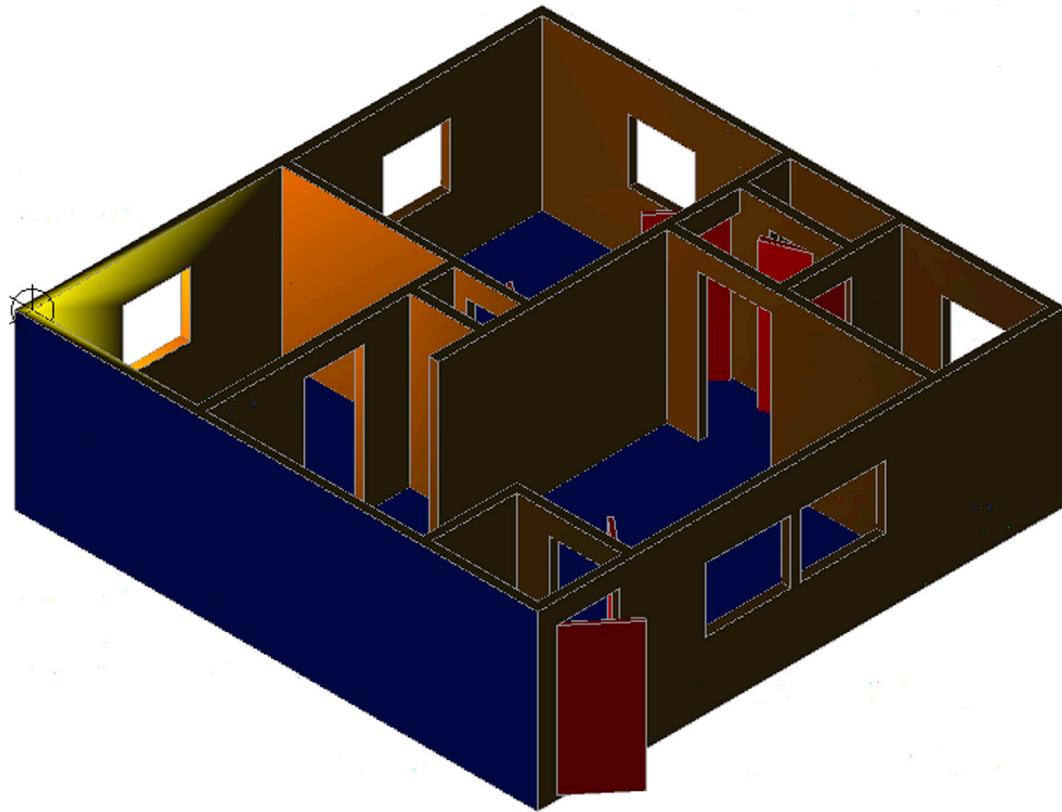


Chapter 30

Lighting and Rendering



Learning Objectives

In this final chapter, we explore lighting and rendering and discuss

- Point light
- Spotlight
- Distant light
- Shadows
- Sun and Sky
- Materials
- Rendering

By the end of this chapter, you will be able to add various lighting effects and basic materials to your design.

Estimated time for completion of this chapter: 2 hours.

30.1 INTRODUCTION TO LIGHTING AND RENDERING

This final chapter of this textbook is dedicated to “finishing” a design. This means the application of lighting, shadows, environmental effects, backgrounds, materials, and rendering. It is something that is done last, after a design is completed, as these effects do not stand alone but are applied to an existing model. All finishing effects are loosely grouped under two major categories: *lighting* and *rendering*.

It should be stated up front that, despite major improvements in AutoCAD’s lighting and rendering ability (including a new rendering engine for AutoCAD 2016 last year), it is still not quite on par with available dedicated rendering software. Packages such as Form Z, Rhino, and the industry standard 3ds Max (3D Studio Max) can create stunning photorealistic images and, in some cases, advanced animation. Autodesk has had a bit of a dilemma with AutoCAD. Should it pursue advanced rendering development and risk taking sales away from its own 3ds Max or add to AutoCAD to please those few customers who may need some rendering ability? After all, the vast majority of AutoCAD designs are still plain old 2D schematics or floor plans, and it makes little sense to load AutoCAD with rendering power that customers rarely need.

The answer is somewhere in the middle. AutoCAD always had limited lighting and rendering ability, going back to the Advanced Modeling Extension of the early releases, and slowly new features were added. These were just enough to satisfy casual 3D users but never so much that they would not consider the expensive dedicated software. One way around this, of course, is to purchase reasonably priced add-ons, like AccuRender (see Appendix: Lighting, Rendering, Effects, and Animation). This software adds dramatically to the existing capabilities without expensive investment.

In the meantime, AutoCAD’s development team (always in need of new features to advertise as a new version rolls out) slowly but surely kept improving the built-in lighting and rendering. Today, with the latest version, Release 2017, we have quite a bit to discuss. It is still not 3ds Max, but if you have never worked with advanced dedicated effects software, you may be impressed. It is also a great introduction into that world. Let us take a look first at lighting and related topics (such as Shadows and Sun and Sky), followed by materials and rendering.

30.2 LIGHTING

Lighting in digital art and CAD software is based on several established techniques and principles, and AutoCAD is no exception. A model can be lit in one of several ways, which involve variations on *ambient*, *directional*, or *spotlight* light sources. This, of course, mimics our everyday experiences, where we have a variety of lighting conditions, from diffused sunlight to the intense headlights of a car and everything in between.

Most of the options that have to do with lighting are either on the Lights toolbar or the Visualize tab of the Ribbon. Both are shown in Fig. 30.1, along with shadows and the sun options that we discuss later.

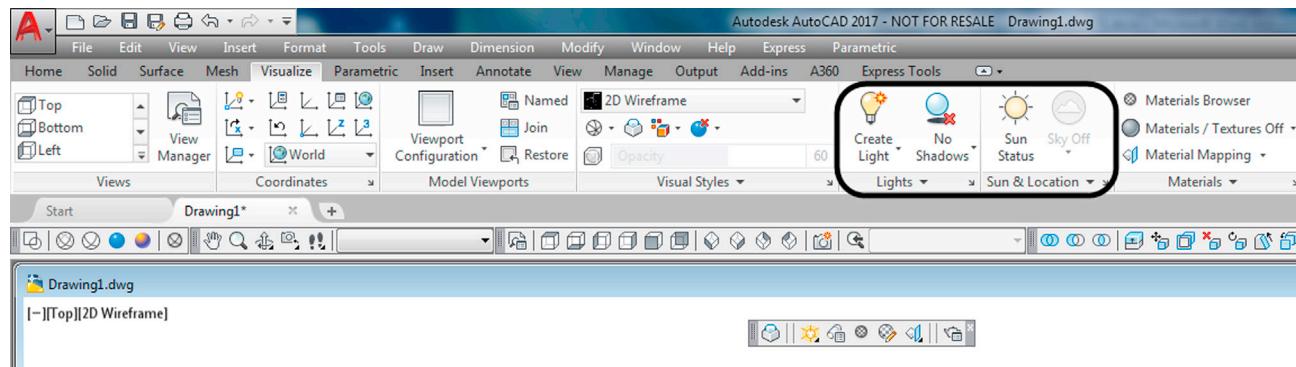


FIGURE 30.1 Ribbon Visualize tab (with relevant panels circled) and the Lights toolbar.

The three main options for lighting are

- *Point light*: This light, similar to a lightbulb, originates from one point and radiates in all directions.
- *Spotlight*: This light, similar to a flashlight, originates from one point, but radiates in only one direction.
- *Distant light*: This light, similar to the sun, originates from a distant source and does not fall off in intensity.

Let us give these various lights a try. After discussing the basics of each, we list the options available with each light type, which are more or less similar from one lighting scenario to another. Bring up the same 3D apartment model used in the previous chapter and switch to the Realistic Visual Style (RVS), as seen in Fig. 30.2.

