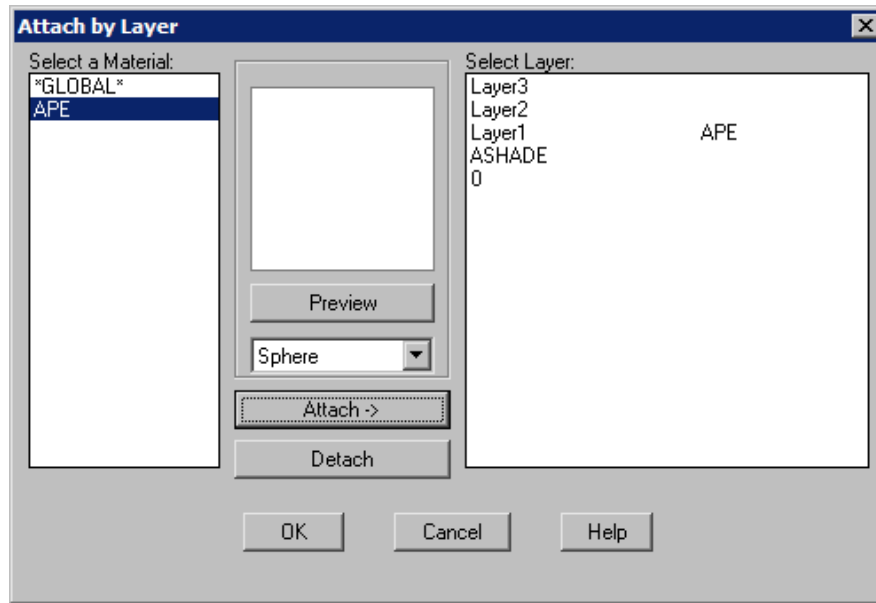


Figure 26-5 *Attach by Layer* dialog box

## Materials Library

Choose this button to invoke the **Materials Library** dialog box for importing the materials.



### Tip

You can invoke the **Materials Library** directly from the **Materials** dialog box by choosing the **Materials Library** button. This will save one step of invoking the **Materials Library** dialog box with the **MATLIB** command.

## Select

This button informs you of which material is attached to the selected object. When you choose this button, the **Materials dialog** box is temporarily closed and you will be prompted to select the object. As soon as you select the material, the **Materials dialog** box will be redisplayed and a message will be displayed below the **OK** button in this dialog box informing you about the material that is attached to the selected object.



**Note**

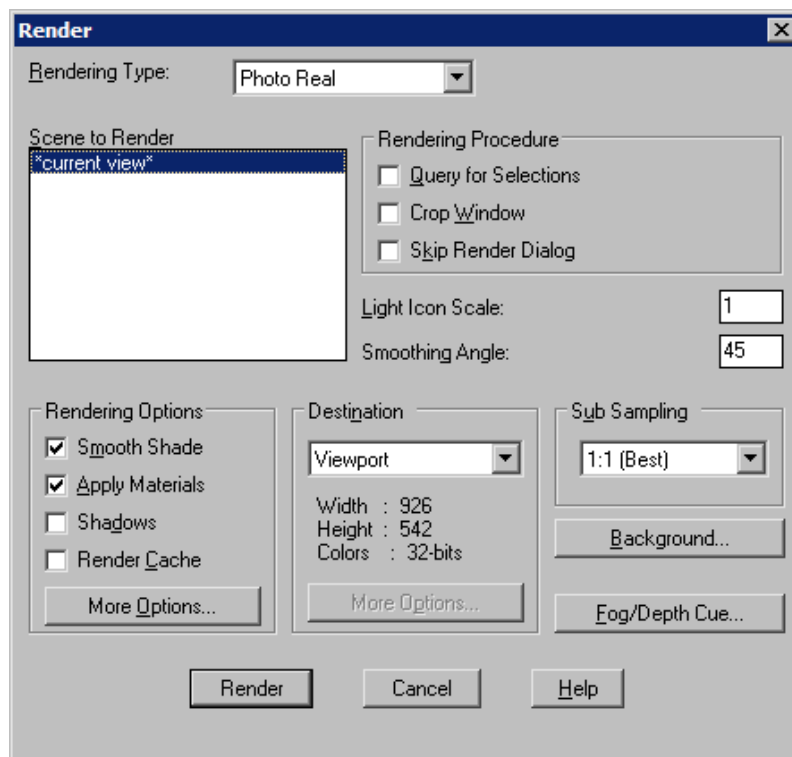
The remaining options for creating a material and editing the materials will be discussed later in this chapter.

## UNDERSTANDING ELEMENTARY RENDERING

**Toolbar:** Render > Render  
**Menu:** View > Render > Render  
**Command:** RENDER (RR)



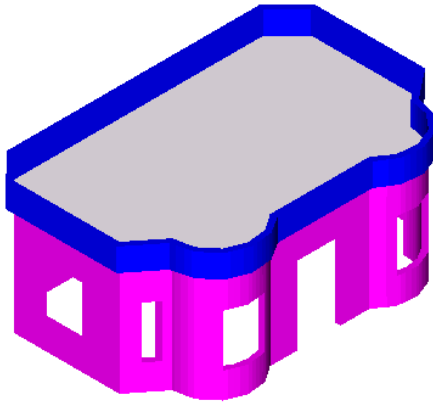
In this section, you will learn about the elementary or the basic rendering. When you choose this button, the **Render** dialog box will be displayed, see Figure 26-6. There are basically three types of rendering. They are as follows.



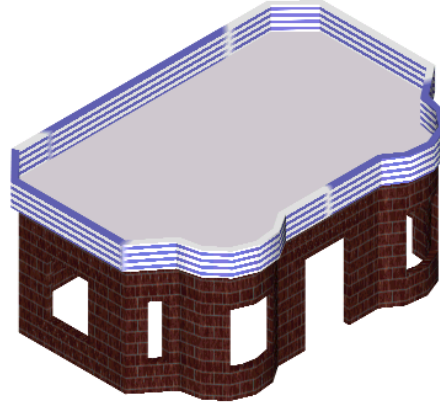
*Figure 26-6 Render dialog box*

**Render.** This is the basic rendering option and renders the object without actually displaying the effect of the material. In this type of rendering, global material is attached to the model and rendered. The color of rendered image will depend on the color of the object. To render the design using this option, select it from the **Rendering Type** drop-down list in the **Render** dialog box and choose the **Render** button. Note that you cannot set the shadow option when you use this option and so it does not give a realistic effect to the model, see Figure 26-7.

**Photo Real.** This is the photorealistic rendering procedure. In this type of rendering, the specified material is attached to the model and rendered. You can view the bitmap images on the model and also view the transparent effect of the model if the material selected is transparent. If the lights are also added to the design, you can also view the shadows of the model. You can select this option from the **Rendering Type** drop-down list. Figure 26-8 shows a model to which material is applied, and then rendered using this option.

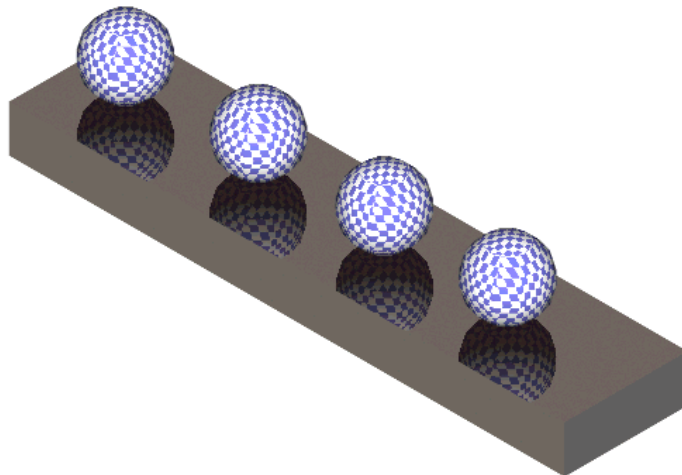


*Figure 26-7 Model rendered using the **Render** option*



*Figure 26-8 Model rendered using the **Photo Real** option displaying the effect of materials*

**Photo Raytrace.** This is also a photorealistic method of rendering. This method uses the ray tracing method for calculating the parameters such as the mirror effect, reflection, and refraction. If you have created your own material and provided the mirror effect to it, you can view the mirror effect only if you render using this option, see Figure 26-9.



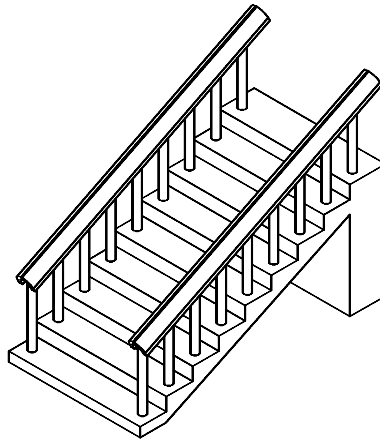
*Figure 26-9 Model rendered using the **Photo Raytrace** option showing the mirror effect*

**Note**

The remaining options of the **Render** dialog box will be discussed in the *Understanding Advanced Rendering* section of this chapter.

**Example 1***Architectural*

In this example, you will draw the staircase shown in Figure 26-10. You can assume your own dimensions. Attach the materials to the objects and then render the model.



**Figure 26-10** Model for Example 1

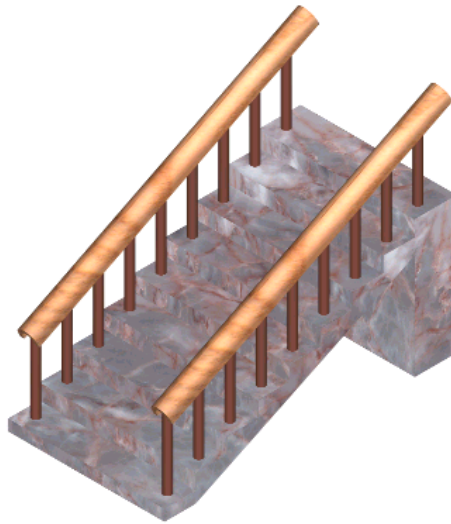
The materials that you have to assign to the model are given next.

Stairs	MARBLE PALE
Balusters	COPPER
Handrail	WOOD - WHITE ASH

1. Create the model shown in Figure 26-10. Assume your own dimensions.
2. Choose the **Materials** button from the **Render** toolbar to invoke the **Materials** dialog box. Choose the **Materials Library** button to invoke the **Materials Library** dialog box.
3. Select **MARBLE PALE** material from the **Current Library** list box and then choose the **Import** button. Similarly, import the other two materials. Choose **OK** to return to the **Materials** dialog box.
4. In the **Materials** dialog box, select the **MARBLE PALE** material from the **Materials** list box and then choose the **Attach** button. The **Materials** dialog box will be temporarily closed and you will be prompted to select the object to which you want to assign this material. Select the stairs and then press ENTER to redisplay the **Materials** dialog box.

Similarly, attach **COPPER** to all the balusters and **WOOD - WHITE ASH** to the handrails. Choose **OK** to exit the dialog box.

5. Choose the **Render** button from the **Render** toolbar to invoke the **Render** dialog box.
6. Select **Photo Real** from the **Rendering Type** drop-down list and then choose the **Render** button. The rendered image should look similar to the one shown in Figure 26-11.



*Figure 26-11 Rendered image of staircase*

## ADDING LIGHTS TO THE DESIGN

<b>Toolbar:</b>	Render > Lights
<b>Menu:</b>	View > Render > Lights
<b>Command:</b>	LIGHT



Lights are vital to rendering a realistic image of an object. Without proper lighting, the rendered image may not show the features the way you expect. The lights can be added to the design using the **Lights** dialog box. This dialog box can be invoked by choosing the **Lights** button from the **Render** toolbar, see Figure 26-12.

AutoCAD render supports four light sources. All these light sources are discussed next.

### Ambient Light

You can visualize ambient light as the natural light source that equally illuminates all surfaces of the objects, see Figure 26-13. Ambient light does not have a source, and therefore, has no location or direction. The ambient light is the default light that is applied to the design when you render it. You do not have to assign this light source to the design. However, you can

modify the color and intensity of the ambient light using the options provided under the **Ambient Light** area of the **Lights** dialog box.

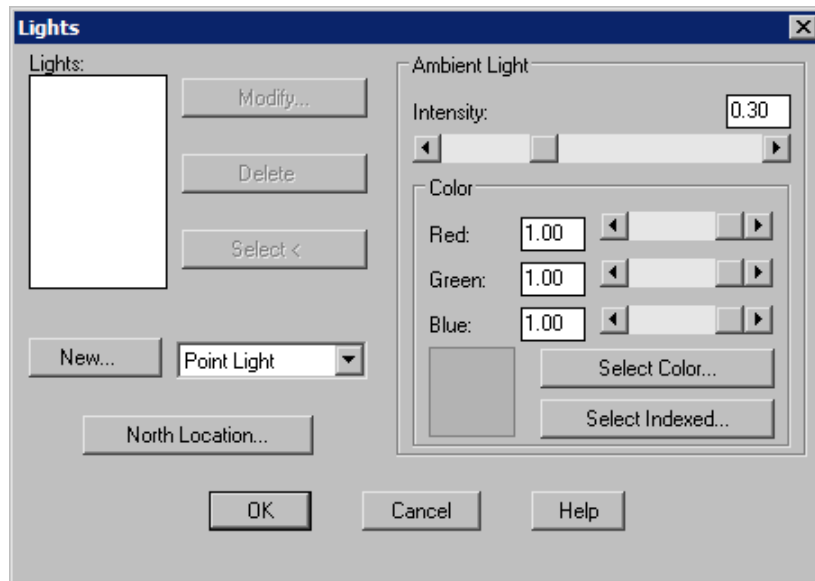


Figure 26-12 *Lights* dialog box

The slider bar provided under this area can be used to increase or decrease the intensity of the ambient light. By default, the color of the ambient light is white. You can also set the color of the light by selecting the color from the **Color** area. The two buttons provided under the **Color** area are used to create a custom color using the **Color** dialog box or select a standard color from AutoCAD Color Index. Normally, you should set the ambient light to a low value because high values gives a washed-out look to the image. If you want to create a dark room or a night scene, turn off the ambient light. With ambient light alone you cannot render a realistic image. Figures 26-14 and 26-15 show the same model rendered using different intensities of the ambient light.

