



Bringing Your Ideas to Life: Creating Photorealistic Renderings Using AutoCAD® 2013

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AC1603 This class covers the essentials of producing photorealistic renderings of your designs using AutoCAD® software. The class will cover a typical workflow that you can use to create a quality rendering. We'll start by creating a saved 3D perspective view of a design. Next, we'll discuss the creation and application of general-purpose light sources. You will then learn how to add life to a design by applying several of the stock materials pre-installed with AutoCAD. Afterward, we will look at how to edit materials to suit a specific need or, when necessary, create custom materials from scratch. We will also explore how to create image based materials and map them to objects. Finally, we'll learn how to render images to the screen or to a file while looking at several tips and tricks along the way.

Learning Objectives

At the end of this class, you will be able to:

- Create & save a 3D perspective view
- Illuminate a scene using both natural & artificial light
- Navigate the Materials Browser to search / select / apply materials
- Customize stock materials or create your own
- Control how materials are mapped to objects
- Create high resolution images of a 3D model

About the Speaker

Jeff has been using Autodesk software to produce civil engineering drawings for more than fifteen years. As a CAD manager, he was responsible for the production and oversight of construction drawings, installation of software, and creating and maintaining CAD standards. In the evenings, Jeff served on the faculty of two colleges where he wrote curriculum and taught Advanced AutoCAD and Civil 3D courses. He is known for always giving 110% in the classroom, as well as for his ability to make complex concepts easy to understand. He is an Autodesk Certified Professional for both AutoCAD and Civil 3D. Jeff is also a published author having produced 19 AutoCAD training titles for lynda.com. He was a top-rated speaker at Autodesk University 2011. As Sr. Application Engineer for Infrastructure at Seiler Instrument, Jeff provides Civil 3D, AutoCAD and Map 3D training, technical support, and implementation services for firms located in the Central U.S. region.

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After 11/30/2012, tutorials can be downloaded from: <http://tinyurl.com/AC1603JB>

Before we get started

If you think about it, the primary focus of rendering is similar to that of traditional photography. Essentially, you seek to create a compelling image through the use of creative viewpoints, dynamic lighting, and interesting textures and materials. The biggest difference is in the amount of time it takes to capture the photo. When rendering, you're photographing an environment that isn't real, so every subtle nuance must be calculated. For this reason, your "AutoCAD® camera" takes photographs one pixel at a time.

(How long it takes to "snap" a photo will be directly related to the complexity of your model, quality of lighting and materials, and speed of your processor.)

The best part about the rendering process is that you have complete control over EVERY aspect of an image. In essence, you are the ruler of your own virtual environment, having total control over how the rest of the world views your stuff.

"It's good to be the King!"

My approach

Since our time is limited, (90 min.) we will be looking at each rendering concept using a "need to know" approach. By focusing on essential skills, we can cover more ground, while laying a solid foundation to be built upon later. The class consists of several small exercises designed to highlight fundamental rendering skills. Each exercise builds on a concept from the previous one to provide repetition, as well as a means of applying what has already been learned. Finally, while the models used in these exercises are small, *(facilitates quick renders during class)* the skills learned can be applied to models of any size.

Want to work through the exercises on your own? All of the content used in this presentation will be downloadable from <http://tinyurl.com/AC1603JB>

*Want to take your skills farther? Please investigate the AU 2012 course **AC1607 - "Take Your AutoCAD® 2013 Renderings to the Next Level"**. AC1607 takes a more advanced approach to rendering, and it is designed to be a continuation of this course!*

One last thing!

When it comes to rendering, an important system variable to remember is FACETRES. FACETRES controls the "smoothness" of curved solids when they are rendered. By default, FACETRES is assigned a value of .5. *(Acceptable value range = .01 – 10)*. The lower the number, the more "faceted" a curved solid will look in the rendered image. Raising the number improves the appearance while increasing the time it takes to render. All exercise files used in this course have FACETRES = 3.