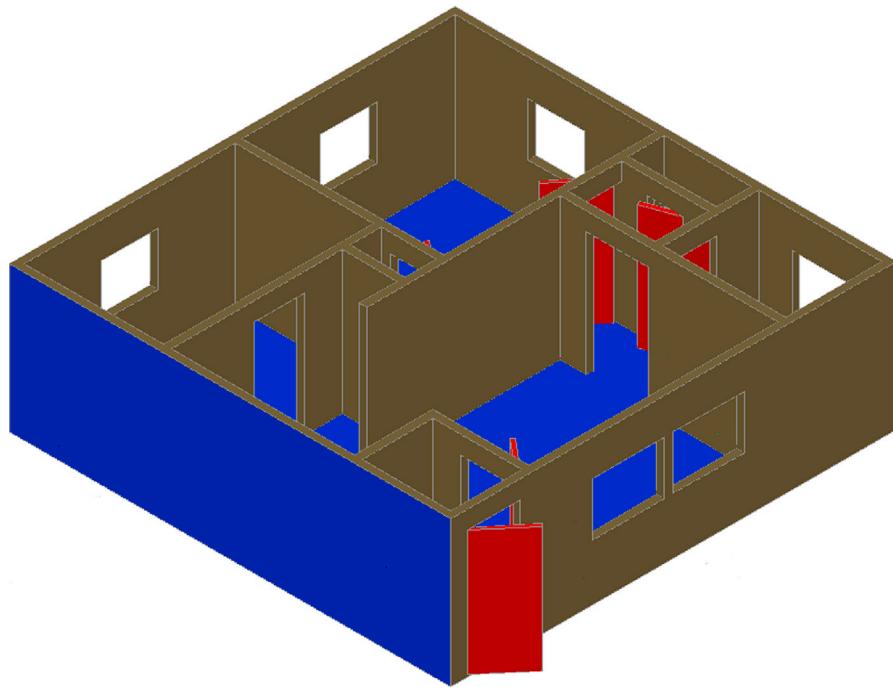


FIGURE 30.2 RVS shading.

Point Light

The first lighting condition to try is the most often used one, the New Point Light option.

Keyboard: Type in **light** and press Enter

Cascading menus: View→Render→Light→New Point Light

Toolbar icon: Lights toolbar→

Ribbon: Visualize tab→Lights panel→

Step 1. Begin the New Point Light via any of the preceding methods. You may see a warning dialog box, asking if you want to turn off default lighting (not shown here). Go ahead and agree to that.

Step 2a. If you type in **light**,

- AutoCAD says: Enter light type [Point/Spot/Web/Targetpoint/Freespot/freeweB/Distant] <Point>:

Go ahead and select **P** for **Point** and press Enter. Go on to Step 2b.

Step 2b. If you used any of the other methods or just completed Step 2a,

- AutoCAD says: Specify source location <0,0,0>:

Step 3. Select the extreme upper left corner of the building.

- AutoCAD says: Enter an option to change [Name/Intensity factor>Status/Photometry/shadow/Attenuation/filterColor/eXit] <eXit>:

Step 4. We go over some of these options in detail momentarily, but for now press **i** for Intensity.

- AutoCAD says: Enter intensity (0.00 –max float) <1.0000>:

Step 5. Enter the value 20. Then, press **c** for Color.

- AutoCAD says: Enter true color (R,G,B) or enter an option [Index color/Hsl/colorBook] <255,255,255>:

Step 6. Press **i** for Index color and enter color number 30 (it is one of the yellows).

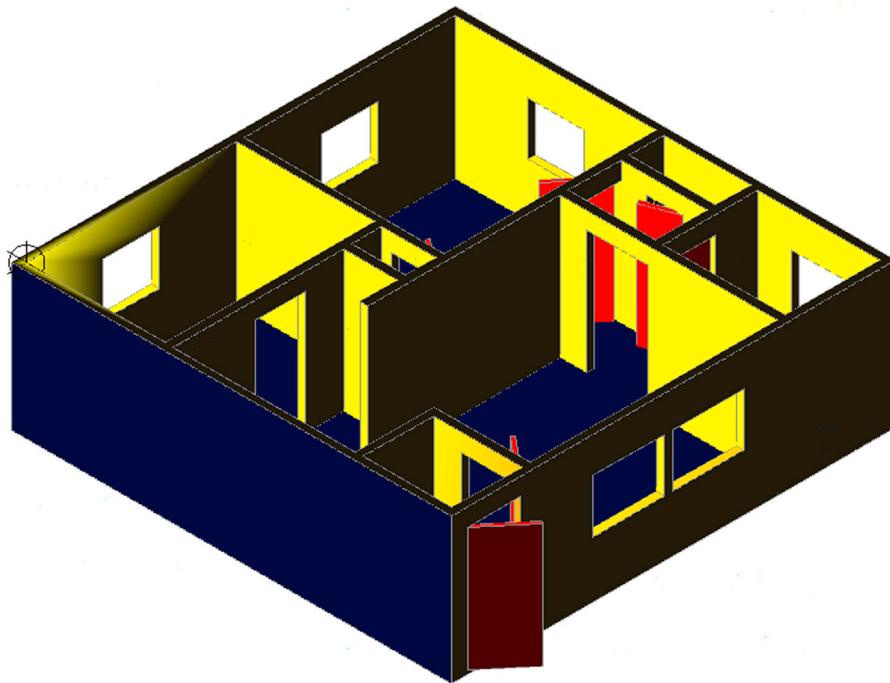


FIGURE 30.3 Point Light (LIGHTINGUNITS 0).

The result is a spotlight located at an upper left corner of the 3D model (notice the circular marker), shining yellow light on the entire structure (Fig. 30.3). Note that the light goes through the walls, illuminating everything equally, as if the walls were not even there. We change this later with the LIGHTINGUNITS system variable. You can locate as many point lights as you want; we do only one example of this.

Spotlight

The New Spotlight option is similar in theory to the New Point Light option just covered.

Keyboard: Type in light and press Enter
Cascading menus: View→Render→Light→New Spotlight
Toolbar icon: Lights toolbar→ 
Ribbon: Visualize tab→Lights panel→ 

Step 1. Begin the Spotlight via any of the preceding methods. You may see a warning dialog box, asking if you want to turn off default lighting (not shown here). Go ahead and agree to that.

Step 2a. If you type in **light**,

- AutoCAD says: Enter light type [Point/Spot/Web/Targetpoint/Freespot/freeweB/Distant] <Point>:

Go ahead and select **S** for **Spot** and press Enter. Go on to Step 2b.

Step 2b. If you used any of the other methods or just completed Step 2a,

- AutoCAD says: Specify source location <0,0,0>:

Step 3. Select a corner of the building (a flashlight is attached to the crosshairs).

- AutoCAD says: Specify target location <0,0,-10>:

Step 4. Select a point in such a way as to indicate a direction for the spotlight to shine. A large menu appears that has essentially the same choices seen previously.

- AutoCAD says: Enter an option to change [Name/Intensity factor/Status/Photometry/Hotspot/Falloff/shadow/Attenuation/filterColor/eXit] <eXit>:

Step 5. Using values of 100 for the Intensity factor and 255,127,0 for the filterColor, go ahead and adjust those options.

Fig. 30.4 shows the results. The spotlight is attached to the right corner of the design. It is clicked on to show its light cone (called a *glyph*) and grips. These glyphs can be adjusted via the grips to vary the “sweep” of the light source and the area it affects (illuminates).

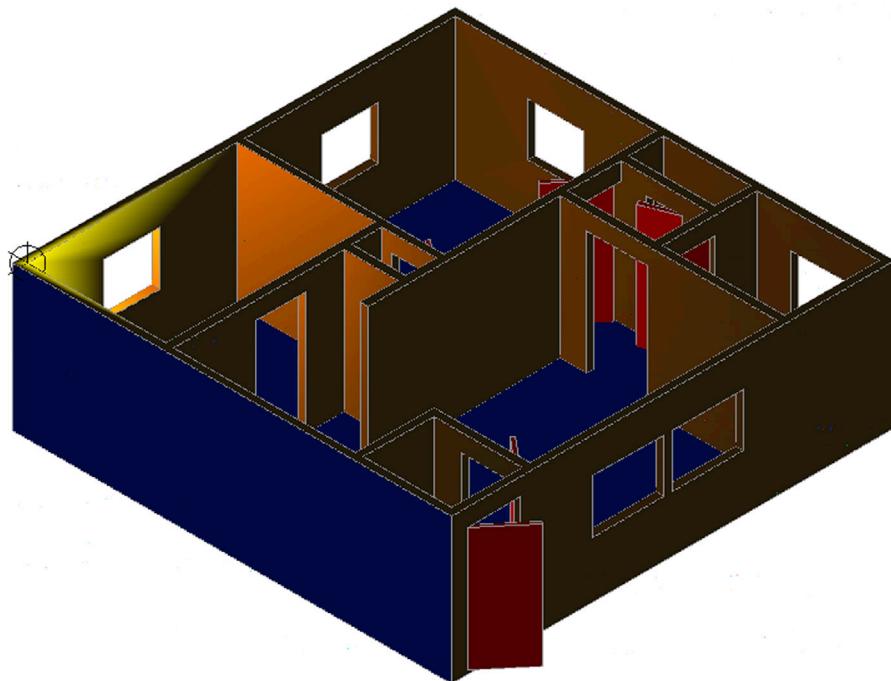


FIGURE 30.4 Spotlight.