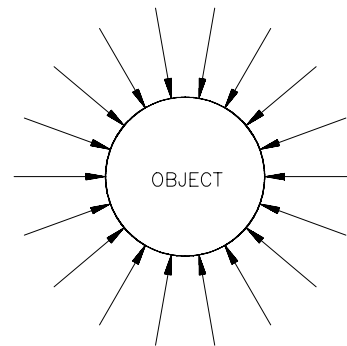
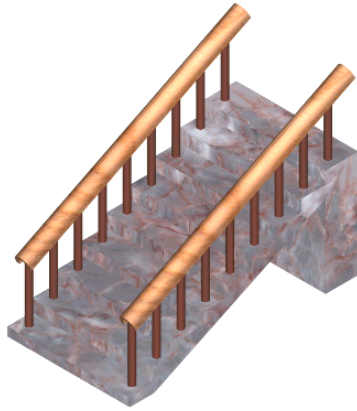


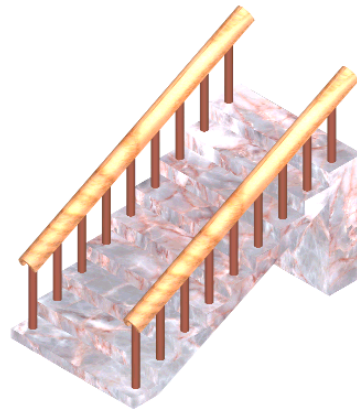
Figure 26-13 *Ambient light providing a constant illumination*

## Point Light

A point light source emits light in all directions, and the intensity of the emitted light is uniform. You can visualize an electric bulb as a point light source. In AutoCAD render, if you



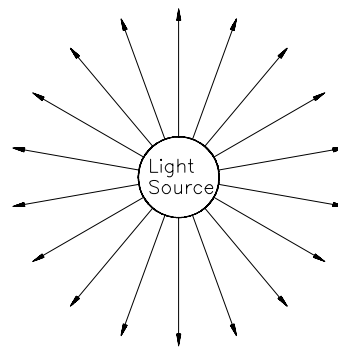
**Figure 26-14** Model rendered with ambient light intensity = 0.3



**Figure 26-15** Model rendered with ambient light intensity = 0.7

select to add a point light to the design, you can set the options of casting the shadow of the objects in the design. Figure 26-16 shows a point light source that radiates light uniformly in all directions.

As this is not a default light source, therefore, you will have to add this light source manually. This light source can be added by selecting **Point Light** from the drop-down list provided in front of the **New** button in the **Lights** dialog box and then choosing the **New** button. The **New Point Light** dialog box will be displayed, see Figure 26-17.



**Figure 26-16** Point light source emitting light uniformly in all directions

## New Point Light Dialog Box Options

### Light Name

This edit box is used to specify the name of the point light. Specifying a light name is mandatory.

### Intensity

This slider bar is used to specify the intensity of the point light. You can specify the intensity using the slider bar or directly entering the required value in the edit box.

### Position Area

The options provided under this area are very important and are used to specify the location of the light source. This area provides you with the following two buttons:

**Modify.** Choose this button to specify the location of the point light source. The **New Point**

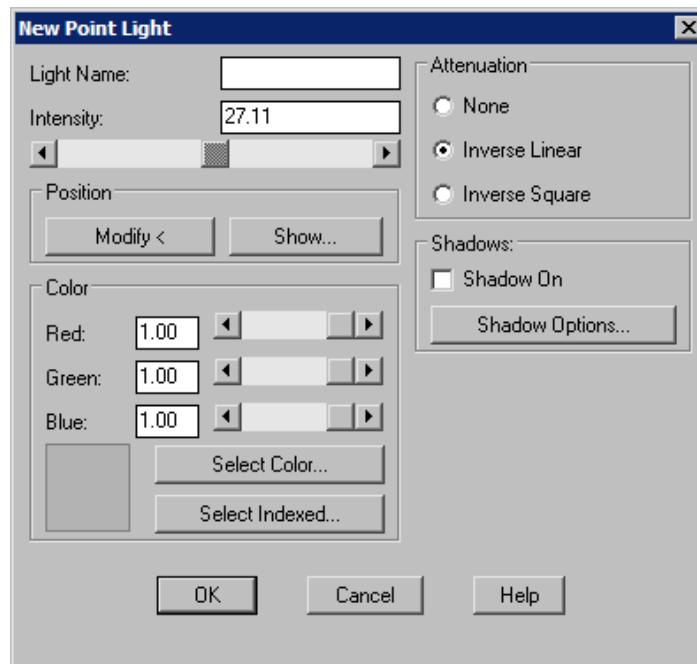


Figure 26-17 *New Point Light* dialog box

**Light** dialog box will be temporarily closed and you will be prompted to specify the location of the light source. The **New Point Light** dialog box will be redisplayed once you specify the location.

**Show.** When you choose this button, the **Show Light Position** dialog box will be displayed as shown in Figure 26-18. This dialog box displays the X, Y, and Z coordinates of the light source and the target of the light. Since the point light source emits the light uniformly in all directions, there is no target for a point light.

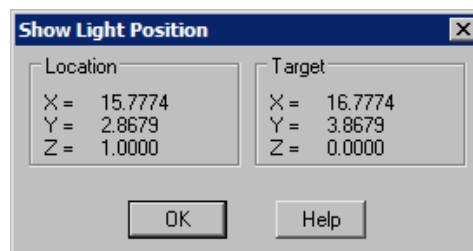


Figure 26-18 *Show Light Position* dialog box



**Note**

A point light source emits light in all directions, so it has no fixed target. **Target** area in the **Show Light Position** dialog box (Figure 26-18) is provided for a spotlight and distant light.

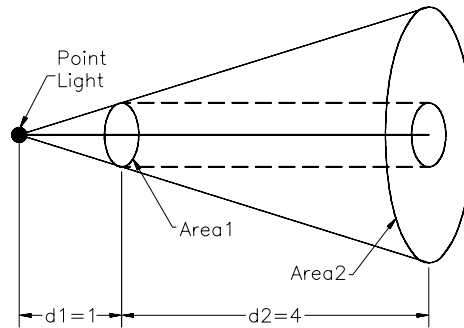
## Color Area

The options provided under this area are used to specify the color for the point light. You can define a custom color by using the RGB sliders provided under this area or by using the **Select Color** dialog box that is displayed when you choose the **Select Color** button. You can also select a color from the AutoCAD Color Index by choosing the **Select Indexed** button. The selected color will be displayed in the preview box provided under this area.

## Attenuation Area

The light intensity is defined as the amount of light falling per unit of area. The intensity of light is inversely proportional to the distance between the light source and the object. Therefore, the intensity of light decreases as the distance increases. This phenomenon is called **Attenuation**. In AutoCAD, it occurs only with spotlights and point light.

In Figure 26-19, the light is emitted by a point source. Assume that the amount of light incident on Area1 is  $I$ . Therefore, the intensity of light on Area1 =  $I/\text{Area1}$ . As the light travels farther from the source, it covers a larger area. The amount of light falling on Area2 is the same as on Area1, but the area is larger. Therefore, the intensity of light for Area2 is smaller (Intensity of light for Area2 =  $I/\text{Area2}$ ). Area1 will be brighter than Area2 because of higher light intensity. AutoCAD render provides you with the following three options for controlling the attenuation.



**Figure 26-19** The concept of attenuation

**None.** If you select the **None** option for light falloff, the brightness of objects is independent of distance. This means that objects that are far away from the point light source will be as bright as those close to the light source.

**Inverse Linear.** In this option, the light falling on the object (brightness) is inversely proportional to the distance of the object from the light source ( $\text{Brightness} = 1/\text{Distance}$ ). As distance increases, brightness decreases. For example, assume that the intensity of the light source is  $I$  and the object is located at a distance of  $2$  units from the light source. Now, brightness or intensity =  $I/2$ . If the distance is  $8$  units, the intensity (light falling on the object per unit area) =  $I/8$ . The brightness is a linear function of the distance of the object from the light source.

**Inverse Square.** In this option, the light falling on the object (brightness) is inversely proportional to the square of the distance of the object from the light source ( $\text{Brightness} = 1/\text{Distance}^2$ ). For example, assume that the intensity of the light source is  $I$  and the object is located at a distance of  $2$  units from the light source. Now, brightness or intensity =  $I/(2)^2 = I/4$ . If the distance is  $8$  units, the intensity (light falling on the object per unit area) =  $I/(8)^2 = I/64$ .



## Shadows Area

The options provided under this area are used to control the display of the shadows of the objects after rendering. The shadows will be displayed only if the **Shadow On** check box provided under this area is selected. The other shadow related options can be controlled using the **Shadow Options** dialog box (Figure 26-20) displayed upon choosing the **Shadow Options** button provided under this area.

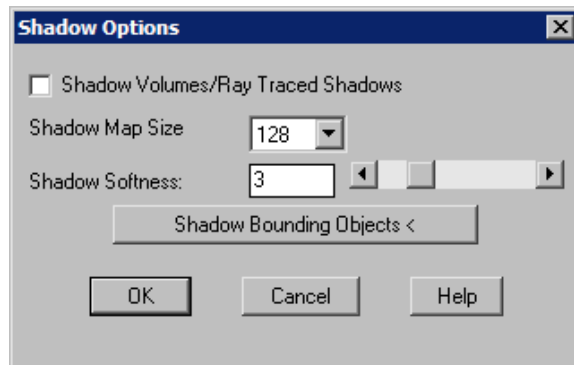


Figure 26-20 Shadow Options dialog box

**Shadow Volumes/Ray Traced Shadows.** If this check box is selected, the shadows that will be displayed will be volumetric and ray-traced for the photo real and photo ray-traced renders, respectively. Therefore, if this check box is selected, the remaining options of this dialog box will not be available.

**Shadow Map Size.** This drop-down list is used to select the map sizes for the shadows. The map sizes are calculated in terms of the pixels and the greater the number of pixels, the better the shadow will be. However, if the map size is large, the time taken to render the model will also increase. Figure 26-21 shows a model with shadow map size 128, and Figure 26-22 shows a model with shadow map size 1024.

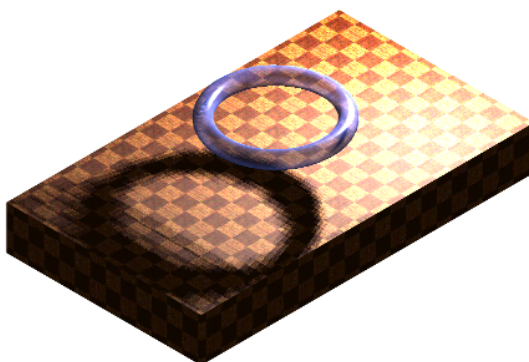


Figure 26-21 Shadow map size = 128

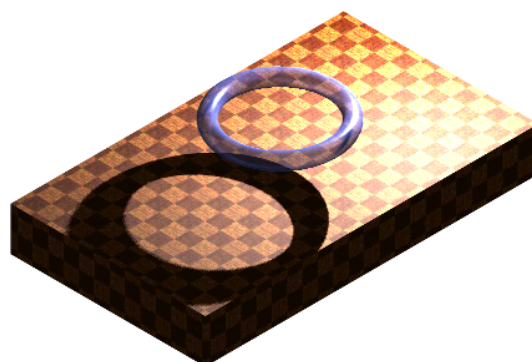


Figure 26-22 Shadow map size = 1024

**Shadow Softness.** This slider bar is used to specify the softness for the shadow. If the value of this slider is increased, the shadow will be blurred.

**Tip**

*You can view the best shadow effect by keeping the value of the shadow map size between 512 and 1024, and shadow softness between 3 and 4.*

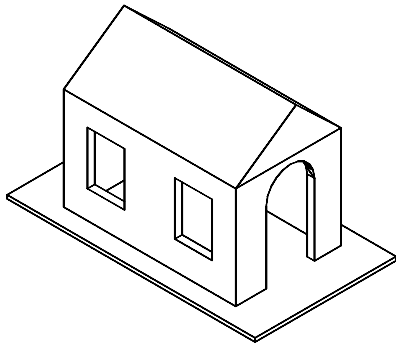
**Shadow Bounding Objects.** Choose this button to select the objects whose bounding boxes will be used to clip the shadows. When you choose this button, the **Shadow Options** dialog box will be temporarily closed and you will be prompted to select objects to clip the shadows.

**Tip**

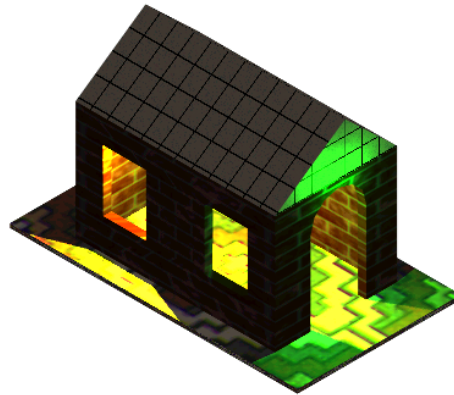
*You can remove the objects from the selection sets containing the objects for clipping the shadows by entering **R** at the **Select the shadow bounding objects** prompt. You will then be prompted to select the objects to be removed.*

**Example 2***Architectural*

In this example, you will apply the point light at the lintel of the window and at the lintel of the door of the model as shown in Figures 26-23 and 26-24. Choose your own materials to make the model look realistic and then render.



**Figure 26-23** Model for Example 2



**Figure 26-24** Model after rendering

1. Create the model as shown in Figure 26-23.
2. Choose your own materials and attach the materials to the model as described in Example 1. (Recommended: BROWN BRICK for Walls, SOUTH WEST PATTERN for flooring, and TILE WHITE for roof.)
3. Choose the **Lights** button from the **Render** toolbar to invoke the **Lights** dialog box.
4. Select **Point Light** from the drop-down list provided in front of the **New** button. Now, choose the **New** button to invoke the **New Point Light** dialog box.

5. Enter light name as **1** in the **Light Name** edit box. Select yellow color from the AutoCAD Color Index. Set the intensity based on the size of the objects in the drawing.
6. Choose the **Modify** button to set the position of the light **1**. Once you choose the **Modify** button, the dialog box will be exited and you will be prompted to specify the location of the light. Specify the location at the lintel of the window.
7. Select the **Shadows On** check box in the **Shadow** area. Choose **OK** to exit the dialog box.
8. Similarly, you can set the second light at the lintel of the door. Set the color of the light to green.
9. Choose the **Render** button in the **Render** toolbar to invoke the **Render** dialog box. Select **Photo Real** from the **Rendering Type** drop-down list. Select the **Shadows** check box from the **Rendering Options** area. The rendered image is shown in Figure 26-25.