Exercise #1 - Using the Sun & Sky to Illuminate a Scene

Open *01_sun_study.dwg*

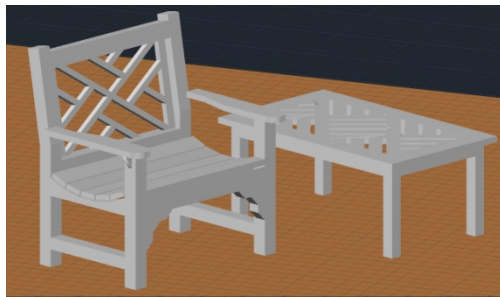
Learning goals: Create a saved view for the purpose of rendering. Apply realistic sunlight to a rendered model.

The first step in preparing to render a model is to create an interesting view.

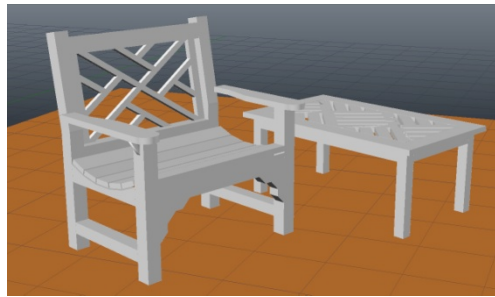
Step 1. Zoom in and center the geometry on screen.

Currently we are looking at this model using a parallel view. This isn't very realistic, as there are no vanishing points. To produce a more realistic image, we need to be certain we are viewing our geometry using a true three point perspective view.

Step 2. Right click on the ViewCube and select "Perspective" from the menu



Parallel view

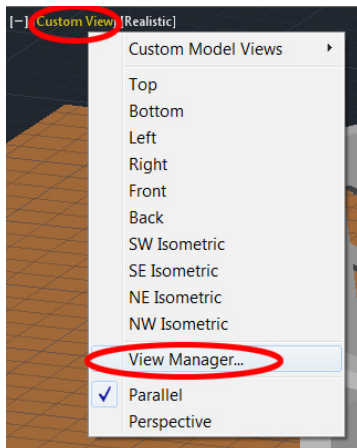


Perspective view

Notice how a perspective view gives the model a much more dynamic appearance. To ensure your renderings look as realistic as possible, all renderings **MUST** be created from a perspective view.

Let's assume the view we have represents the view we'd like to render. It would be a good idea to save this view, (*much like placing a camera on a tripod*) such that we can return to it in the future if necessary.

Step 3. Open the View Controls menu and select View Manager. In the View Manager dialog box, click NEW to create a saved view.



Step 4. In the New View dialog box, give the view a memorable name. Then REMOVE the check from "Save layer snapshot with view."



(This will prevent potentially confusing layer changes whenever this view is restored.) Click OK to close any open dialog boxes.

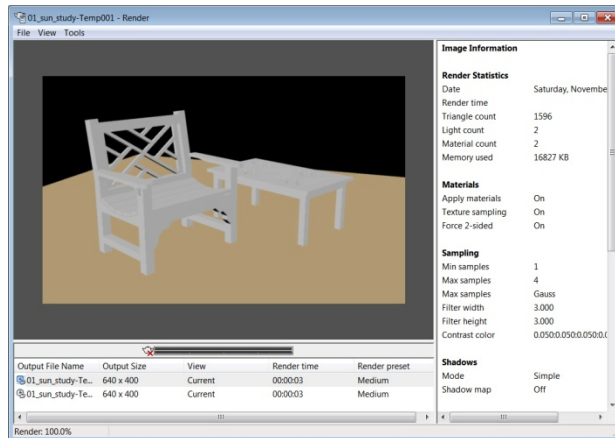
From now on, no matter where you happen to be working in the model, you can always return to this view by going back to the View Controls menu, (*displayed at left*) choosing Custom Model Views and then select your view.

Step 5. Try it! Orbit around the model, and then restore your saved view.

(Note there is another saved view called Afternoon. We'll use this later.)

At this point we are in a position to start rendering. If you haven't already done so, make sure the 3D Modeling workspace is current, and select the Render tab. This tab holds all the tools we'll be using in this class.

Step 6. Click the Render “teapot” icon to render the drawing for the first time.



This opens the Render Window where you can watch as your 3D model is transformed into a photograph. The render window is much like the interface on a digital camera. Below the current rendered image is a list of previous renderings. *(You can select these to view your rendering “history” and compare prior versions.)*

The area to the right is equivalent to metadata, displaying all of the settings that were current when a rendering was created.