Distant Light

The final light type we try out is New Distant Light. This is more of a floodlight that saturates everything and is not used as often.

Keyboard: Type in **light** and press **Enter**

Cascading menus: **View**→**Render**→**Light**→**New Distant Light**

Toolbar icon: **Lights toolbar**→

Ribbon: **Visualize tab**→**Lights panel**→

Step 1. Begin the Distant Light via any of the preceding methods. You may see a warning dialog box asking if you want to disable distant lights when the lighting unit is photometric (not shown here). Allow it in this case!

Step 2a. If you type in **light**,

- AutoCAD says: Enter light type [Point/Spot/Web/Targetpoint/Freespot/freeweB/Distant] <Point>:

Go ahead and select **d** for Distant and press Enter. Go on to Step 2b.

Step 2b. If you used any of the other methods or just completed Step 2a,

- AutoCAD says: Specify light direction FROM <0,0,0> or [Vector]:

Step 3. Pick a direction from which the light comes.

- AutoCAD says: Specify light direction TO <1,1,1>:

Step 4. Pick a direction into which the light goes. The familiar menu appears (not shown this time), and you can set some options to complete the distant light setting.

Lighting Options

You probably noticed that each of these lighting approaches featured (with slight variations) several lengthy menus of options. We touched on a choice here and there as we set up sample light scenarios. Let us go ahead and describe in detail what these options mean. After you read through all of them, go back and retry all the Point, Spot, and Distant lights, varying the options and comparing the results.

- **Name:** You can give the light setting a name so you know to what you are referring later on. Use logical names like Bedroom_Spotlight_1.
- **Intensity factor:** This is the brightness of the light and you can enter almost any value. The exact number is dictated by design needs and often arrived at by trial and error.
- **Status:** This simply means *on* or *off*. You can position a light then turn it off, as with a regular light switch, if not needed in a scenario.
- **Photometry:** This option depends on the LIGHTINGUNITS system variable that was mentioned earlier, to be set to 1 or 2 (International or American with Photometry enabled), not 0, which is Generic lighting, as seen in Fig. 30.3. Once that is set, photometry refers to the *perceived power emitted by a light source*. The result of setting that system variable is that a more realistic light gradient is shown, where the intensity fades as you move farther from the lamp source, as seen in Fig. 30.5. There are three additional options under the Photometry menu choice:
 - **Intensity:** This is similar to the previous generic intensity setting, but allows for more options. The default values are in Candelas (Cd), the SI unit of luminous intensity. You can also press **f** for the **Flux** option (Lm) or press **i** for **Illuminate**, in which case you can use Lux (Lx) or Foot Candle (Fc) values. As a suboption, you can even use

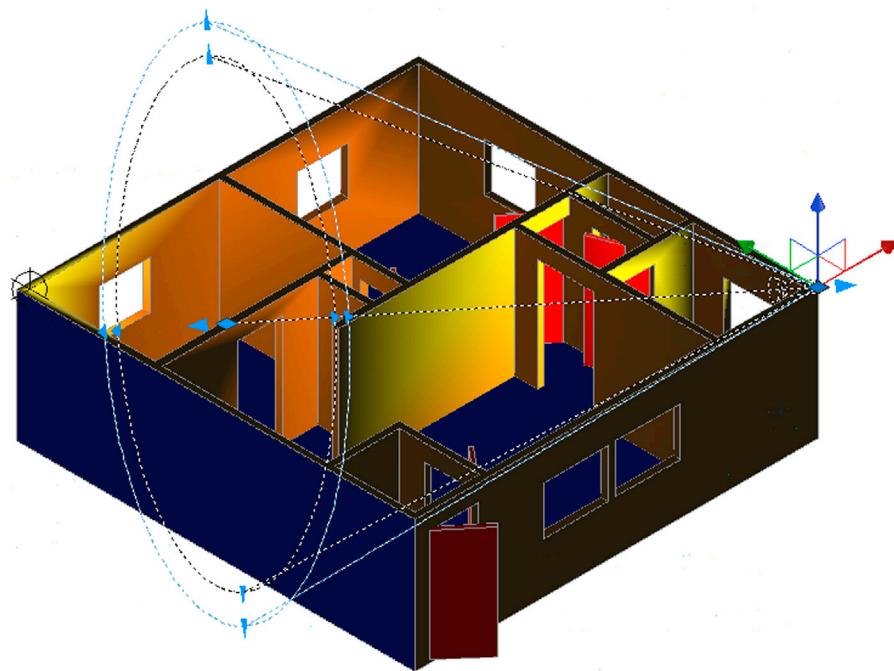


FIGURE 30.5 Point Light (LIGHTINGUNITS 1).

Distance. These settings are familiar to any architect or designer who works with lighting. Photometry is a science unto itself; experiment with the various options, and if you have never worked with lighting before, seek out information online or in a library on this interesting topic.

- *Color*: This option assigns color to the light (otherwise, it is the default white) but works differently from the color filters in the main menu. Here, color represents a type of lamp or a Kelvin temperature setting. If you type in a question mark and press Enter twice you get this list of standard colors or lamps:

- "D65"
- "Fluorescent"
- "Coolwhite"
- "Whitefluorescent"
- "daylightfluorescent"
- "Incandescent"
- "Xenon"
- "Halogen"
- "Quartz"
- "Metalhalide"
- "mErcury"
- "Phosphormercury"
- "highpressureSodium"
- "Lowpressuresodium"

You can choose a lamp type and it is shown. Another interesting option is the ability to use temperature as a light setting. Go back one step and type in *k* for *Kelvin* and enter a temperature value. As mentioned before, it takes experience and knowledge to use these tools properly and there is a science of proper lighting. For those who work in this field, AutoCAD gives some basic tools with which to work; and this is definitely an invitation to learn more.

- *eXit*: This option exits the Photometry command.
- *shadow*: This command controls the appearances of shadows when your light source encounters an obstruction (such as a piece of furniture). The options under that menu choice include
 - *Off*: This option turns off shadows.
 - *Sharp*: This displays shadows with sharp edges (less realistic, but better computer performance).
 - *soFtmapped*: This entire option has to do with soft shadows and how much computer resources (map size and memory) to allocate to the shadow. As with all such settings, there is a trade-off between quality and system performance.
 - *softsAmpled*: This is another set of settings for realistic shadows.
- *Attenuation*: Attenuation is the gradual loss in intensity of any kind of energy source through a medium, which in this case is the decay of our light source as distance from that source increases. This is another interesting topic all unto itself. A variety of settings are available here, such as
 - *attenuation Type*: The two choices are *Inverse Linear* and *Inverse Squared*, which have to do with the strength of the light (whether the value is squared or linear) as the distance increases.
 - *Use limits*: This option turns limits on and off (see next two option descriptions).
 - *attenuation start Limit*: This option specifies where the light starts.
 - *attenuation End limit*: This option specifies where the light ends.
 - *eXit*: This option exits the attenuation command.
- *filterColor*: This is simply the color of the light emitted with no regard to temperature or type of lamp, as seen with Photometry settings. You can enter RGB values, Index colors, or use any of the other color choices AutoCAD provides.
- *Hotspot*: This command, seen in the Spotlight option only, specifies the angle that defines the brightest cone of light, which is known as the beam angle. This value can range from 0° to 160°.
- *Falloff*: This command, also seen in the Spotlight option only, specifies the angle that defines the full cone of light, which is also known as the *field angle*. This value can also range from 0° to 160°.

To complete our tour of AutoCAD's lighting features, there are a few more items to cover. Perhaps the most important one is the Properties palette as it applies to lighting. Double-click on any light to call it up, as seen with the spotlight in Fig. 30.6. Using the Properties palette you can change virtually any aspect of the newly created light, with the added benefit that you can see the effect right away.