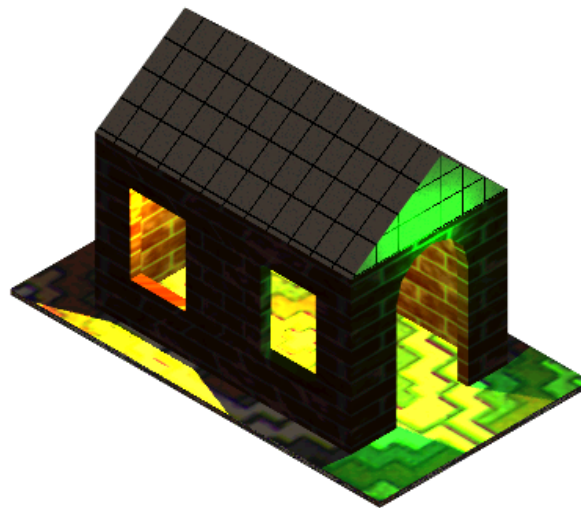


Figure 26-25 Rendered model of house

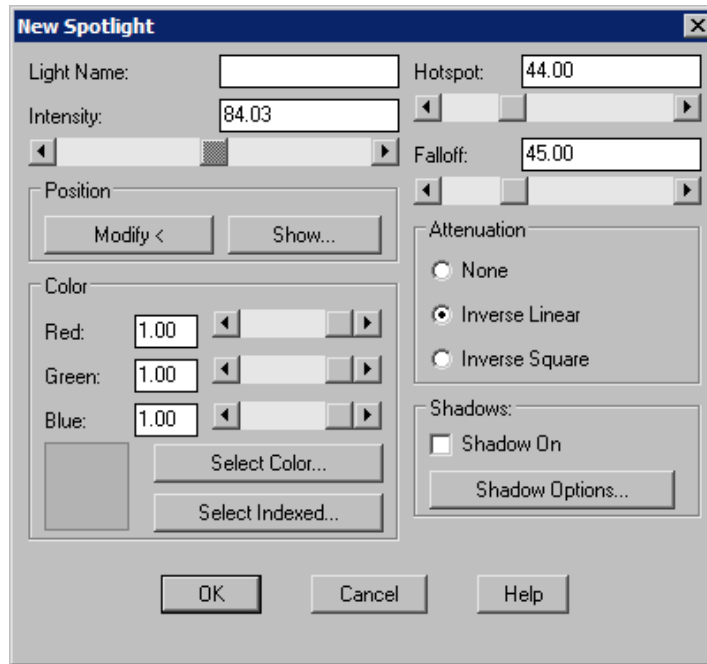
**Tip**

You can increase the smoothness of the rendered curved object by increasing the value of the **FACETRES** system variable. The default value of this variable is 0.5. Set this value close to 6.

**Spotlight**

A spotlight emits light in the defined direction with a cone-shaped light beam. This light has a focused beam that starts from a point and is targeted at another point. This type of light is generally used to illuminate a specific point, such as illuminating a person on stage. The phenomenon of **attenuation** also applies to spotlights. This light can be applied by selecting **Spotlight** from the drop-down list provided in front of the **New** button and then choosing

the **New** button. The **New Spotlight** dialog box (Figure 26-26) will be displayed when you choose this button.



*Figure 26-26 New Spotlight dialog box*

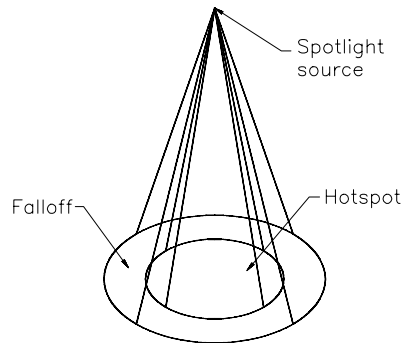
Most of the options under the **New Spotlight** dialog box are similar to those under the **New Point Light** dialog box. One of the differences is that when you choose the **Modify** button from the **Position** area, you will be prompted to enter two values. As already mentioned, this type of light source has a start point and a target point; therefore, you will be first prompted to specify the light target and then the light location.

### Hotspot/Falloff

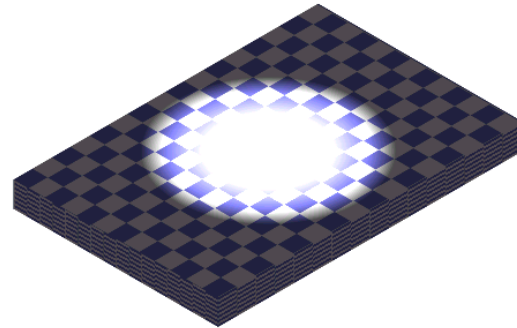
As mentioned earlier, the spotlight has a focused beam of light that is targeted at a particular point. Therefore, there are two cones that comprise the spotlight.

The hotspot is defined as the cone that carries the highest intensity light beam. In this cone, the light beam is most focused and is defined in terms of an angle, see Figure 26-27. The value of this angle can be adjusted with the help of the slider bar associated with it.

The other cone is called falloff and it specifies the full cone of light. It is the area around the hotspot, where the intensity of the beam of light is not very high as shown in Figures 26-27(a) and 26-27(b). It is also defined in terms of an angle that can be adjusted with the help of the slider bar associated with it. The value of the hotspot and the falloff can vary from 0 to 160.



**Figure 26-27(a)** The hotspot and falloff cones



**Figure 26-27(b)** The hotspot and falloff after rendering

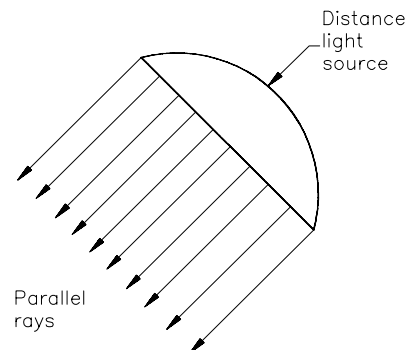


**Tip**

The value of hotspot should always be less than the falloff. If you have set the value of hotspot more than the value of falloff, then upon exiting the dialog box you will get an error message that **Hotspot must be < or = Falloff**.

## Distant Light

A distant light source emits a uniform parallel beam of light in a single direction only (Figure 26-28). The intensity of the light beam does not decrease with the distance. It remains constant. For example, the sun rays can be assumed to be a distant light source because the light rays are parallel. When you use a distant light source in a drawing, the location of the light source does not matter; only the direction is critical. Distant light is used mostly to light objects or a backdrop uniformly and for getting the effect of sunlight. The distant light can be added by selecting **Distant Light** from the drop-down list provided in front of the **New** button and then choosing the **New** button.



**Figure 26-28** Distant light source

The **New Distant Light** dialog box will be displayed as shown in Figure 26-29. The options in this dialog box are similar to those under the **New Point Light** dialog box, except for a few additions. This dialog box allows you to define the distant light using the following two methods:

### Using Azimuth and Altitude

You can set the **Azimuth** and **Altitude** of the distant light direction by moving the slider bars

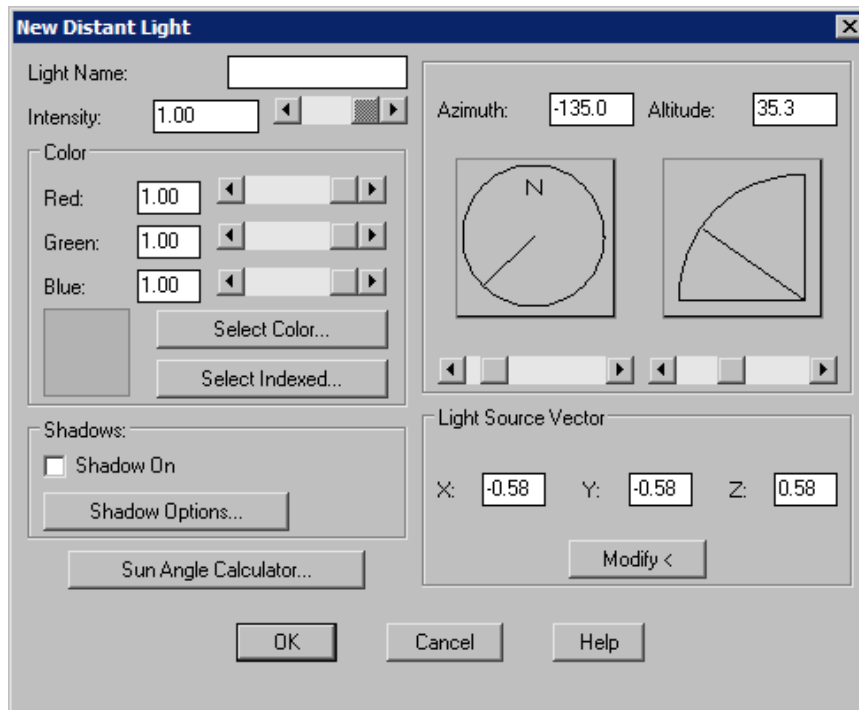


Figure 26-29 New Distant Light dialog box

associated with them. You can also set the angles by moving the arms of the angle in the **Azimuth** and **Altitude** image boxes. You can change the default light source vector by specifying the coordinates in the **X**, **Y**, and **Z** edit boxes under the **Light Source Vector** area.

### Using the Sun Angle Calculator

This is the second and the simpler method of defining the distant light. With this method you can define a light anywhere in the world by defining its geographic location. You can also define the date and time at which you want to view the light effect. To use this method, choose the **Sun Angle Calculator** button from the **New Distant Light** dialog box to display the **Sun Angle Calculator** dialog box (Figure 26-30). This dialog box is divided into two areas. The left area describes the local settings. The right area describes the solar settings. Depending upon the local settings, solar setting will adjust itself.

In the local setting, you can set the date and clock time in the **Date** and **Clock Time** edit boxes, respectively. You can also set the latitude and longitude in the **Latitude** and **Longitude** edit boxes, respectively, and the directions as north, south, east, and west from **North** and **West** edit boxes. By default the **Y** axis is assumed north by AutoCAD.

You can also specify the geographic location of the place where you want to view the light effect. This is done by choosing the **Geographic Location** button in the **Sun Angle Calculator**

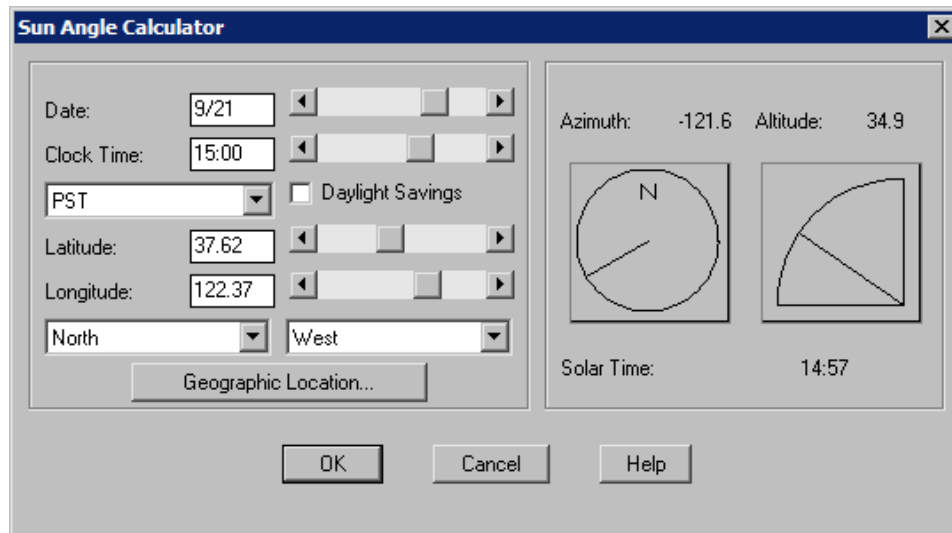


Figure 26-30 Sun Angle Calculator dialog box

dialog box. The **Geographic Location** dialog box will be displayed when you choose this button, see Figure 26-31.

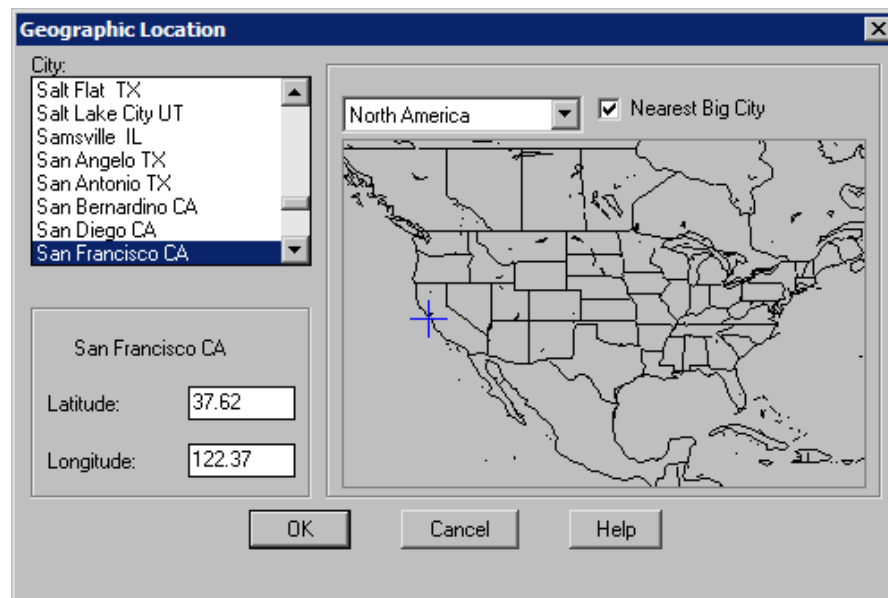
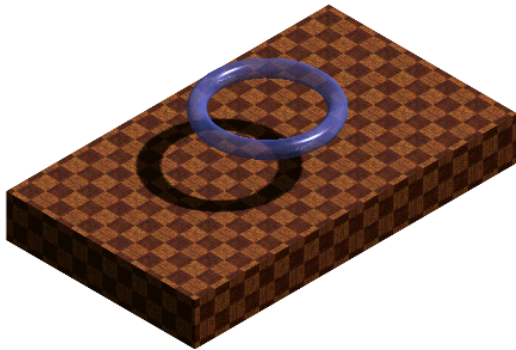


Figure 26-31 Geographic Location dialog box

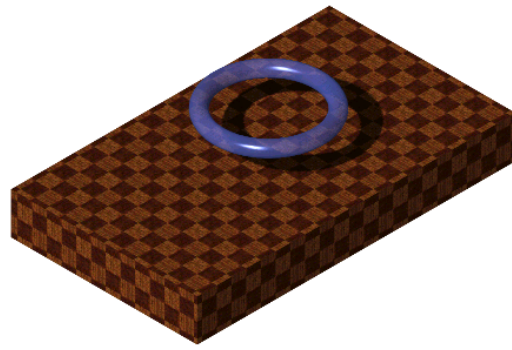
You can select various locations from the drop-down list provided in this dialog box and the map of this location will be displayed. Also, all the nearest cities will be displayed in the **City**



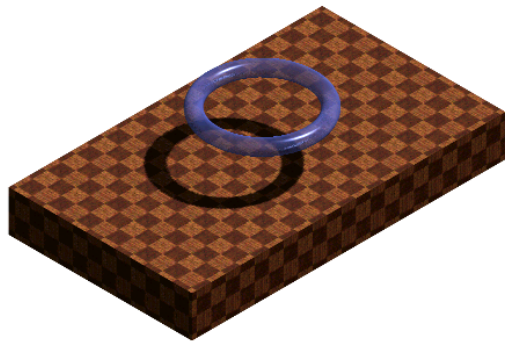
list box. You can also move the cursor in the world map area and it will show the city and the corresponding latitude and longitude. Once you have selected the desired city, you can go back to the **Sun Angle Calculator** dialog box and set the date and time. Figures 26-32 through 26-37 show the position of the shadows at different times.