Tip: To cancel a rendering in progress, press the ESC key.

As you can see, this rendering isn't very lifelike. Go ahead and click the X to close the Render Window and we'll add some sunlight.

Step 7. In the Sun & Location panel, click Sun Status to toggle on sunlight. *(In the event you receive a warning, it's okay to choose “Turn off default lighting”.)* Click the Render icon again to view the new rendering.

As you can see, the presence of the sun is creating some shadows in the image. Take a second look at the Sun & Location panel. Notice there are sliders for controlling date and time. Try experimenting with different times and see how it affects the rendered shadows.

To make the overall scene look more realistic, we need to create some atmosphere.

Step 8. In the Sun & Location panel, open the Sky menu and choose Sky Background and Illumination.

This will create a more traditional looking sky while also allowing the brightness of the atmosphere to contribute to the rendering.

Step 9. Render the drawing again and note the difference.

As you can see, adding atmosphere makes the scene look much more lifelike, while also taking more time to calculate and render. Now that the atmosphere is turned on, try orbiting your view in modelspace and see if you can locate the sun up in the sky. The sun will also show up in your renderings if it falls within the image frame.

Before we wrap this up, let's try a little review.

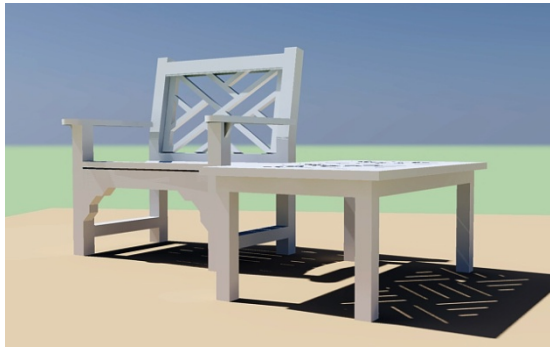
Step 10. Restore the view called **Afternoon**, ensure **Sky Background & Illumination** is toggled on and change the time of day to **5:00 PM**.

Render the image and notice the differences. Let's make a few final changes...

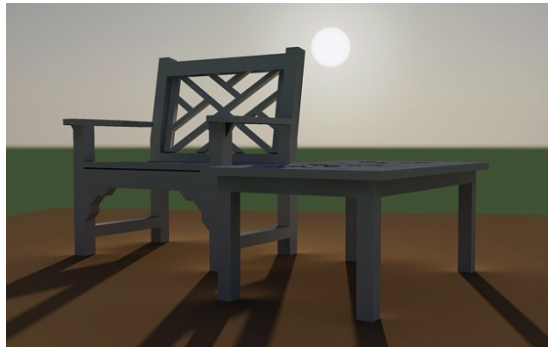
Step 11. In the **Ribbon**, expand the **Lights** panel (*small triangle icon*) and note that you can adjust the exposure settings of the rendering. Set **Midtones = 2.5** to brighten the scene

Step 12. In the **Ribbon**, click the small arrow in the lower right corner of the **Sun & Location** panel and note the number of controls available for the sun and sky. Make the following adjustments...
Intensity Factor = 1.25, **Ground Color = 110,219,0**, **Disk Intensity = 2**

Render the image one last time. In the **Render Window**, use the links below the image to compare this rendering to all of the other renderings created in this exercise.
Continue to experiment with the settings!



Rendered at 12:00 PM



Rendered at 5:00 PM

After completing this exercise, you can ...

- Create / Save / Restore a 3D perspective view
- Apply sunlight and atmosphere to an outdoor rendering
- Adjust the exposure of a rendering
- Customize the sun and sky settings

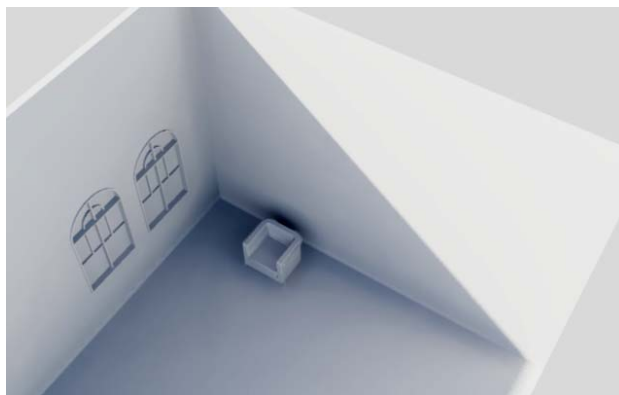
Exercise #2 - Selecting & Applying Photorealistic Materials

Open *02_interior_natural_light.dwg*

Learning goals: Navigate the Materials Browser to select photorealistic materials. Apply materials to model components. Customize basic material properties.