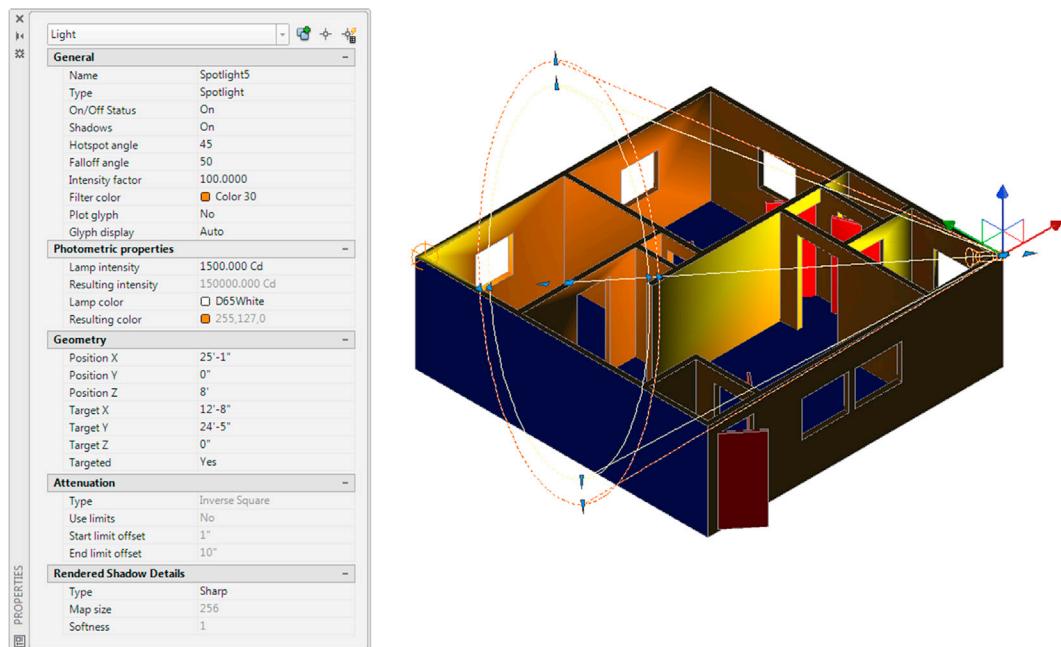


FIGURE 30.6 Properties palette.

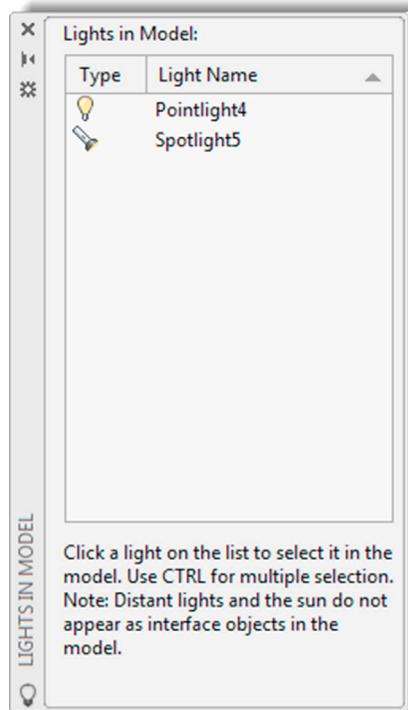


FIGURE 30.7 Lights in Model palette.

To keep track of all your lights, you can activate the Lights in Model palette (Fig. 30.7) by clicking on the Lights List icon on the toolbar or the arrow flyout on the Ribbon's Render tab. This palette shows every light created, which is why it is important to give them descriptive names. In our example, we did not, and they are simply referred to as Pointlight4 and Spotlight5.

Shadows, Sun, and Sky

Shadows are an integral part of the sun and sky settings, which are nothing more than shadows customized to a specific location and time. You can get a simple shadow right away, however. Draw and position some simple 3D shapes, make sure they are lifted off the ground (above zero in the XY plane), and in the Ribbon's Visualize tab, find the shadow settings and select Ground Shadows (Fig. 30.8). The result is seen in Fig. 30.9.

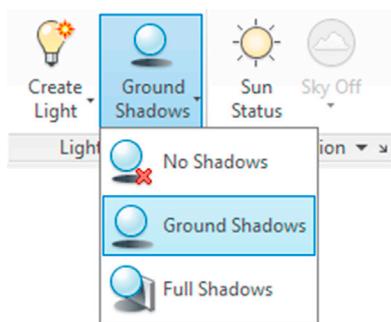


FIGURE 30.8 Ribbon's Ground Shadows.

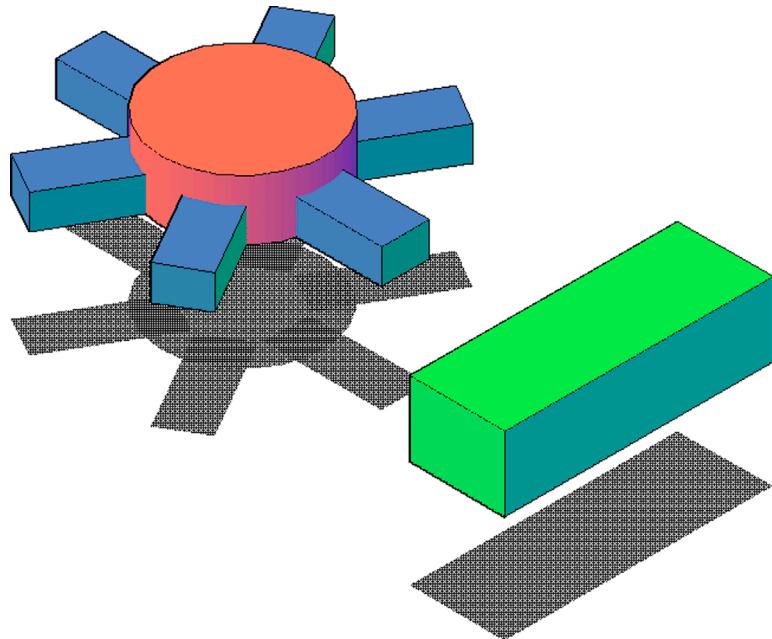


FIGURE 30.9 Basic ground shadows.

Sun and Sky, as mentioned already, refer to a background light setting where you can set a particular city location anywhere in the world and its particular latitude and longitude are factored into the lighting conditions. To set the time zone, you need access to Live Map Data through Autodesk 360. If you have this, then press the Set Location drop-down icon in the Render, Sun & Location tab (it looks like a globe) and select From Map. A pop-up box (Fig. 30.10) then asks you if you want to use Live Map Data. If you say Yes, you are prompted to sign into Autodesk 360. Note that you can also import maps via the *.km1 or *.kmz files if you have used those before.

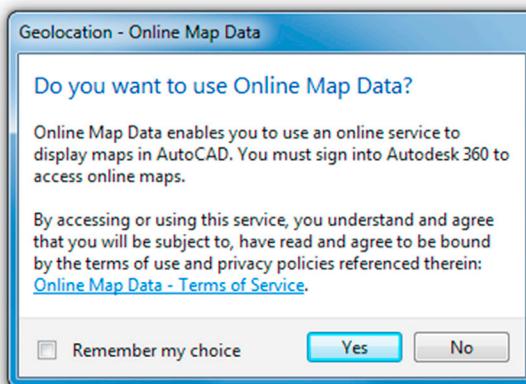


FIGURE 30.10 Geolocation—Live Map Data.

Note that this is new for AutoCAD 2014, 2015, 2016, and 2017. Prior to that, in AutoCAD 2013 and older versions, you could have just picked to enter the location values and seen the dialog box shown in Fig. 30.11. It is reproduced here in case you end up working on an older release. The Geographic Location dialog box allows you to set your particular region, country, or city via drop-down menus. You can use the provided time zones as an alternative. You can also click anywhere on the map or enter values manually, although not too many people have that kind of information handy. When done, click on OK.

Finally, let us bring up sun properties via the final icon on the Lights toolbar. The Sun Properties palette appears, as seen in Fig. 30.12.

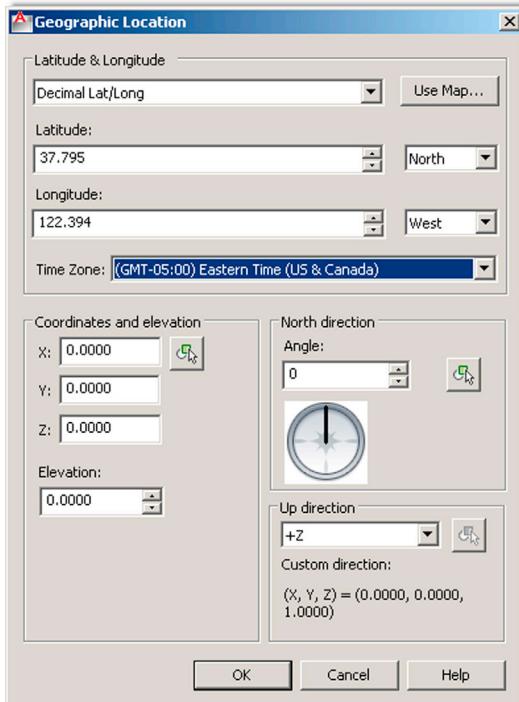


FIGURE 30.11 Geographic Location, from AutoCAD 2013.