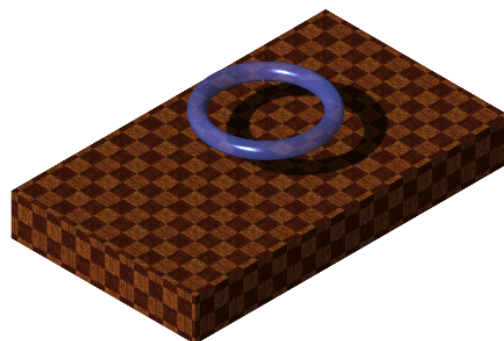
**Figure 26-32** City: Chicago, Time: 11:00, Date: 1st May



**Figure 26-33** City: Chicago, Time: 16:00, Date: 1st May

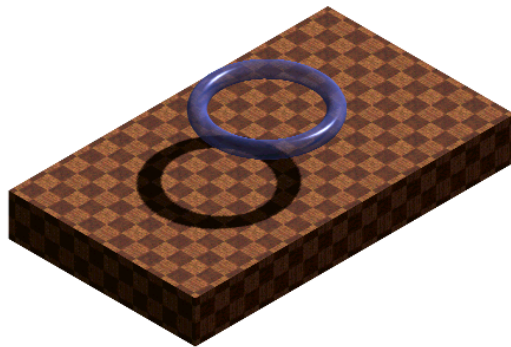


**Figure 26-34** City: Tokyo, Time: 11:00, Date: 1st May

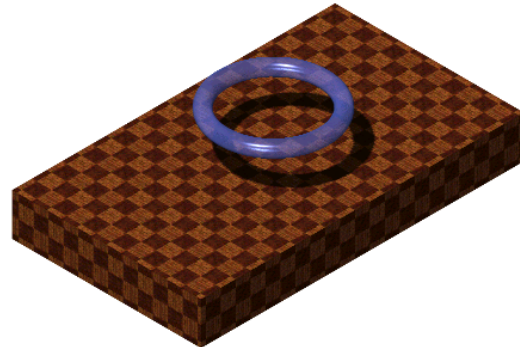


**Figure 26-35** City: Tokyo, Time: 16:00, Date: 1st May





**Figure 26-36** City: New Delhi, Time: 11:00, Date: 1st May



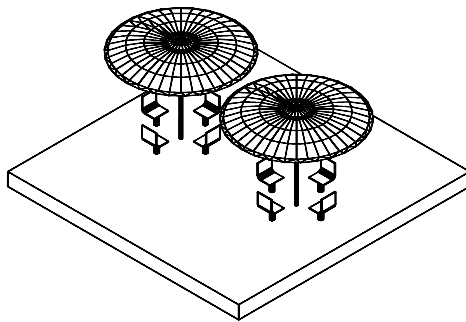
**Figure 26-37** City: New Delhi, Time: 16:00, Date: 1st May

### Example 3

*Architectural*

In this example, you will attach distant light to the model shown in Figures 26-38 and 26-39. Choose your own materials. Set the distant light using the geographic location. The geographic location and other parameters that have to be set are given next.

City: New York, Date: 20 June, Time: 14:00.



**Figure 26-38** Model for Example 3 before rendering



**Figure 26-39** Model for Example 3 after rendering

1. Create the model as shown in Figure 26-38.
2. Choose the materials and attach it to the model as described in Example 1.
3. Choose the **Light** button from the **Render** toolbar to invoke the **Lights** dialog box. Select **Distant Light** from the drop-down list and then choose the **New** button to invoke the **New Distant Light** dialog box.

4. Specify the name of the distant light as **D1** in the **Light Name** edit box. Select the **Shadow On** check box from the **Shadows** area. You can also specify the details of the shadow by choosing the **Shadow Options** button. Choose the **Sun Angle Calculator** button to invoke the **Sun Angle Calculator** dialog box.
5. In this dialog box, choose the **Geographic Location** button to invoke the **Geographic Location** dialog box. Select **North America** from the drop-down list provided above the map. Select **New York NY** from the **City** drop-down list. You can also select the city by clicking in the map of North America displayed in the **Geographic Location** dialog box. Choose **OK** to exit the dialog box.
6. In the **Sun Angle Calculator** dialog box, choose **MST** from the **PST** drop-down list. Set the date and clock time as **6/20** and **14:00** in the **Date** and **Clock Time** edit boxes, respectively. Choose **OK** to exit the **Sun Angle Calculator** dialog box. Choose **OK** to exit the **New Distant Light** dialog box. Once more, choose **OK** to exit the **Lights** dialog box.
7. Choose the **Render** button from the **Render** toolbar to invoke the **Render** dialog box. Select the **Photo Real** from the **Rendering Type** drop-down list. Select the **Shadows** check box from the **Rendering Options** area of the **Render** dialog box.
8. Choose the **Render** button to render the model and exit the dialog box. The final rendered model is shown in Figure 26-40.



*Figure 26-40 Final model for Example 3 after rendering*

## MODIFYING LIGHTS

As mentioned earlier, the lights and lighting effects are important in rendering to create a realistic representation of an object. The sides of an object that face the light must appear brighter and the sides that are on the other side of the object must be darker. This smooth

gradation of light produces a realistic image of the object. If the light intensity is uniform over the entire surface, the rendered object will not look realistic. For example, if you use the **SHADE** command to shade an object, that object does not look realistic because the displayed model lacks any gradation of light. Any number of lights can be added to the drawing. The color, location, and direction of all the lights can be specified individually. As mentioned before, you can specify attenuation for point lights and spotlights. AutoCAD also allows you to change the color, position, and intensity of any light source. The only limitation is that light types cannot be interchanged. For example, you cannot change a distant light into a point light. Any light can be modified by choosing the **Lights** button from the **Render** toolbar. The **Lights** list box will display all the lights that have been added to the drawing. Select the light you want to modify from this list box and then choose the **Modify** button. Depending upon the type of light selected, the dialog box will be displayed. For example, if you select a distant light for modifications, the **Modify Distant Light** dialog box will be displayed. One such **Modify Distant Light** dialog box is shown in Figure 26-41.

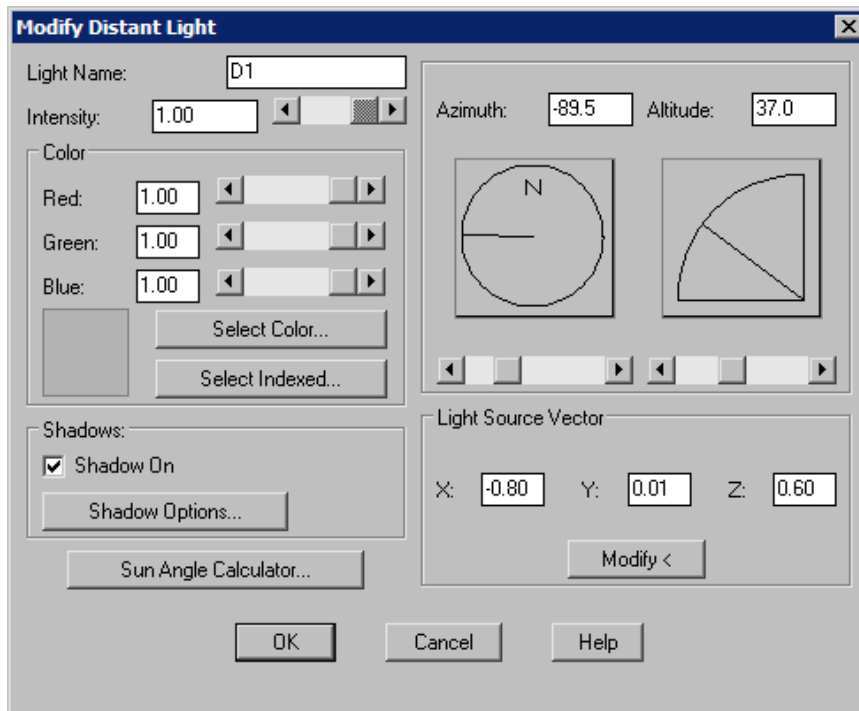


Figure 26-41 *Modify Distant Light* dialog box

The options of the **Modify Light** dialog box are similar to those under the **New Light** dialog box.

## CREATING NEW MATERIALS

AutoCAD allows you to create your own materials. This is done using the **Materials** dialog box. You can create four types of materials: **Standard**, **Granite**, **Marble**, and **Wood**. To create

any of these materials, choose it from the drop-down list provided below the **New** button in the **Materials** dialog box and then choose the **New** button. The dialog box corresponding to the material that you have selected from the drop-down list will be displayed. Figure 26-42 shows a dialog box for creating a standard material.

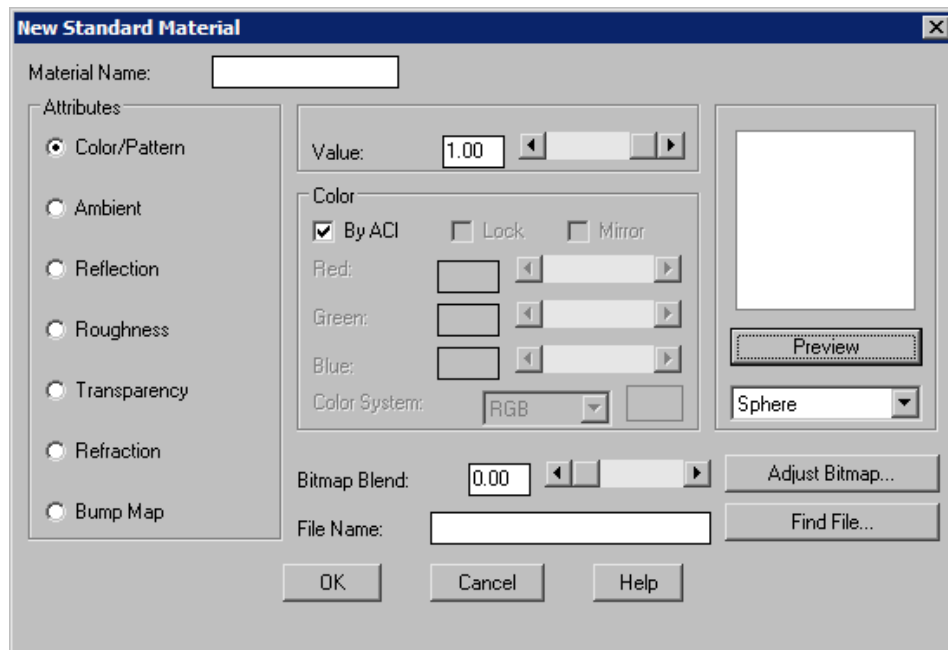


Figure 26-42 New Standard Material dialog box

You can define various parameters for the new material using this dialog box. To provide the mirror effect, select the **Mirror check** box that will be available when you select the **Reflection** radio button from the **Attributes** area. You can control the value of the reflection of the new material using the **Value** slider bar. You can also attach a bitmap image to the material by choosing the **Find File** button. When you choose this button, the **Bitmap File** dialog box will be displayed that allows you to select the bitmap file.



#### Tip

AutoCAD has stored its bitmap images in the *Textures* subdirectory of the AutoCAD 2004 directory. These bitmap images are in the \*.tga format. Therefore, to select any of these images, you will have to first select \*.tga from the **Files of type** drop-down list in the **Bitmap File** dialog box.



#### Note

You can create a material similar to the original AutoCAD material. This is done by selecting the original material from the **Materials** area and then choosing the **Duplicate** button.

## MODIFYING THE MATERIAL

You can also modify AutoCAD materials using the **Materials** dialog box. To modify a material, select the material from the **Materials** area in the **Materials** dialog box and then choose the **Modify** button. When you choose this button, the **Modify Material** dialog box will be displayed. This dialog box will depend upon the type of material that is selected to be modified.

## UNDERSTANDING ADVANCED RENDERING

**Toolbar:** Render > Render  
**Menu:** View > Render > Render  
**Command:** RENDER



As mentioned earlier, render allows you to control the appearance of the objects in the design. This is done by defining the surface material and reflective quality of the surface and by adding lights to get the desired effects. The basic rendering has already been discussed earlier in this chapter, and now you will learn about the advanced rendering. You will also learn about the other options of the **Render** dialog box shown in Figure 26-43.