This exercise is meant to build on the previous example. In this case we'll be rendering an interior scene using natural sunlight. We'll also talk about selecting and applying materials to the objects.

Step 1. Zoom out such that you can see the entire model. Then turn on Sunlight, and Sky Background & Illumination. Render the drawing when finished.



Note the sunlight is creating a large shadow that covers most of the room.


At this point, the rendering is rather "bland" because the components are being rendered using the layer colors.

To add more life to the image we'll select some of AutoCAD's photorealistic materials from the Materials Browser.

Step 2. Open the Materials Browser.

(On the Render Tab, click the "Materials Browser" icon inside the Materials panel.)

The Materials Browser is where we go "shopping" for photorealistic materials. There are thousands to choose from, nicely organized on this single palette.

Click the "Add" icon  on a sample to load it into the drawing. If desired, selecting a category in the left panel will narrow the display of samples.

Still can't find what you need? Use the search field at the top. Simply enter keywords to see all materials associated with those words. **Try it!** – Get a feel for the tool by selecting some of the categories. Try using keywords like BLUE, or WOOD, and note how it affects the samples.

Tip: Right-click on materials loaded in the drawing and select Delete to remove them. Purge works too!

For this rendering we need to select some materials

Step 3. Load the following materials into the drawing...

"Beechwood – Honey" (for the floor)

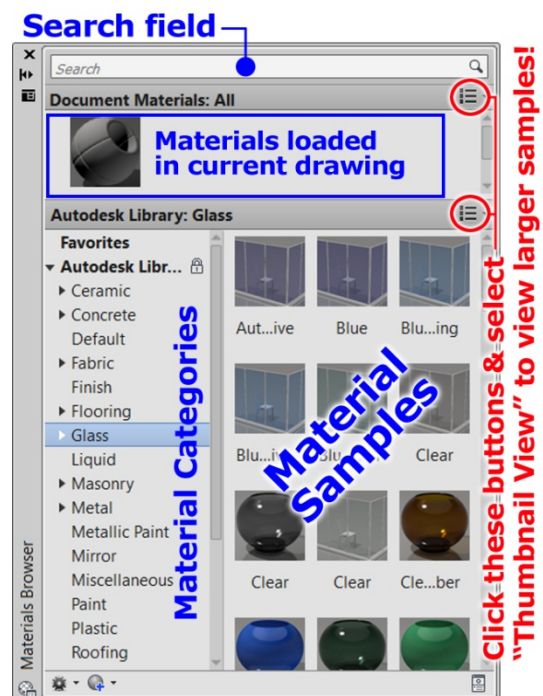
"Chrome – Satin" (for the chair frame)

"Glass Clear – Light" (for the window panes)

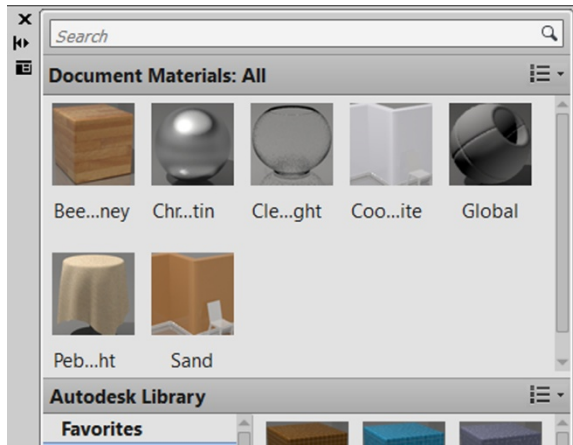
"Cool White" (for the wall and window trim)

"Pebbled – Light Brown" (for the chair fabric)

"Sand" (for the wall paint)



When finished, the Document Materials area of the Browser will look similar to this...