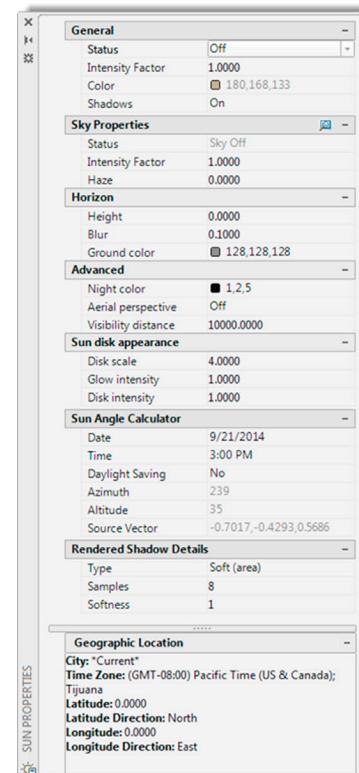


FIGURE 30.12 Sun Properties palette.

Using this palette and a bit of trial and error (at least until you understand what each property does), you can set the ambient sunlight properties. The exact description of each category is found in the Help files, reproduced here for convenience and in edited form for clarity.

General: This is where you set the general properties of the sun.

- **Status:** This option turns the sun on and off. If lighting is not enabled in the drawing, this setting has no effect.
- **Intensity Factor:** This option sets the intensity or brightness of the sun. The range is from 0 (no light) to maximum. The higher is the number, the brighter the light.
- **Color:** This option controls the color of the light. Enter a color name or number or click on Select Color to open the Select Color dialog box.
- **Shadows:** This option turns on and off the display and calculation of shadows for the sun. Turning shadows off increases performance.

Sky Properties: This is where you set the general properties of the sky.

- **Status:** This option determines if the sky illumination is computed at render time. This has no impact on the viewport illumination or the background. It simply makes the sky available as a gathered light source for rendering. Note: This does not control the background. Its values are Sky Off, Sky Background, and Illumination.
- **Intensity Factor:** This option provides a way to magnify the effect of the sky's light. Its values are 0.0 to MAX.
- **Haze:** This option determines the magnitude of scattering effects in the atmosphere. Its values are 0.0 to 15.

Horizon: This category of properties pertains to the appearance and location of the ground plane.

- *Height:* This option determines the absolute position of the ground plane relative to world zero. This parameter represents a world-space length and should be formatted in the current length unit. Its values are + to MAX.
- *Blur:* This option determines the amount of blurring between ground plane and sky. Its values are 0 to 10.
- *Ground Color:* This option determines the color of the ground plane by selecting a color from the drop-down list. You can also select the Select Color dialog box to make a color choice.

Advanced: This category of properties adds various artistic effects.

- *Night Color:* This option specifies the color of the night sky by selecting a color from the drop-down list. You can also select the Select Color dialog box to make a color choice.
- *Aerial Perspective:* This option specifies if aerial perspective is applied. Its values are On or Off.
- *Visibility Distance:* This option specifies the distance at which 10% haze occlusion results. Its values are 0.0 to MAX.

Sun Disk Appearance: This category of properties pertains to the background only, and they control the appearance of the sun disk.

- *Disk Scale:* This option specifies the scale of the sun disk (1.0=correct size).
- *Glow Intensity:* This option specifies the intensity of the sun's glow. Its values are 0.0 to 25.0.
- *Disk Intensity:* This option specifies the intensity of the sun disk. Its values are 0.0 to 25.0.

Sun Angle Calculator: This category of properties sets the angle of the sun.

- *Date:* This option displays the current date setting.
- *Time:* This option displays the current time setting.
- *Daylight Saving:* This option displays the current setting for daylight savings time.
- *Azimuth:* This option displays the azimuth, the angle of the sun along the horizon clockwise from due north. This setting is read-only.
- *Altitude:* This option displays the altitude, the angle of the sun vertically from the horizon. The maximum is 90°, or directly overhead. This setting is read-only.
- *Source Vector:* This option displays the coordinates of the source vector, the direction of the sun. This setting is read-only.

Rendered Shadow Details: This category of properties specifies the properties of the shadows.

- *Type:* This option displays the setting for shadow type. This setting is read-only when the display of shadows is turned off. The selections are Sharp and Soft (mapped), which display the Map size option, and Soft (area), which displays the Samples option. Soft (area) is the only option for the sun in photometric workflow (LIGHTINGUNITS set to 1 or 2).
- *Map size* (Standard lighting workflow only): This option displays the size of the shadow map. This setting is read-only when the display of shadows is turned off. Its values are 0 to 1000.
- *Samples:* This option specifies the number of samples to take on the solar disk. This setting is read-only when the display of shadows is turned off. Its values are 0 to 1000.
- *Softness:* This option displays the setting for the appearance of the edges of shadows. This setting is read-only when the display of shadows is turned off. Its values are 0 to 50.0.

Geographic Location: This category of properties displays the current geographic location settings. This information is read-only. When a city is not stored with latitude and longitude, the city does not appear in the list. Use the Edit Geographic Location button to open the Geographic Location dialog box.

30.3 MATERIALS AND RENDERING

Rendering in AutoCAD is a two-part story. The first part involves materials and simply adding them to designs. AutoCAD has a sizable built-in library of materials, with most residing in the tool palettes; and adding them is simply a matter of click and drag onto the design. These materials are pictures, usually bitmaps, and they simply cover the design similar to wallpaper. You can also create and modify your own materials, within limits.

The other side to rendering is actual rendering, where more advanced settings are applied and the software makes passes over the design, rendering the surfaces as desired. In regard to both material application and rendering, other dedicated software packages have far more capabilities than AutoCAD, as explained earlier in this chapter, but this is still a good introduction to this fascinating world. And, remember that quality of output is often a result of knowledge. An expert using limited software may still achieve better results than a novice on superior software. If you wish to pursue this type of work further, consult [Appendix I](#), Lighting, Rendering, Effects, and Animation for additional information on this topic.

Materials

Let us jump right into materials by introducing the two relevant palettes (materials is very much a palette-driven feature): the Materials Browser and the Materials Editor. Both are shown in Fig. 30.13 and can be accessed via the cascading menus: Tools→Palettes→Materials Browser (or Materials Editor).

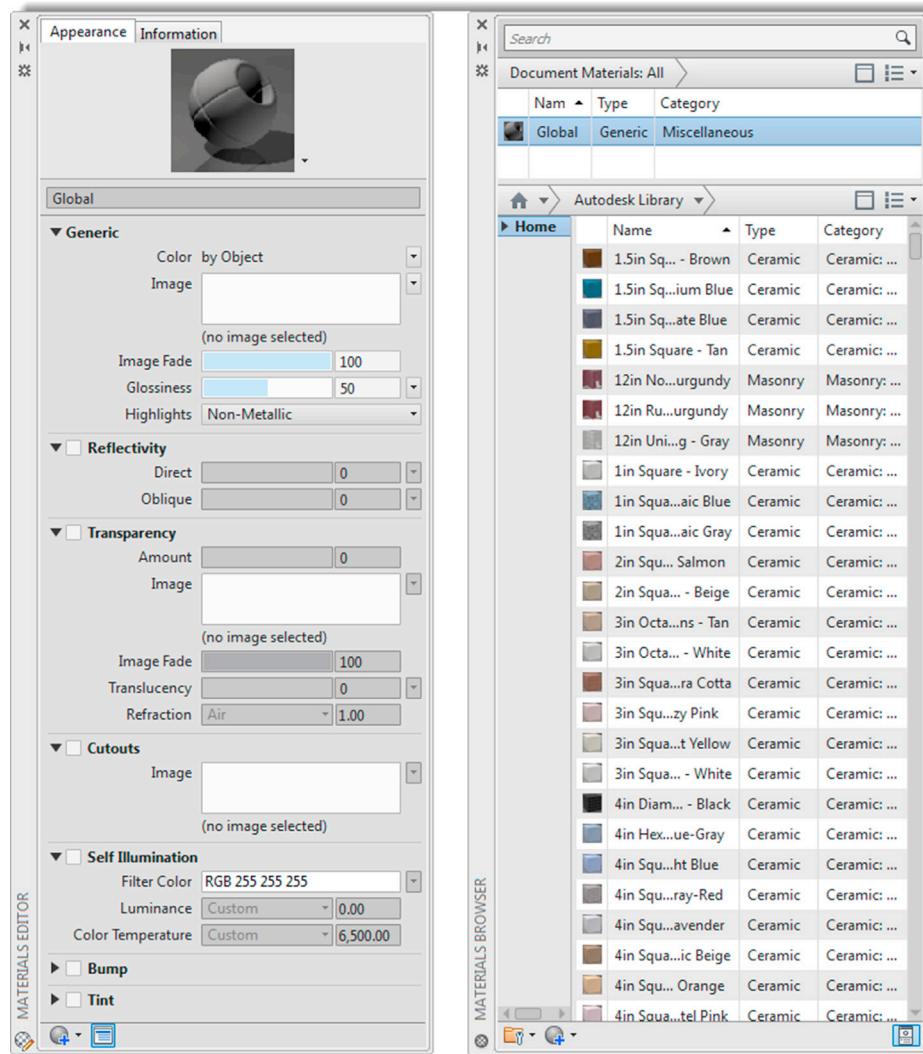


FIGURE 30.13 Materials Editor and Materials Browser.