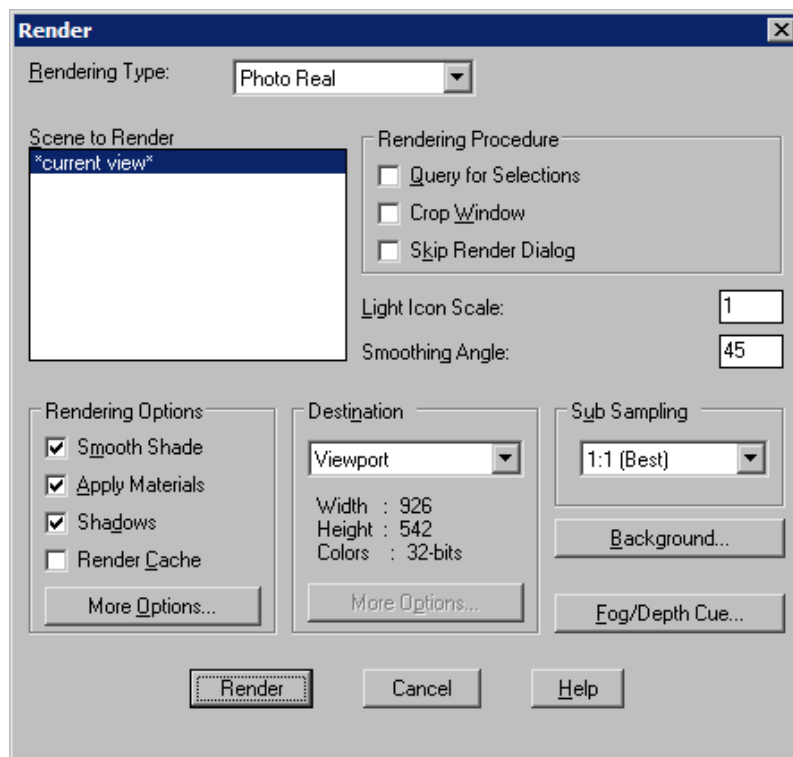


Figure 26-43 *Render* dialog box

## Rendering Procedures Area

The **Rendering Procedure** area of the **Render** dialog box has the following options.

### Query for Selections

If you select the **Query for Selections** check box, AutoCAD prompts you to select objects to render. Only the objects that you have selected will now be rendered. This way you can avoid rendering all the objects drawn on the screen and render only the desired objects. This reduces the time it takes to render large drawings.

### Crop Window

If you select this check box, AutoCAD will prompt you to define a window. Only the portion of the design that lies completely inside the window will be rendered.

### Skip Render Dialog

If you choose the **Skip Render Dialog** option, the current view is rendered without displaying the Render dialog box, and previous settings of render are taken into consideration. To invoke this dialog box again, when you invoke the **RENDER** command, you need to enter **RPREF** (Render preferences) at the Command prompt and clear this check box.

### Light Icon Scale

The **Light Icon Scale** edit box can be used to set the size of the light blocks in the drawing.

### Smoothing Angle

The **Smoothing Angle** option lets you specify the angle defined by two edges. The default value for smoothing an angle is 45-degree. Angles less than 45-degree make the edges smooth. Angles greater than 45-degree are taken as edges.

## Rendering Options Area

Various rendering options are provided under the **Rendering Options** area of this dialog box. These are described next.

### Smooth Shade

The **Smooth Shade** option allows you to smooth the rough edges. If this option is enabled, the rough-edged appearance of a multiface surface is smoothed. This option determines that the surface normals and colors across two or more adjoining faces are blended.

### Apply Materials

The **Apply Materials** option allows you to assign surface materials to objects. If this check box is cleared, the objects in the drawing are assigned the **\*GLOBAL\*** material.

### Shadows

When you select this option, AutoCAD generates shadows. The effect of shadows would not be visible if this check box is cleared even if the shadow option of the **Lights** dialog box is

enabled. This option applies only to Photo Real and Photo Ray trace rendering.

### Render Cache

Selecting this option results in writing rendering information to a temporary cache file that is stored in the memory of the current drawing. This file can then be used for the coming renderings. This eliminates the need for AutoCAD to recalculate all the objects for rendering. This saves time, especially when rendering solids.

### More Options

If you choose the **More Options** button, the **Render Options** dialog box is displayed. The options in this dialog box depend on the type of rendering selected from the **Rendering Type** drop-down list. These dialog boxes provide the options to improve render quality.

### Destination Area

The **Destination** area of the **Render** dialog box allows you to specify the destination for the rendered image output. The destination here refers to the kind of output of the rendering you desire. The kind of output can be selected from the drop-down list provided under this area. This drop-down list provides you with the following options.

### Viewport

If you select the **Viewport** option, AutoCAD renders the object in the current viewport and the output is displayed in the drawing area. This is the default option.

### Render Window

This option is selected to render the design to a window. When you select this option and choose the **Render** button, a window is opened displaying the rendered design. This option is generally used for plotting the rendered design. You can control the quality and size of the output using various buttons provided in this window.

### File

The **File** option lets you output the rendered image to a file. When you select this option, the **More Options** button is activated. You can choose this button to specify the type and the size of output file. After setting all the options, when you choose the **Render** button, the **Rendering File** dialog box will be displayed. You can specify the name and the directory for the output file using this dialog box.

### More Options

This button will be available only if you select **File** from the drop-down list provided under this area. You can use the **More Options** button to set the configuration for the output file through the **File Output Configuration** dialog box (Figure 26-44).

**File Type Area.** In this area, you can specify the type and rendering resolution of the output file. The file formats allowed are BMP, PCX, Postscript, TGA, and TIFF. The screen resolution can also be specified in this area.

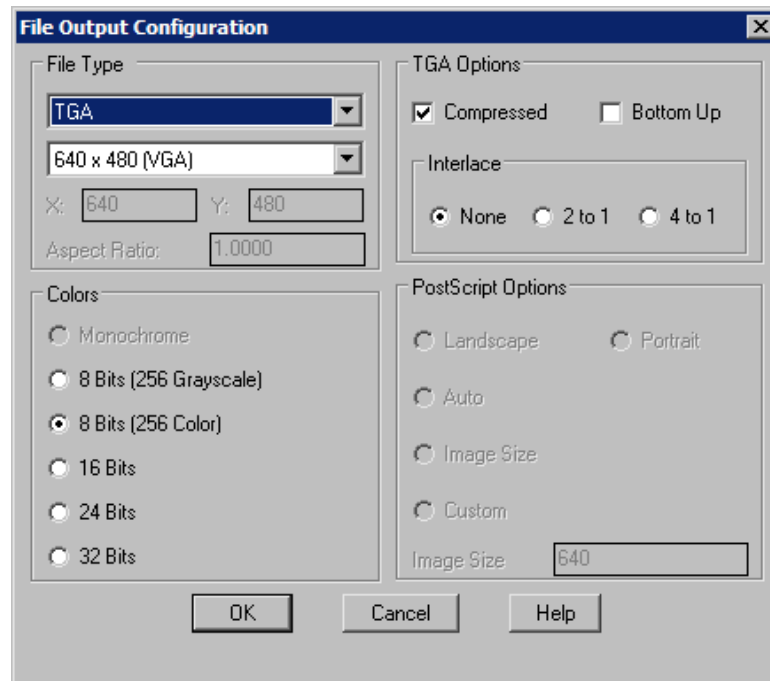


Figure 26-44 File Output Configuration dialog box

**Colors Area.** The colors in the output file can be specified in this area. The type of output file will determine the options that will be available in this area.

**TGA Options Area.** The **Compressed** option lets you specify compression for those file types that allow compression. The **Bottom Up** option lets you specify the scan line start point as bottom left instead of top left.

**Interlace Area.** Selecting the **None** option turns off line interlacing. Selecting the other two options turn on the interlacing.

**PostScript Options Area.** The **Landscape** and **Portrait** options in this area specify the orientation of the file. The **Auto** option automatically scales the image. The **Custom** option sets the image size in pixels. The **Image Size** edit box uses the explicit image size.

### Sub Sampling

The **Sub Sampling** drop-down list controls the quality and time of rendering by reducing the number of pixels to be rendered. A **1:1** ratio (default) produces the best quality rendering but takes maximum time. If you are just testing a rendering, you can change the value to reduce rendering time. Figure 26-45 shows a model rendered with the ratio set to 1:1, and Figure 26-46 shows a model rendered with the ratio set to 6:1.



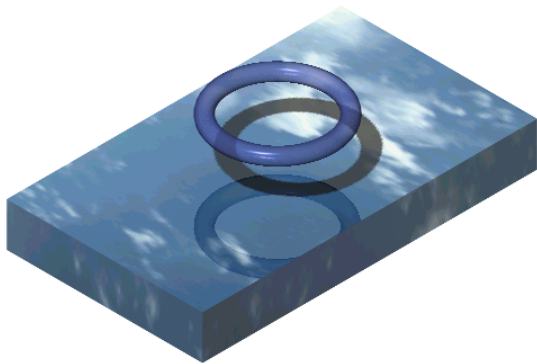


Figure 26-45 Model rendered keeping the ratio to 1:1

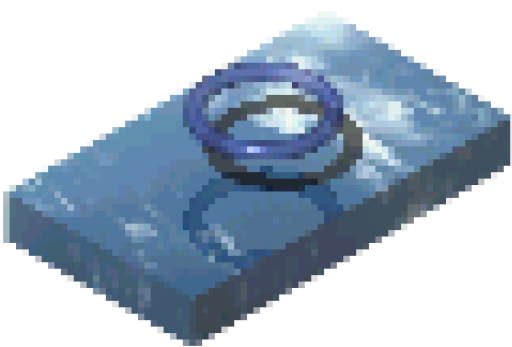


Figure 26-46 Model rendered keeping the ratio to 6:1

### Background

You can choose the **Background** button in the **Render** dialog box to invoke the **Background** dialog box (Figure 26-47). This dialog box can also be displayed using the **BACKGROUND** command. The background option allows you to add a background to a rendering.

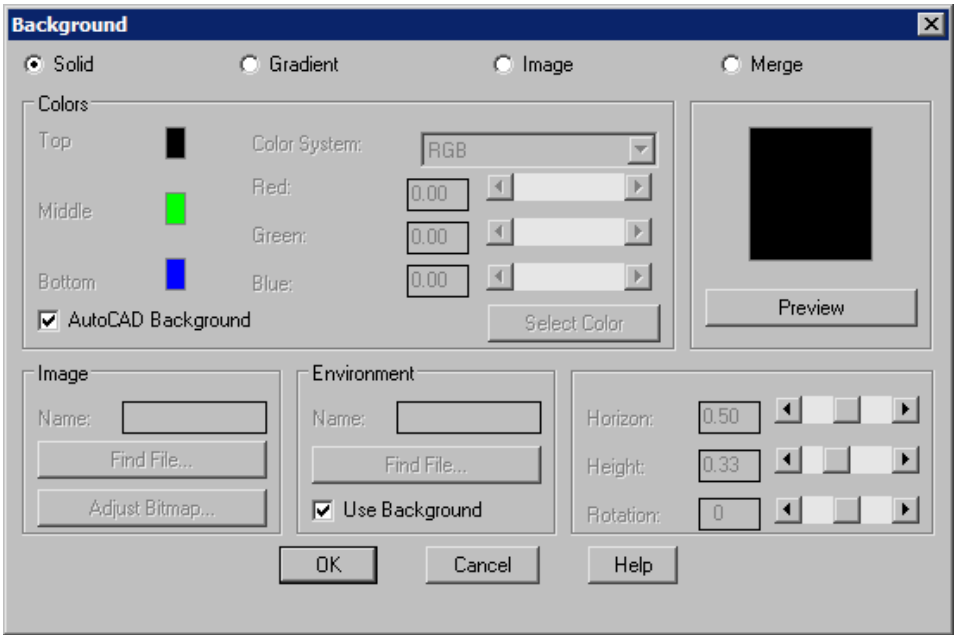


Figure 26-47 Background dialog box

## Solid

This option is selected to set a solid background for the rendering. By default, the solid AutoCAD background is selected. However, if you clear the **AutoCAD background** check box, the **Colors** area is available. In this area, you can specify a color for the background. Note that the background will display only a single color when you render using this option.

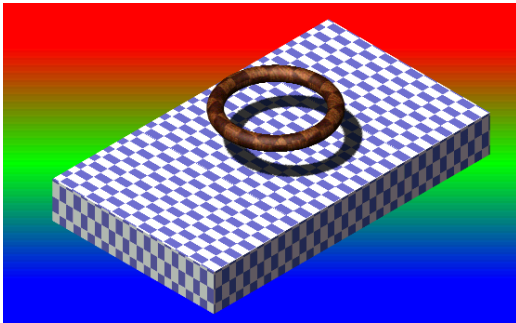
## Gradient

Here you can specify background in the graded pattern of colors. You can specify colors from the **Colors** area by selecting different options. You can set the color using the **RGB** or **HLS** color patterns. You can also select the colors using the **Select Custom Color** button to assign it to the **Top**, **Middle**, and **Bottom** color swatch, and can see the preview by selecting the **Preview** button. Figure 26-48 shows a rendering with **Gradient** background.

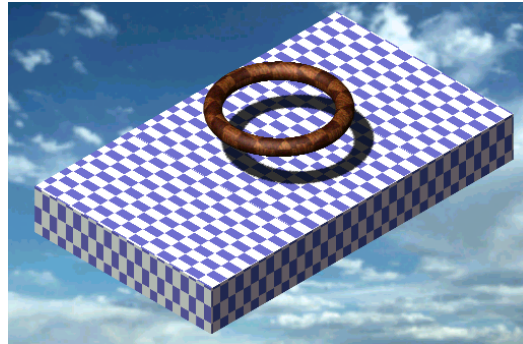
Apart from the color area, there are three more buttons that are activated when you select this option. These buttons are **Horizon**, **Height**, and **Rotation**. The **Horizon** button represents the percentage of unrotated height. The **Height** button represents the percentage of the second color in a three-color pattern. The **Rotation** button will rotate the background pattern through the angle specified.

## Image

This option is used to specify a bitmap file that will be used as a background for the rendering. When you select this button, the options under the **Image** area are activated. You can choose the **Find File** button to display the **Background Image** dialog box. This dialog box can be used to select the image file for the background. As mentioned earlier, AutoCAD image files are saved in the *Textures* subdirectory in the \*.tga format. You can select any of these files or other bitmap files using this dialog box, see Figure 26-49.



**Figure 26-48** Rendering with gradient background



**Figure 26-49** Rendering with image as the background

## Merge

This option will merge the previous background settings with the current one. The previous

background settings may be the solid, gradient, or image. To visualize it, draw a 3D model and then render it with the help of the solid, gradient, or image option of the **Background** dialog box. Without regenerating the model, now move this model to some distance and then use the **Merge** option of the **Background** dialog box to render the model again. You will see that the same model is visible in two different positions. This is because the **Merge** option has merged the previous rendering with the current one.