The next thing we need to do is assign these materials to objects in the drawing. There are essentially two ways to do this. The first method we'll use is drag and drop.

Step 4. Click hold and drag the Beechwood material from the Browser and release it over the floor.

Step 5. Drag and drop the Sand material from the Browser and release it over the wall.

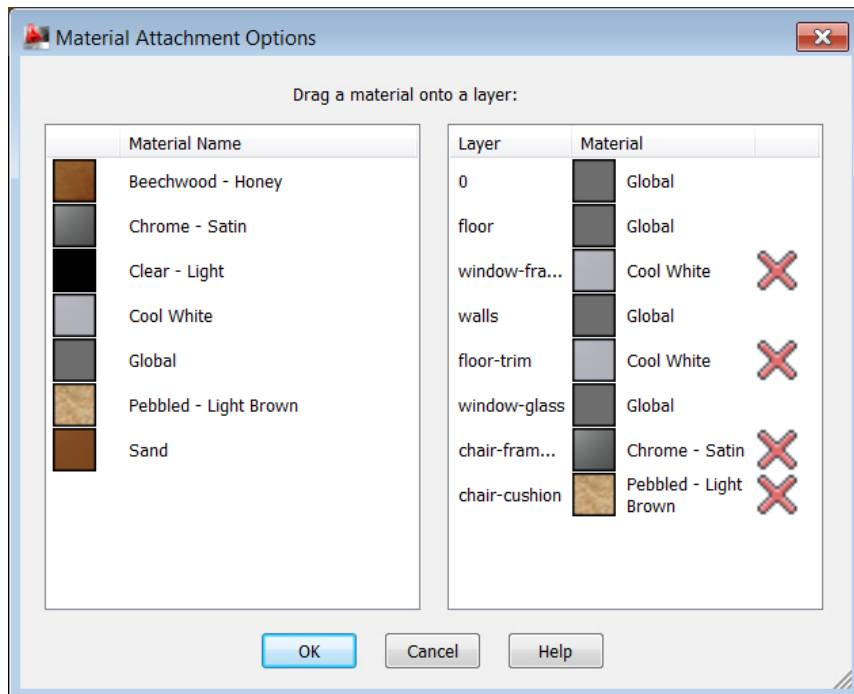
Note how easy it is to apply materials to the components in a model.

Step 6. Use the same drag and drop technique to apply the Glass material to each window pane.

As you can see, the drag and drop method works nicely, but it could be tedious if you are working with several small parts. Next we'll look at how to assign a material to ALL objects on a specific layer. We'll use the "Attach by Layer" tool to do this.

Step 7. In the Ribbon, expand the Materials panel (click the small triangle) and select "Attach by Layer".

This will open the Material Attachment Options dialog box as displayed below.



Using this tool, simply drag and drop a material from the left, and place it on the layer of your choice.

(You've probably already guessed that if you click the red X you can remove a material from a layer.)

Step 8. Assign the remaining materials to the appropriate layers.

(Use the image at left as a guide)

When finished, restore the view called "final".

(Ensure that the Sunlight, and Sky Background and Illumination are still toggled on.)

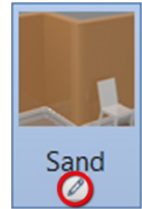
Step 9. Render the drawing – The result will look similar to the example on the next page...



As you can see, materials make a big difference in the quality of a rendered image.

There is one more thing we should do before wrapping up this exercise. Notice that the walls have an overly “glossy” appearance. To tone this down we need to make a simple adjustment to the Sand material.

Step 10. In the Materials Browser, click the “Edit” button on the Sand material to open it in the Materials Editor.

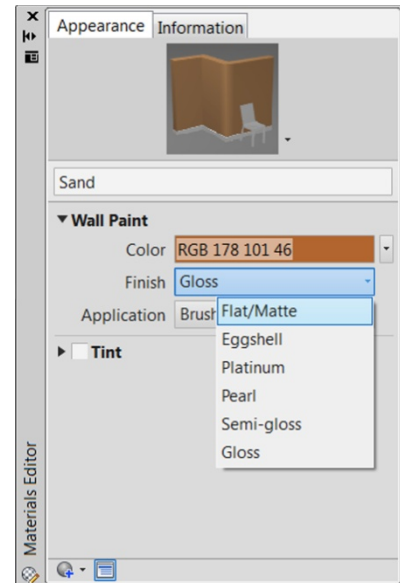


(Note: Double-clicking a material will also open the Materials Editor.)