Let us first take a look at the Materials Browser. It has expanded significantly over the last several releases of AutoCAD and now features over 1200 materials (a small sample is seen in Fig. 30.14). These materials are bitmap graphics designed in-house at Autodesk (or acquired) and are superimposed onto geometry in a simple manner, akin to wrapping paper. They are not “procedural materials” and do not become one with the design (see Appendix: Lighting, Rendering, Effects, and Animation for more on this). The Materials Browser allows you to visually search the materials database and create a library of materials relevant to your design intent.

Applying these materials without further modification is simply a matter of click and drag. Draw a cube of any size, as seen in Fig. 30.15, and select a random material. Then, click and drag the material onto the cube, which acquires those properties instantly. Some additional examples are shown in Fig. 30.16. If you right-click on any of the materials in the selection list, you can add it to the Material Browser’s My Materials collection for future reuse. These materials can be deleted and renamed, if necessary. The main Autodesk library, however, is locked, as indicated by a padlock. You can sort My Materials

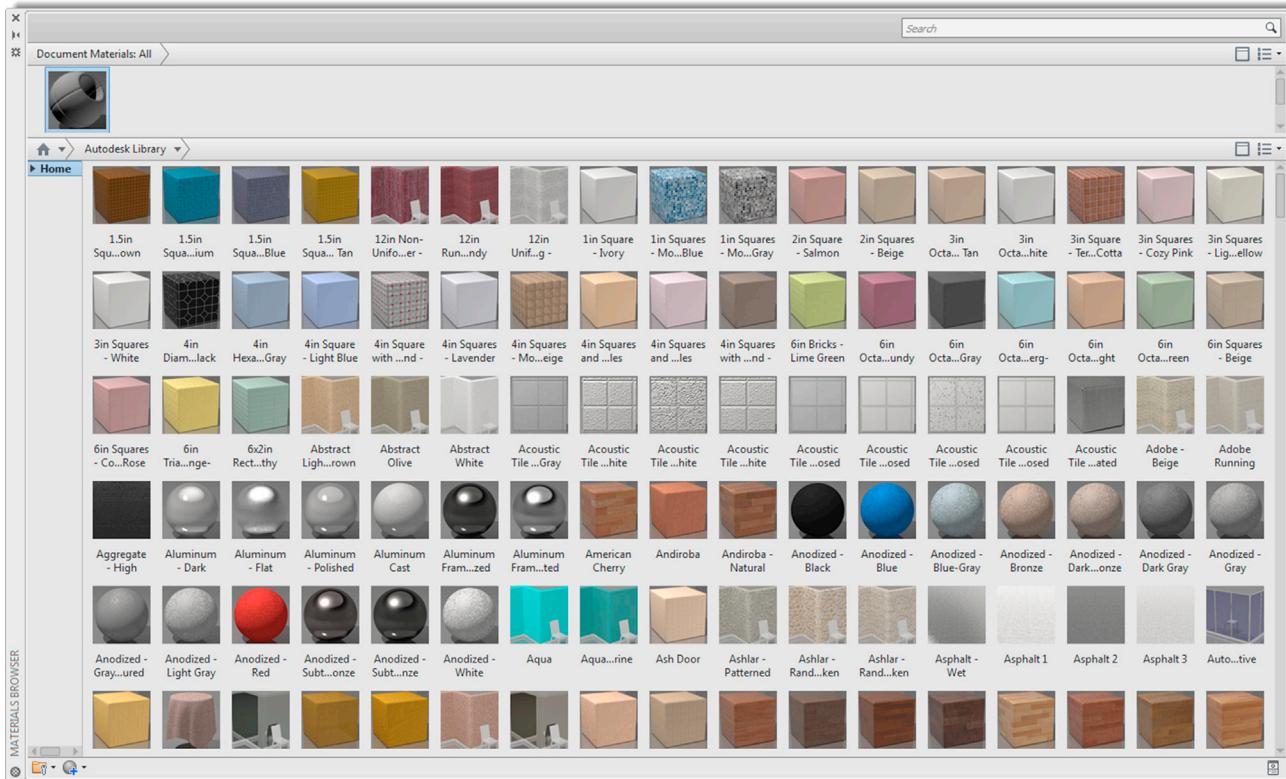
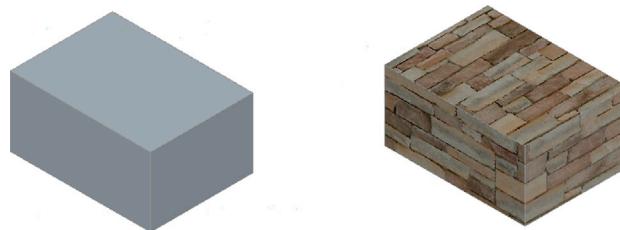


FIGURE 30.14 Expanded Materials Browser.



BASIC CUBE

ASHLAR MATERIAL APPLIED

FIGURE 30.15 Material application.



FIGURE 30.16 Material application.

(or the main library) according to Name, Category, Type, or Color as well as filter what is shown by All, Applied, Selected, or Unused. Spend some time getting acquainted with the Materials Browser, so you have a good idea of what is available and what you can do with these materials.

The Materials Editor is exactly that: It edits and modifies existing materials. To enter something into the editor, double-click on it in the browser—there are also a pair of small icons for this at the bottom of the material, when viewed as a thumbnail. The material appears in the editor's preview window, with associated menus below that. An example is shown with the previously used Ashlar material (Fig. 30.17). Some of the more useful settings that can be modified include Reflectivity, Transparency, and Self Illumination. Explore all these settings to see what the effects are. When done, the material appears in the Materials Browser. Be sure to rename it before using.

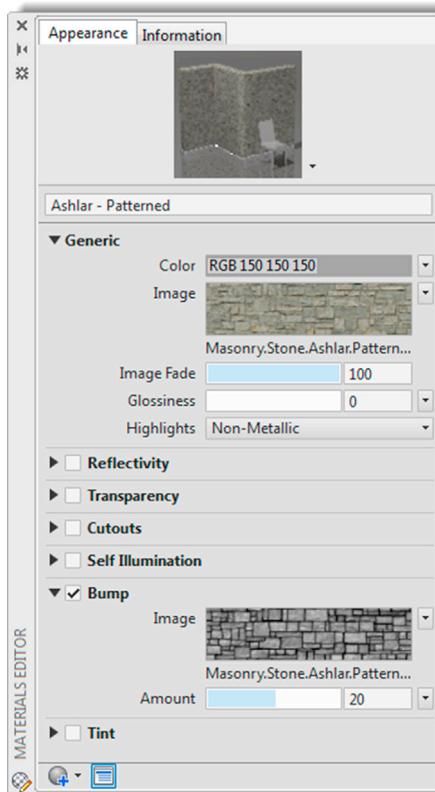


FIGURE 30.17 Materials Editor with a material loaded.

Rendering

Our final discussion involves rendering. Because of AutoCAD's improved materials and excellent visualization and coloring options, rendering in general is not something that most users will require on a regular basis. AutoCAD's rendering ability and the available options are not extensive, though admittedly much improved for the previous release, AutoCAD 2016. The latest version features a new rendering engine and a simplified process to get what you want. Before we go any further though, let us first describe exactly what rendering is.