### Environment Area

This option specifies an environment that creates more reflection and refraction effects on objects with reflective ray-traced materials. You can specify the environment with the help of the **Find File** button that displays the **Raytraced Environment Image** dialog box. Here you can specify the file for the environment.

### Fog / Depth Cue

You can use the **Fog** option to add a misty effect to a rendering. You can also assign a color to the fog. When you choose the **Fog** button, the **Fog / Depth Cue** dialog box is displayed as shown in Figure 26-50. This dialog box can also be invoked using the **FOG** command. Select the **Enable Fog** check box to enable the fog. Enabling the fog does not affect the other

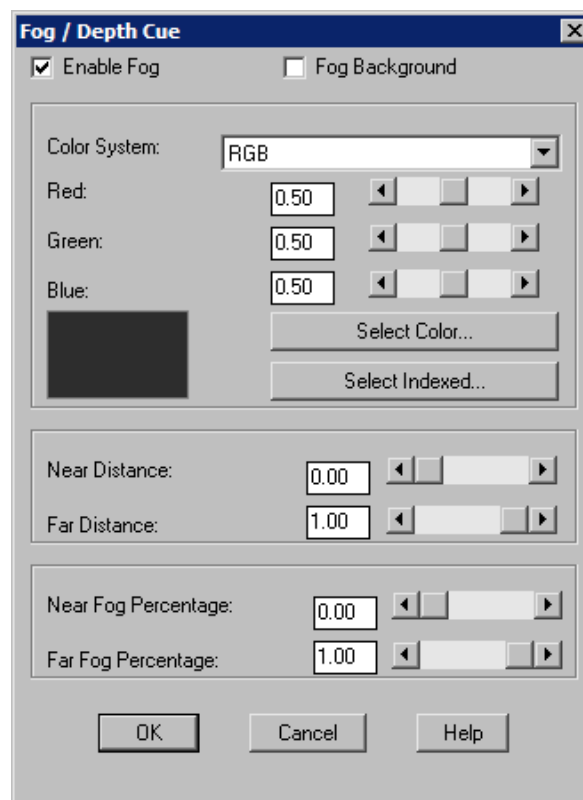
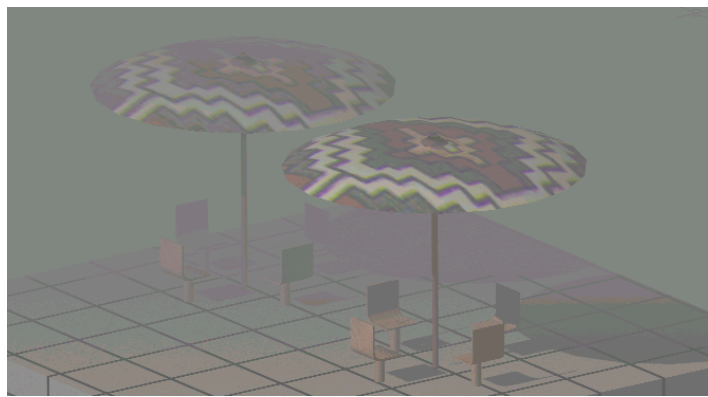


Figure 26-50 Fog / Depth Cue dialog box

settings of the rendering. Choose the **Fog Background** check box to enable the fog to the model as well as background. With the help of the **Color System** you can assign color to the fog by various options specified in the dialog box. **Near Distance** and **Far Distance** options define where the fog begins and ends. The values specified in the **Near Distance** and **Far Distance** edit boxes are the percentage of the distance between the camera and the back clipping plane. The **Near Fog Percentage** and **Far Fog Percentage** edit boxes describe the percentage of fog at the near and far distances. Figure 26-51 shows a rendering displaying the fog effect.



*Figure 26-51 A design rendered with the fog effect*

## DEFINING AND RENDERING A SCENE

<b>Toolbar:</b>	Render > Scenes
<b>Menu:</b>	View > Render > Scene
<b>Command:</b>	SCENE



The rendering depends on the view that is current and the lights that are defined in the drawing. Sometimes the current view or the lighting setup may not be enough to show all features of an object. You might need different views of the object with a certain light configuration to show different features of the object. But when you change the view or define the lights for a rendering, the previous setup is lost. To avoid this, you can save the rendering information in a **scene**. For each scene, you can assign a view and the lights. When you render a particular scene, AutoCAD Render uses the view information and the lights that were assigned to that scene. It ignores the lights that were not defined in the scene. Defining scenes makes it convenient to render different views with the required lighting arrangement. The scenes that you create are displayed under the **Scene to Render** area of the **Render** dialog box. When you choose the **Scene** button from the **Render** toolbar, the **Scenes** dialog box will be displayed as shown in Figure 26-52. To create a new scene, choose the **New** button from the **Scenes** dialog box to display the **New Scene** dialog box as shown in Figure 26-53.

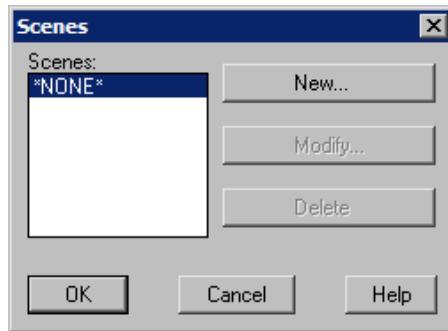


Figure 26-52 Scenes dialog box

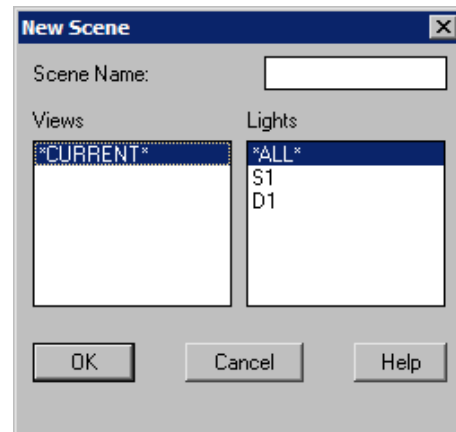


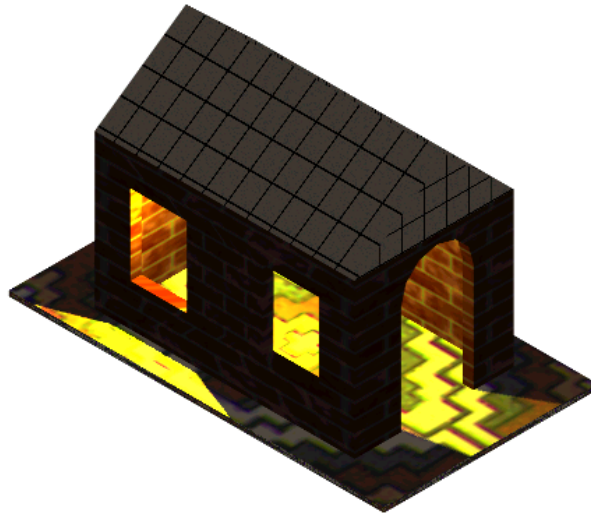
Figure 26-53 New Scene dialog box

The **New Scene** dialog box will display all the views and lights available in the current drawing. You can specify the name of the current scene and select the view and lights that you want to display in the current scene. Now, choose **OK** from the **New Scene** dialog box to go back to the **Scenes** dialog box. This dialog box will now display the new scene in the **Scenes** area. Similarly, you can modify or delete an existing scene using this dialog box.

### Example 4

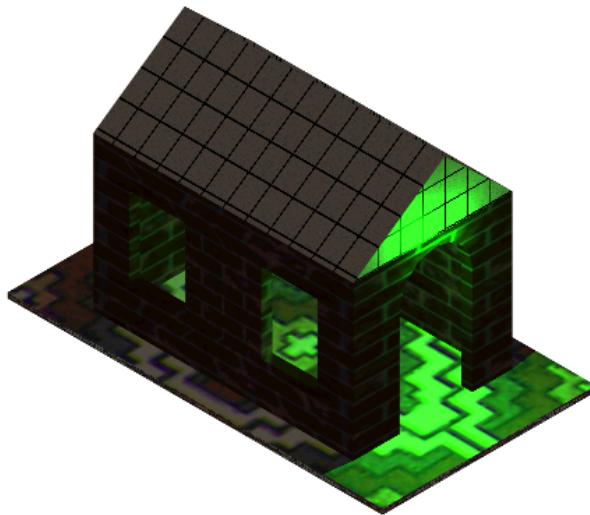
In this example, you will open the model of Example 2 of this chapter and then create two scenes with the names **SCENE1** and **SCENE2**. The first scene should display the effect of light 1 and the second scene should display the effect of light 2.

1. Open the drawing of Example 2.
2. Choose the **Scenes** button from the **Render** toolbar to invoke the **Scenes** dialog box.
3. Choose the **New** button in the **Scenes** dialog box to invoke the **New Scene** dialog box.
4. Enter **SCENE1** in the **Scene Name** area and then select **1** from the **Lights** area. Choose **OK** to go back to the **Scenes** dialog box.
5. Again choose the **New** button to display the **New Scene** dialog box. Enter **SCENE2** in the **Scene Name** edit box. Select **2** from the **Lights** area. Now, choose **OK** to return to the **Scenes** dialog box. You can now see both scenes in the **Scene** area of the **Scenes** dialog box.
6. Choose **Render** button from the **Render** toolbar to invoke the **Render** dialog box. Select **SCENE1** from the **Scene to Render** area. Choose the **Render** button to render the model with the effect of light 1 only as shown in Figure 26-54.



*Figure 26-54 Rendering SCENE1*

7. Similarly, render the drawing by selecting **SCENE2** from the **Scene to Render** area of the **Render** dialog box to view the effect of light 2, see Figure 26-55.



*Figure 26-55 Rendering SCENE2*



**Tip**

*If you want to see the effects of all the lights simultaneously on the model, choose the **Current View** in the **Scene to Render** area in the **Render** dialog box.*

## DEFINING AND RENDERING THE LANDSCAPING

**Toolbar:** Render > Landscape New  
**Menu:** View > Render > Landscape New  
**Command:** LSNEW



The landscaping objects are the objects with a bitmap image attached to them. You can attach the landscaping objects to your model to give it a natural look. The display of the landscaping object depends on whether you choose one or two faces for it and whether it is view aligned. You make these choices according to your rendering requirements. When you choose this button, the **Landscape New** dialog box will be displayed as shown in Figure 26-56.

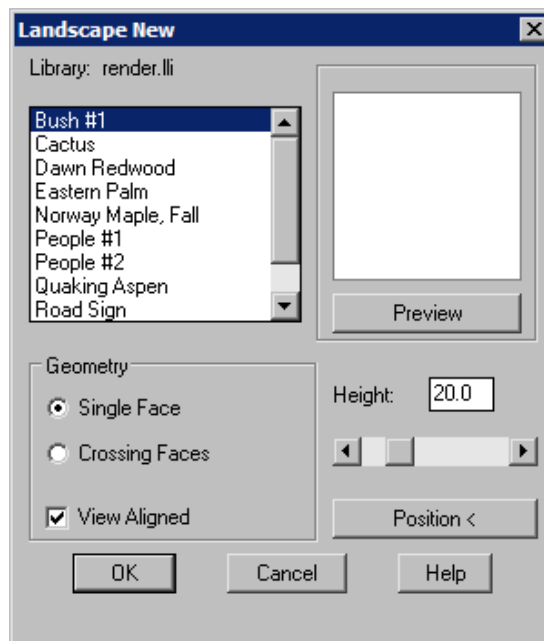
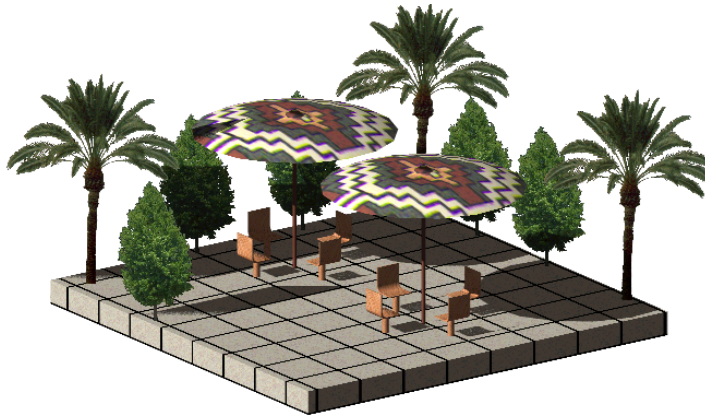


Figure 26-56 *Landscape New* dialog box

This dialog box displays all the landscaping objects that are stored in the *render.lli* library. You can select the desired landscaping object from the list box of the **Landscape New** dialog box. To place a landscaping object, choose the **Position** button. The **Landscape New** dialog box will be temporarily closed and you will be prompted to specify the location for the object. Once you have defined the location, the dialog box will be redisplayed on the screen. The height of the landscaping object can be controlled using the **Height** spinner. You can define a single face landscaping object or a multiface landscaping object. You can also define a view aligned landscaping object. This object will be displayed as it is even if you change the viewpoint of the drawing. Once you have added the landscaping objects to the drawing, render it to view all the landscaping objects.

Figure 26-57 shows a rendering with the landscaping objects.

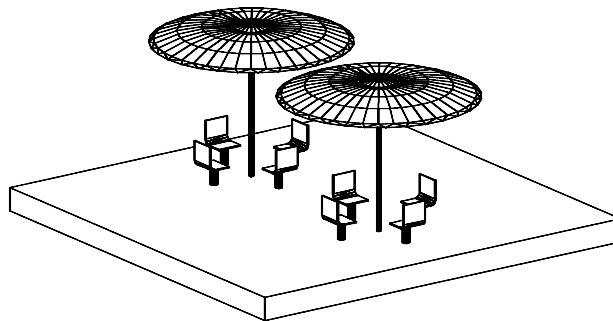


*Figure 26-57 Rendered scene showing the landscaping objects*

### Example 5

In this example, you will attach the landscaping objects to the model of Example 3.

1. Open the drawing of Example 3. Using the **3DORBIT** command, change the orientation of the model and then zoom it, see Figure 26-58.