In advanced modeling software, *rendering* is a general catch-all term that refers to advanced colorizing, materials, and lighting effects applied to a design. In AutoCAD, these procedures are separate from rendering, and we have already covered them in this chapter or elsewhere. What rendering means in *our* discussion is simply a process to generate output that can be saved to a file. Any addition of colors, materials, and lighting is done prior to this. Then, the process of rendering (of a ready-to-go model) produces a tangible output in the form of a JPG, or another format such as a BMP (bitmap), TIF, PNG, and so forth, that can then be printed on a LaserJet or a plotter. These renderings can also be inserted into a presentation or just given to a client. The bottom line is this: You are getting a pretty picture of your model to use as you please.

To try out rendering, bring up the model of our familiar apartment (Fig. 30.18) and, if you wish, add a new material for some variety, as shown in the figure. The gateway to rendering is the Ribbon's Visualize tab, Render panel and to a lesser extent the Render toolbar (they both have similar options), and both are shown in Fig. 30.19.

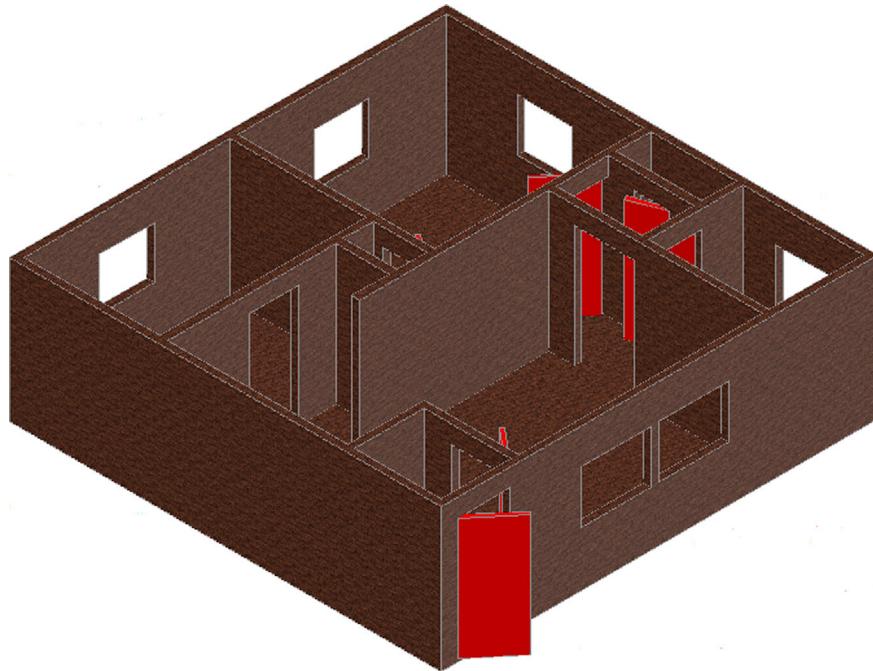


FIGURE 30.18 Rendering model.

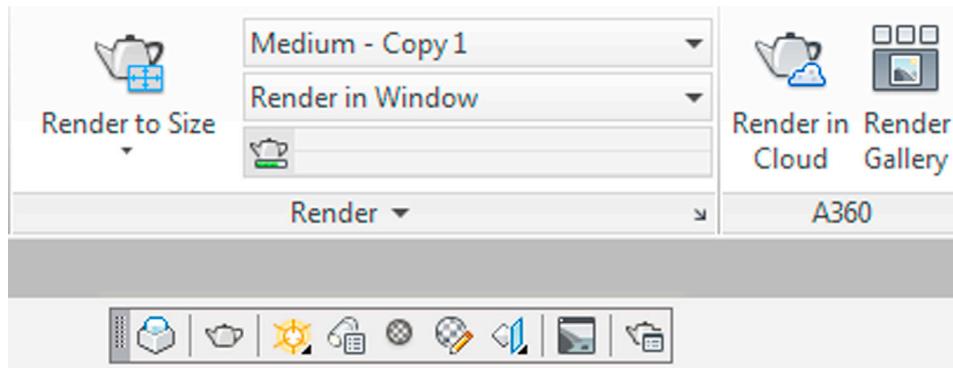


FIGURE 30.19 Ribbon's Render panel and the Render toolbar.

Most of the settings you deal with prior to starting a rendering session have to do with the type and quality of the output, so we take a look at this first. Starting the actual rendering process involves just one push of a button. The new AutoCAD 2016 rendering interface and palettes make these settings easier, more intuitive, and even humorous.

The first item to take a look at is the size of the desired output via the Render to Size drop-down menu in the Render panel, as seen in Fig. 30.20. Here, you can choose your desired level from relatively basic SVGA to Full HDTV to a much denser 300 dpi on an A3 sheet (a very sharp, high-dpi setting for this sized sheet). Needless to say, each upgrade in pixel resolution comes with a penalty in rendering time and computer resource usage.

Additional output settings can be accessed via the appropriately titled More Output Settings... menu choice at the bottom, which brings up a small dialog box (Fig. 30.21) that allows you to make custom Width, Height, and Resolution settings. Also, here, you select other output file formats by checking the box under Save Image and clicking Browse....

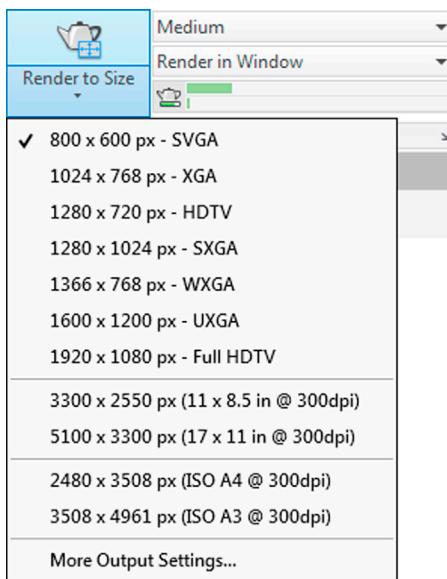


FIGURE 30.20 Render to Size.

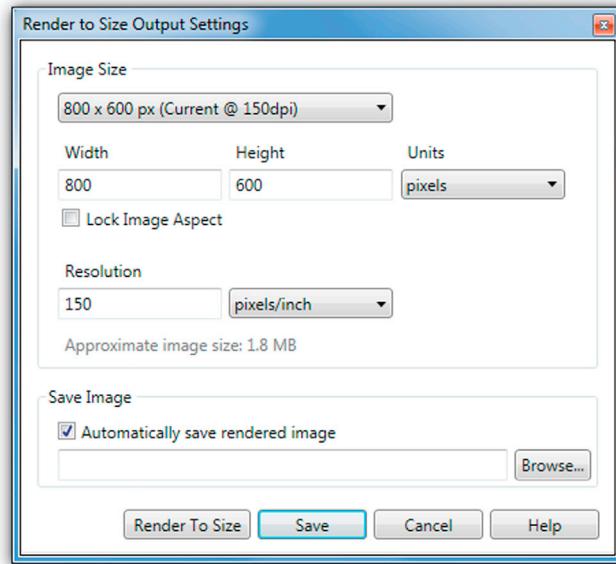


FIGURE 30.21 Render to Size Output Settings.

This action brings up the Render Output File dialog box (Fig. 30.22), where you can drop down the Files of type: field at the bottom. As Fig. 30.22 shows, your available output formats are BMP, PCX, TGA, TIF, JPEG (or JPG), and PNG, with the JPG photograph format being the most familiar to most people. Just as important, you can specify the location of the rendering output, which can be right next to the drawing file itself or in a separate output folder.

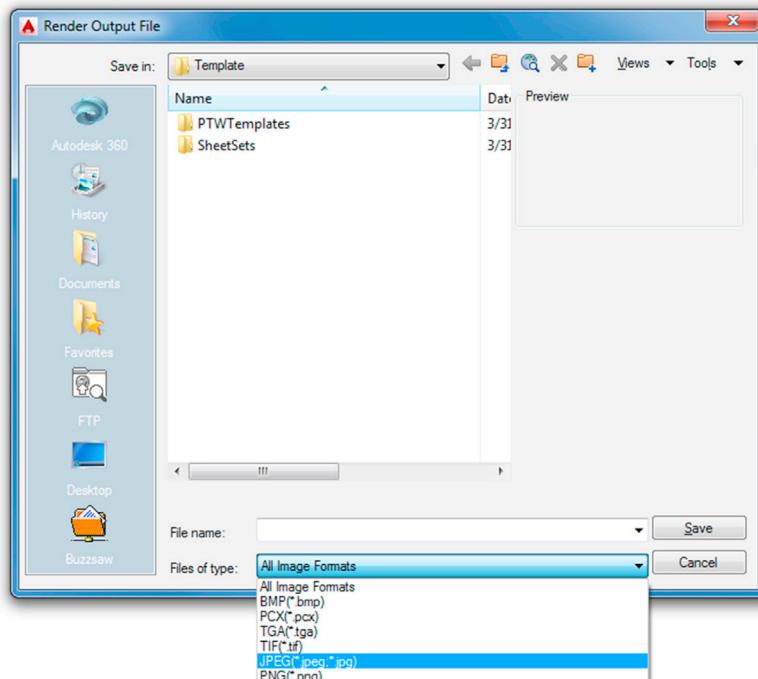


FIGURE 30.22 JPEG Image Option in the Render Output File dialog box.

There is another area of the Render panel, just to the right of the teapot, where you can set rendering by number of levels (or passes) the rendering engine makes or also by time, as seen in Fig. 30.23. The low (1 level), Medium (5 levels), and High (10 levels), of course, make your rendering sharper as you go up the scale, at the usual cost in time and resources.

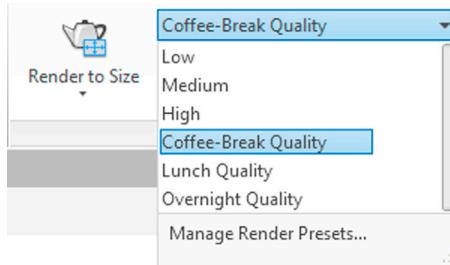


FIGURE 30.23 Rendering levels and times.

Speaking of time, the next three presets render until a time limit is reached, regardless of how many levels are covered. They are, in a bit of rare Autodesk humor, tied to office events. Coffee-Break Quality is 10 minutes of rendering time (as if anyone limits their coffee break to a mere 10 minutes!), Lunch Quality is one hour, and Overnight Quality is 12 hours, assuming of course you are not an entry-level attorney or Wall Street firm employee, working 16-hour days.

At the bottom of the panel seen in Fig. 30.23 is access to the Render Presets Manager via Manage Render Presets... (one of a few ways to get to it). Shown in Fig. 30.24, it allows for some additional settings for your output, with a few features duplicated from elsewhere. Here, levels and times can be set to any intermediate values as opposed to preset ones.

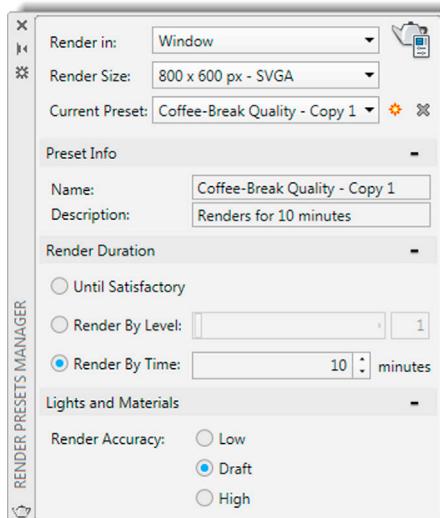


FIGURE 30.24 Advanced Render Settings.

Finally we have one more palette, the Render Environment and Exposure palette (Fig. 30.25). It can be accessed via the drop-down menu on the Render panel (also seen in Fig. 30.25). Here, you can apply some advanced settings with background and lighting and adjust the exposure and white balance of the rendering.

After all these “presettings” are done, you are ready to render your model. Press the teapot icon on the Render toolbar; the rendering window appears and AutoCAD begins making passes over your model. Fig. 30.26 is a screen shot of this process about 28% complete on a very low-resolution rendering of the 3D apartment model. When it is done, the image is saved and ready for use in the format and location you requested in the Render Output File dialog box.

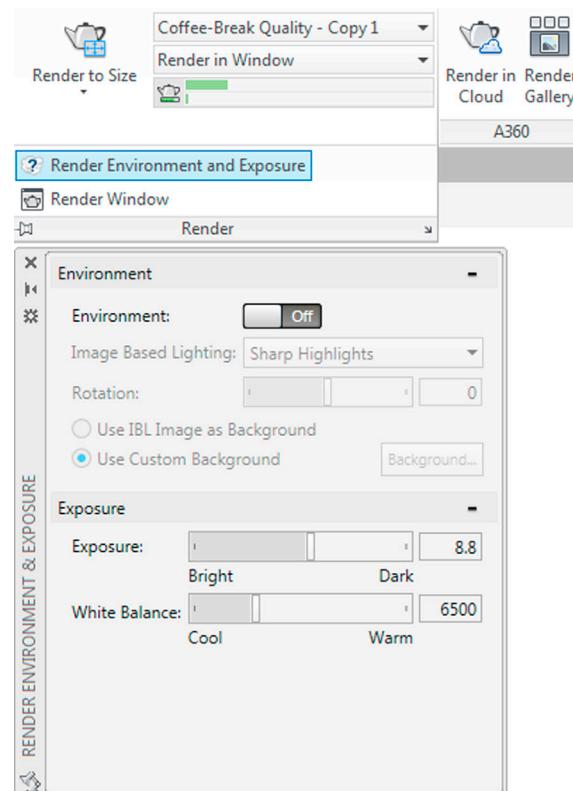


FIGURE 30.25 Render Environment and Exposure palette.

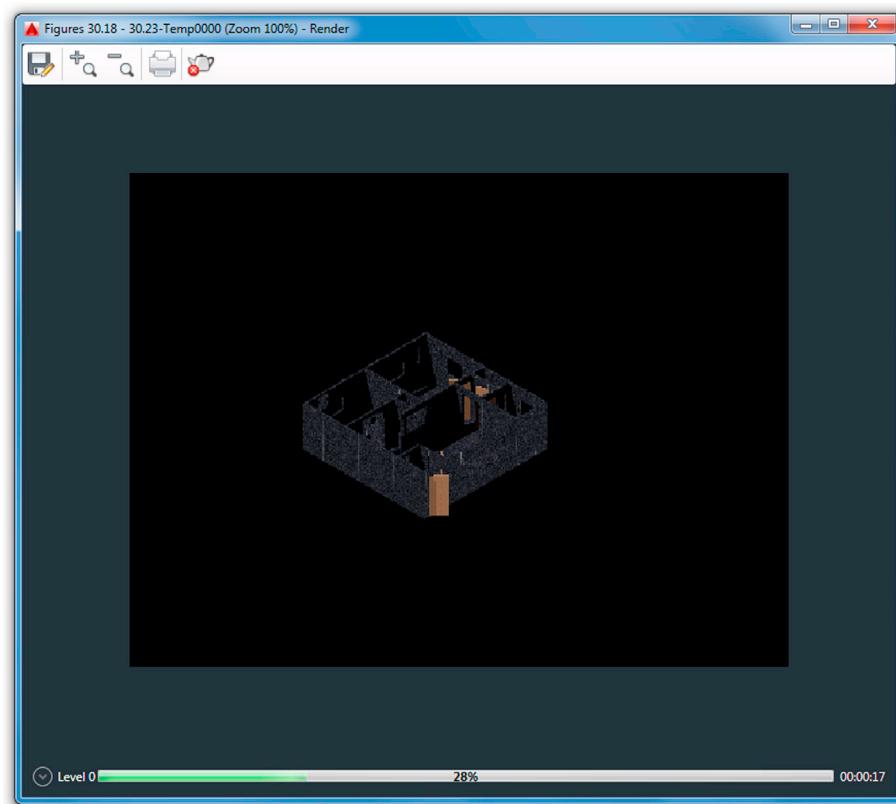


FIGURE 30.26 Render Environment and Exposure in process.

30.4 SUMMARY

You should understand and know how to use the following concepts and commands at the conclusion of this chapter:

- Point light
- Spotlight
- Distant light
- Shadows
- Sun and Sky
- Materials
- Rendering

Review Questions

Answer the following based on what you learned in this chapter:

1. Describe point light.
 2. Describe spotlight.
 3. Describe distant light.
 4. Describe sun and sky.
 5. Describe how to bring up materials.
 6. Describe basic rendering procedures.
-

Exercise

1. Create the following $20'' \times 50''$ box, extruded to 10" and shelled out to 1". Attach a point light to both corners. Set one point light to an intensity of 100 and a blue color. Set the other to an intensity of 75 and a red color. Then, render the figure to a JPG file. (Difficulty level: Easy; Time to completion: 5–10 minutes.)