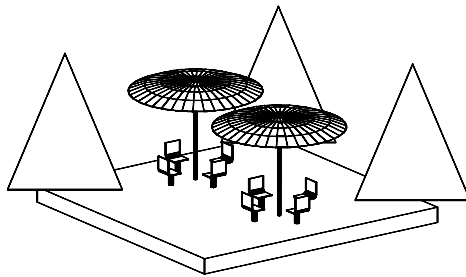


*Figure 26-58 Model after rotating and zooming*

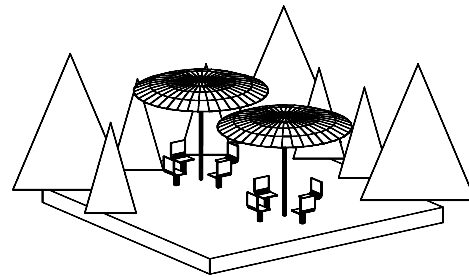
2. Choose the **Landscape New** button from the **Render** toolbar to invoke the **Landscape New** dialog box.



3. In this dialog box, choose **Eastern Palm** from the list box. Choose the **Position** button to place it in the drawing. You will be prompted to choose the **Location of the base of the object**. Specify the location close to the left corner. The **Eastern Palm** landscape object will be placed there.
4. Similarly, place the **Eastern Palm** at the other two corners leaving the bottom left corner as shown in Figure 26-59.
5. Again, using the **Landscape New** dialog box, place **Sweetgum Summer** in the drawing as shown in Figure 26-60.



**Figure 26-59** Model after adding **Eastern Palm**



**Figure 26-60** Model after adding **Sweetgum Summer**

6. Render the drawing using the **Render** button. The drawing after rendering should look similar to the one shown in Figure 26-61.



**Figure 26-61** Model after rendering

## EDITING THE LANDSCAPING OBJECTS

<b>Toolbar:</b>	Render > Landscape Edit
<b>Menu:</b>	View > Render > Landscape Edit
<b>Command:</b>	LSEdit



The landscaping objects placed in the drawings can also be edited. You can modify the height and location of the landscaping object or change the geometry. However, you cannot replace one landscaping object by the other. When you choose this button, you will be prompted to select the landscaping object to be edited. The **Landscape Edit** dialog box will be displayed when you select the object. The options under this dialog box are similar to those under the **Landscape New** dialog box.

## CREATING USER-DEFINED LANDSCAPING OBJECTS

<b>Toolbar:</b>	Render > Landscape Library
<b>Menu:</b>	View > Render > Landscape Library
<b>Command:</b>	LSLIB



By default, *render.lli* contains the standard landscaping objects. In case you want to create your own landscaping objects, you will have to invoke the **Landscape Library** dialog box. This dialog box is invoked by choosing the **Landscape Library** button from the **Render** toolbar. The new landscaping object can be created by choosing the **New** button from the **Landscape Library** dialog box. You can save the new landscaping object in the same library or create a new library using the **Save** button.

## MAPPING THE MATERIALS ON THE OBJECTS

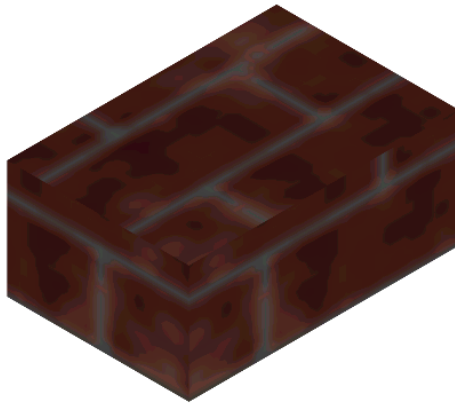
<b>Toolbar:</b>	Render > Mapping
<b>Menu:</b>	View > Render > Mapping
<b>Command:</b>	SETUV



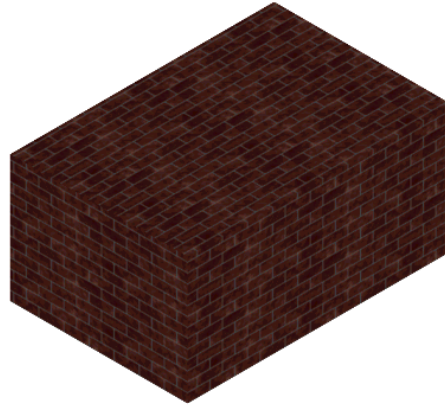
Mapping here is defined as the method of adjusting the coordinates and bitmap of the pattern of the material attached to the solid model. Mapping is generally required when the pattern of the material is not properly displayed on the object after rendering. This can be due to the sizes of the objects. For example, Figure 26-62 shows a model drawn within the limits of 12.00, 9.00. This model has **Brown Brick** attached to it. You can clearly see that the brick pattern is not clear after rendering. Figure 26-63 shows a model drawn with limits 100.00, 100.00 and with the same material. In this model, the brick pattern is clear. Therefore, to display the brick pattern in the smaller box, you need to adjust the coordinates and bitmap of the material.

The mapping is done with the help of the **Mapping** dialog box. To display this dialog box, choose the **Mapping** button from the **Render** toolbar. You will be prompted to select objects. Select the objects to be mapped to display the **Mapping** dialog box, see Figure 26-64.

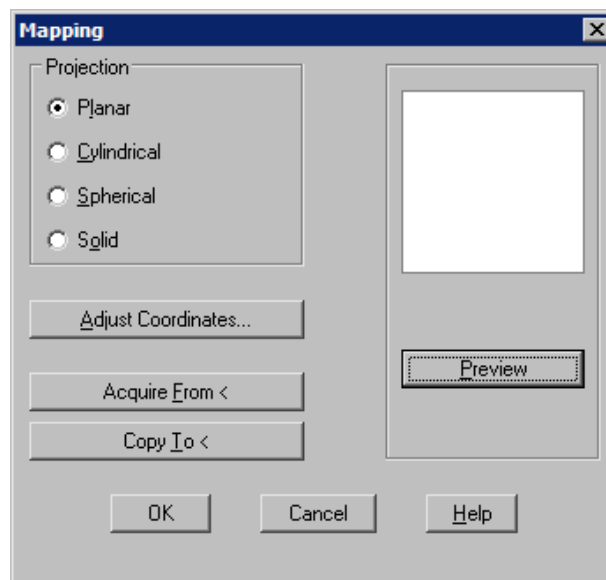
This dialog box allows you to specify the projection of the material in planar, cylindrical,



**Figure 26-62** Brick pattern on the model drawn within 12,9 limits



**Figure 26-63** Brick pattern on the model drawn with limits 100,100



**Figure 26-64** Mapping dialog box

spherical, and solid forms. Figure 26-65 shows a model with planar projection and Figure 26-66 shows a model with cylindrical projection.

You can acquire the mapping from an existing object and copy on the selected object. You can preview the model in the preview window by choosing the **Preview** button.

You can also adjust the projection coordinates of the material with respect to the model by choosing the **Adjust Coordinates** button. When you choose this button, the **Adjust Coordinates**

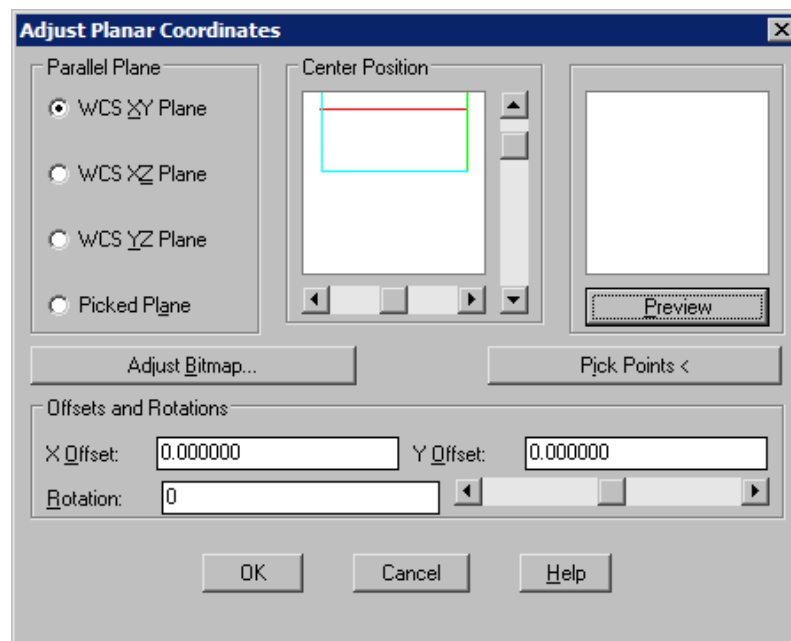


**Figure 26-65** Model with planar projection



**Figure 26-66** Model with cylindrical projection

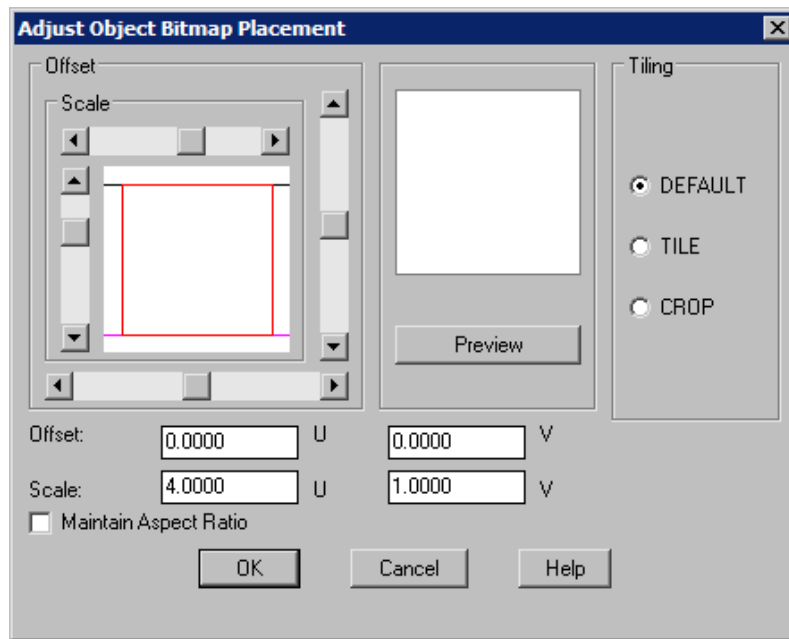
dialog box will be displayed. This dialog box will depend upon the type of projection selected from the **Projection** area of the **Mapping** dialog box. Figure 26-67 shows the dialog box for the cylindrical projection type.



**Figure 26-67** Adjust Cylindrical Coordinates dialog box

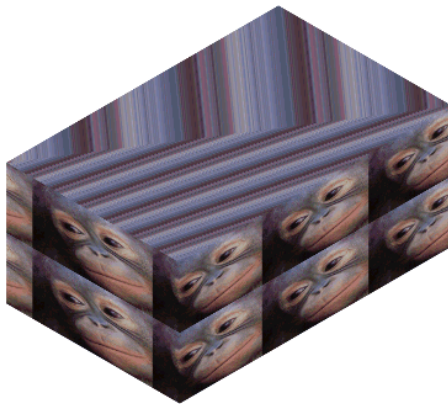
The options under the **Adjust Coordinates** dialog box allow you to map the material with respect to the specified planes. You can also specify the offset and rotation for the pattern of the material along the specified axis. To adjust the bitmap image of the material, choose the

**Adjust Bitmap** button. When you choose this button, the **Adjust Object Bitmap Placement** dialog box will be displayed, see Figure 26-68. The options under this dialog box allow you to change the scale factor of the bitmap image of the material. You can also specify the offset values for the bitmap image of the material using this dialog box.



*Figure 26-68 Adjust Object Bitmap Placement dialog box*

Figures 26-69 and 26-70 show the models rendered with different U and V scale factors set using the **Adjust Object Bitmap Placement** dialog box.



*Figure 26-69 Model rendered with U scale = 8, V scale = 2*



*Figure 26-70 Model rendered with U scale = 4, V scale = 1*

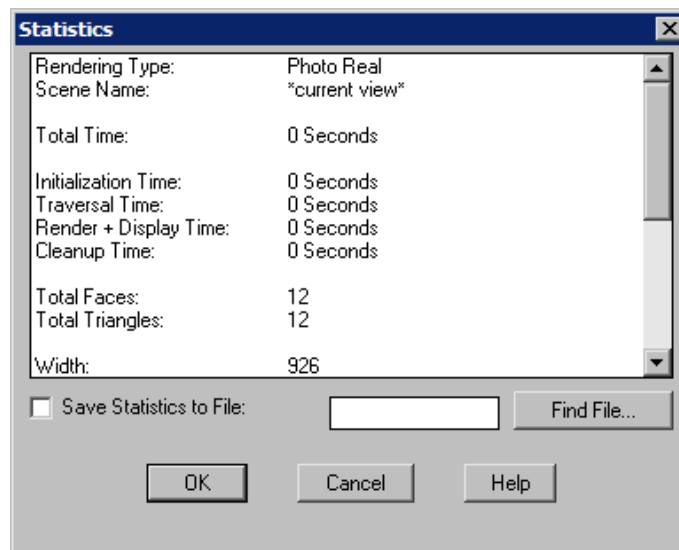
## OBTAINING RENDERING INFORMATION

**Toolbar:** Render > Statistics  
**Menu:** View > Render > Statistics  
**Command:** STATS



This command is used to obtain information about the last rendering. When you choose this button, the **Statistics** dialog box will be displayed as shown in Figure 26-71.

This dialog box provides the information about the name of the scene, the rendering type used, the time taken to produce the rendering, the number of faces processed by the rendering, and the number of triangles processed by the rendering. The information contained in the dialog box cannot be edited. However, the information can be saved to a file by selecting the **Save Statistics to File** check box. The name of the file can be specified in the edit box or you can use the **Find File** button. If a file by the specified name already exists, AutoCAD adds the present information to that file. You can use the **EDIT** function of any text editor to read the file.



*Figure 26-71 Statistics dialog box*

## SAVING A RENDERING

A rendered image can be saved by rendering to a file or by rendering to the screen and then saving the image. Redisplaying a saved rendering image requires very less time compared to the time involved in rendering. Various methods of saving the rendered image are discussed next.

### Saving the Rendered Image to a File

You can save a rendered image directly to a file. One of the advantages of saving the rendered image is that you can redisplay the rendered image in less time as compared to again rendering

the image. Another advantage is that when you render to the screen, the resolution of the rendering is limited by the resolution of your current display. However, if you render to a file, you can specify a higher resolution than that of your current display. Later you can display this rendered image that has a higher resolution. The rendered images can be saved in different formats, such as TGA, TIFF, BMP, PostScript, BMP, PCX, and IFF. The following steps explain the procedure of saving a rendering to a file.

1. Choose the **Render** button from the **Render** toolbar to invoke the **Render** dialog box.
2. In the **Destination** area, select **File** from the **Viewport** drop-down list.
3. Choose the **More Options** button from the **Destination** area. The **File Output Configuration** dialog box is displayed.
4. Specify the file type, rendering resolution, colors, and other options. Then choose the **OK** button to go back to the **Render** dialog box.
5. Choose the **Render** button in the **Render** dialog box. The **Rendering File** dialog box is displayed. Specify the name of the file to which you want to save the rendering and then choose the **OK** button. The rendered image will be saved.

## Saving the Viewport Rendering

A rendered image in the viewport can be saved using the **SAVEIMG** command. This command can be invoked by choosing **Tools > Display Image > Save**. The **Save Image** dialog box will be displayed when you invoke this command, see Figure 26-72. This dialog box is used to specify the type, size, and offset for the output file. The valid output file formats are TGA, TIFF, and BMP. The following steps explain the procedure of saving a viewport rendering.

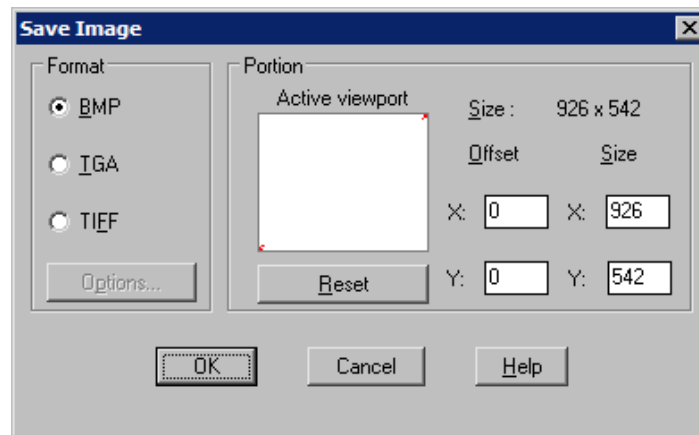


Figure 26-72 Save Image dialog box

1. Invoke the **Render** dialog box and choose the **Render** button to render the object.



2. Choose **Tools > Display Image > Save** to invoke the **Save Image** dialog box.
3. Specify the file format (TGA, TIFF, or BMP), size, and offsets for the image, and then choose the **OK** button to display the **Image File** dialog box.
4. Specify the name of the file to which you want to save the rendering, and then choose the **OK** button. In this way, a rendered image in the viewport can be saved in the specified file format.

## Saving a Render-Window Rendered Image

A rendered image in the **Render** window can be saved using the **Save** button available in the **Render** window. In this case, the rendered image will be saved in a *\*.bmp* format. The following steps explain the procedure for saving a render-window image.

1. Invoke the **Render** dialog box, and select the **Render Window** option in the **Destination** area. Choose the **Render** button to display the **Render** window. The rendered object is displayed in this window.
2. Choose the **Save** button in the **Render** window to save the rendered image. The **Save BMP** dialog box is displayed. Enter the file name in the **File Name** edit box, and then choose the **OK** button. You can set various options using the **Options** button in the **Render** window.

## DISPLAYING A RENDERED IMAGE

<b>Menu:</b>	Tools > Display Image > View
<b>Command:</b>	REPLAY

The rendered images saved in the TGA, TIFF, or BMP format can be redisplayed on the screen using the **REPLAY** command. When you invoke this command, the **Replay** dialog box will be displayed as shown in Figure 26-73.

This dialog box is used to locate the saved image. You can select the type of file from the **Files of type** drop-down list and then select the image file. The **Image Specifications** dialog box will be displayed upon selecting the image file, see Figure 26-74. This dialog box is used to specify various image parameters. Specify the parameters and then choose **OK** to display the image on the screen. This image will be displayed as a raster image.



### Note

*As the image displayed on the screen using the **Replay** command is a raster image, it will be removed from the display if any command that leads to regeneration is invoked.*

## PLOTTING RENDERED IMAGES\*

Plotting the rendered design was one of the biggest problems in the previous releases of AutoCAD. You had to go through a number of steps to plot a rendered drawing. However, in



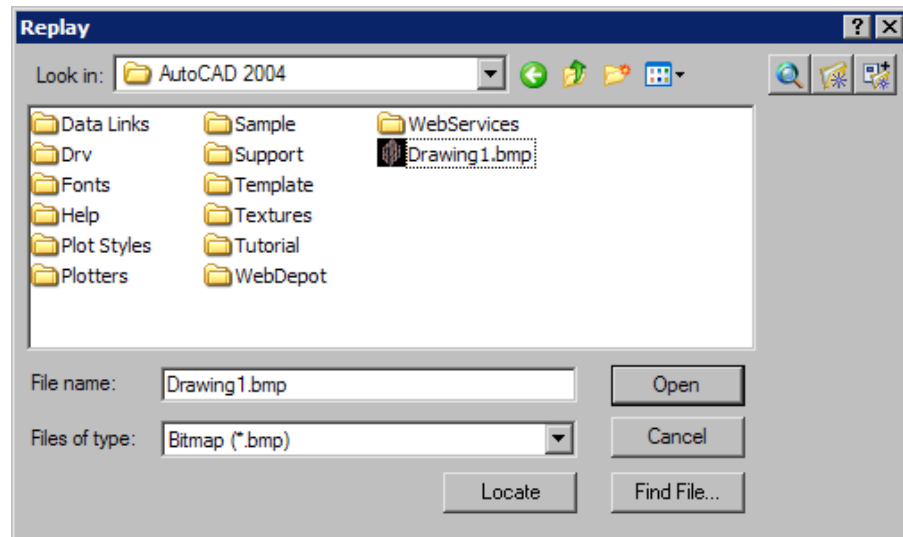


Figure 26-73 *Replay dialog box*

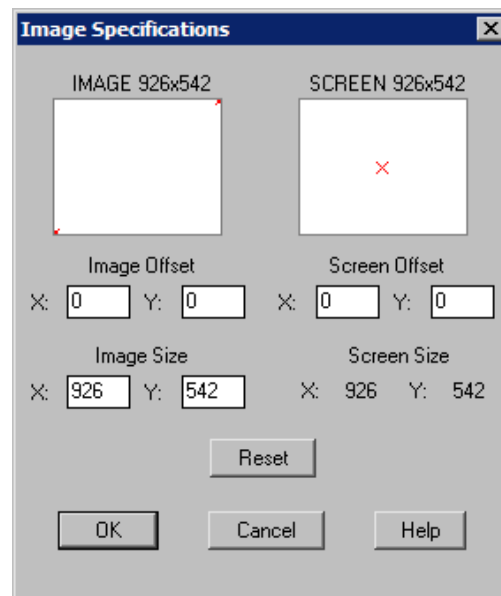


Figure 26-74 *Image Specifications dialog box*

this release of AutoCAD, plotting of rendered designs has become extremely easy. To plot a rendered design, follow the following steps.

1. Open the design to be plotted and then invoke the **Plot** dialog box. Remember that you

do not need to first render the design and then invoke the **Plot** dialog box. You can also render the design while plotting.

2. Select the required printer from the **Plot Device** tab and select the other options.
3. Invoke the **Plot Settings** tab. Select the **Rendered** option from the **Shade plot** drop-down list in the **Shaded viewport options** area.
4. Set the other options in this tab and then plot the design. The design will be first rendered and then plotted in the rendered form.

## UNLOADING AutoCAD RENDER

When you select any AutoCAD **RENDER** command, AutoCAD Render is loaded automatically. If you do not need AutoCAD Render, you can unload it by entering the **ARX** at the Command prompt. You can reload AutoCAD Render by invoking the **RENDER** command or any other command associated with rendering (such as **SCENE**, **LIGHT**, and so on).

Command: **ARX**

Enter an option [?:Load/Unload/Commands/Options]: **U**

Enter ARX/DBX file name to unload: **ACRENDER**

ACRENDER successfully unloaded.

## Self-Evaluation Test

Answer the following questions, and then compare your answers to the answers given at the end of this chapter.

1. A rendered image makes it easier to visualize the shape and size of a 3D object. (T/F)
2. You can unload AutoCAD Render by invoking the **ARX** command. (T/F)
3. Falloff occurs with a distant source of light. (T/F)
4. You can change the color of the ambient light. (T/F)
5. The \_\_\_\_\_ and \_\_\_\_\_ commands are used to import the material from the material library to the current drawing.
6. The \_\_\_\_\_ source emits a focused beam of light in the defined direction.
7. The default material library that is opened when you invoke the **MATLIB** command is \_\_\_\_\_.
8. The \_\_\_\_\_ command is used to insert the landscaping objects in the current drawing.

9. A \_\_\_\_\_ light source emits light in all directions, and the intensity of the emitted light is uniform.
10. In case you have saved the rendered image in a TGA, TIFF, or BMP format, you can use the \_\_\_\_\_ command to display the image.

### Review Questions

Answer the following questions.

1. You can also import the materials to the current drawing directly using the **RMAT** command. (T/F)
2. You can assign the materials to the object using the **AutoCAD Color Index**. (T/F)
3. The Photo Real rendering allows you to view the mirror effect of the material. (T/F)
4. You can increase or decrease the intensity of ambient light, but you cannot turn it completely off. (T/F)
5. Which light does not have a source, and hence, has no location or direction?
  - (a) **Ambient**
  - (b) **Point**
  - (c) **Spot**
  - (d) **Distant**
6. The intensity of light decreases as the distance increases. This phenomenon is called:
  - (a) **Attenuation**
  - (b) **Frequency**
  - (c) **Light Effect**
  - (d) **None**
7. Which light allows you to define the geographic location?
  - (a) **Ambient**
  - (b) **Point**
  - (c) **Spot**
  - (d) **Distant**
8. Apart from the **RENDER** command, which command can be used to change the background of rendering?
  - (a) **FOG**
  - (b) **ARX**
  - (c) **LIGHT**
  - (d) **BACKGROUND**
9. Which command is used to map the materials on the object?
  - (a) **MAP**
  - (b) **MATERIAL**
  - (c) **SET**
  - (d) **SETUV**

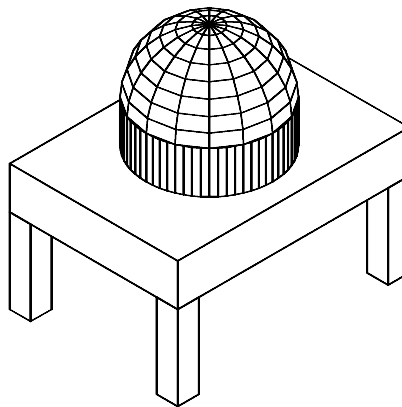
10. In the \_\_\_\_\_ source, the light falling on the object (brightness) is inversely proportional to the distance of the object from the light source.
11. The \_\_\_\_\_ command allows you to define the scenes for viewing the effect of the selected light sources.
12. A spotlight source emits a \_\_\_\_\_ beam of light in one direction only.
13. Redisplaying a saved rendered image takes \_\_\_\_\_ time as compared to the time involved in rendering.
14. You can assign the materials using the AutoCAD Color Index using the \_\_\_\_\_ dialog box.
15. Attenuation is defined as \_\_\_\_\_.

## Exercises

### Exercise 1

*General*

Create the 3D drawings as shown in Figure 26-75. Next, render the drawing after attaching the materials and inserting lights at appropriate locations so as to get a realistic model.



*Figure 26-75 Drawing for Exercise 1*

### Exercise 2

*Architectural*

Create the model (Figure 26-76) and attach the materials. Choose your own materials. Apply the Point light and the Spotlight at the sill of the window and at bottom of the door. Also attach a background **VALLEY\_1** and some landscaping objects to it and then render the model.

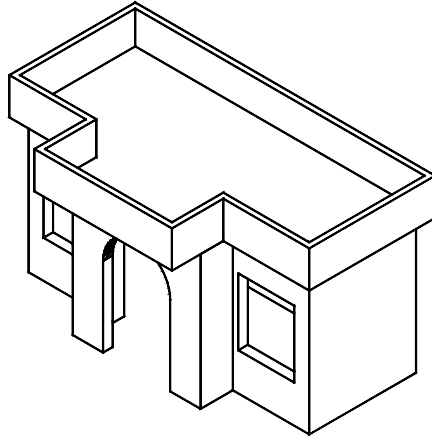


Figure 26-76 Model for Exercise 2

### Exercise 3

General

In this exercise, you will display the effect of fog on the model shown in Figure 26-77. Choose your own materials.

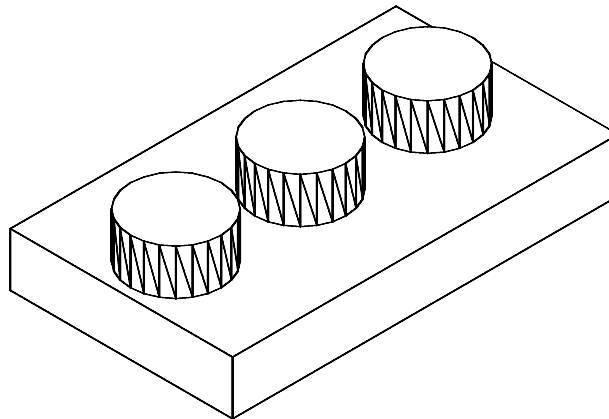


Figure 26-77 Model for Exercise 3



#### Tip

The display of fog is based on the trial and error method. Use different combinations of options available in the **Fog** dialog box to get the desired effect. To clearly visualize the fog, use white color as the background of model.

**Exercise 4***General*

Render the Tool Organizer of Chapter 25. Assign dark red wood material to the peg board and white ash to the remaining members. Also the wood texture of the two shelves should be in the opposite direction, Figure 26-78.



*Figure 26-78 Model for Exercise 4*

**Exercise 5***General*

Render the Work Bench of Chapter 25. Assign ash wood to all members. Adjust the mapping coordinates so that the rendered image looks as shown in Figure 26-79.



*Figure 26-79 Model for Exercise 5*

**Answers to Self-Evaluation Test**

1 - T, 2 - T, 3 - F, 4 - T, 5 - MATLIB, RMAT, 6 - spotlight, 7 - *render.mli*, 8 - LSNEW, 9 -distant, 10 - REPLAY