Since this material represents wall paint, the settings are associated with real world wall paint properties.

Step 11. Assign a Flat/Matte finish to the paint, and lighten it's color a little by changing it to 178,101,46.

Close the Materials Editor when finished and render the drawing a final time



Feel free to keep going! Try new materials or colors. Play with the angle of the sunlight. See if you can create a more interesting view.

After completing this exercise, you can ...

- Navigate the Materials Browser to select photorealistic materials
- Apply materials to model components
- Customize basic material properties

Exercise #3 – Using Artificial Light to Illuminate a Scene

Open **03_artificial_lights.dwg**

Learning goals: Illuminate a drawing using point lights. Edit the properties of a light source. Create soft cast shadows.

As you can see, materials have already been assigned to the components in this drawing. *(For the sake of review, try opening the Materials Browser and identify the materials being used.)*

In this exercise we're going to focus on how we can create some artificial light sources.

Let's start by rendering the drawing to see what we're starting with.

Step 1. Restore the view named “off-center” and render the drawing.



At this point the drawing is being rendered using “generic” lighting. It's important to note that before we add a single light source to a model, AutoCAD provides us with this default lighting. *(If it didn't, we wouldn't be able to see our components.)*

Adding our own light source to the drawing involves selecting a specific type of light, its location, and its illumination properties. For the purpose of this tutorial, we'll be working with the easiest light source to manage; the point light. A point light represents a ball of light, casting light in all directions.

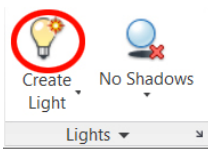
Step 2. Zoom out such that you can see the entire model and then turn on layer “LIGHTS”.

Notice the two yellow circles in the drawing. These circles represent locations where we will be placing light sources. Orbit the view and note that the circles are positioned above the components in the model.

Using the image to the right as a reference, we'll start by inserting a point light at the center of circle A. A point light can be created by clicking the point light icon within the Lights panel of the ribbon.

Step 3. Launch the Point Light command. *(If asked, go ahead and turn off default lighting.)*

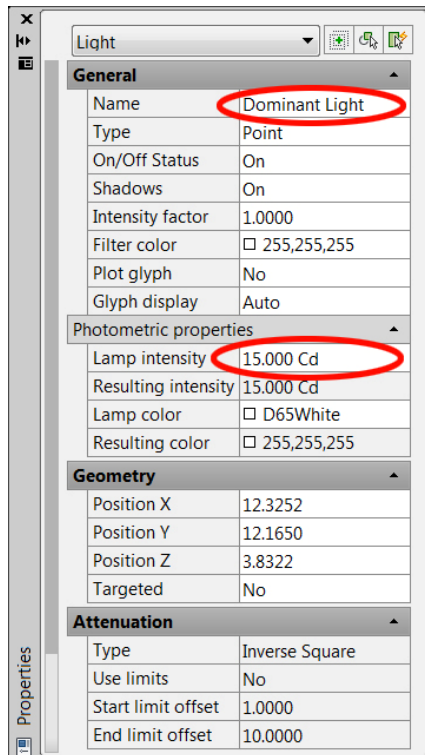
Place the light at the center of circle A and then press Enter to accept the defaults and exit the command.



Notice how HOT the model looks in modelspace at this point. This is because we are working with a very small model and a very bright light. Let's adjust the properties of the light using AutoCAD's Properties Palette.

Step 4. Click to select the new point light and use the Properties Palette to view its settings.

(Press CTRL+1 to toggle on the Properties Palette if necessary.)



Step 5. Name the point light “Dominant Light” and change the Lamp Intensity to 15 candelas. (While you’re here, review some of the other possible settings.)

When finished, restore the view called “off-center” and render the drawing again.



As you can see, the rendering is starting to take shape.

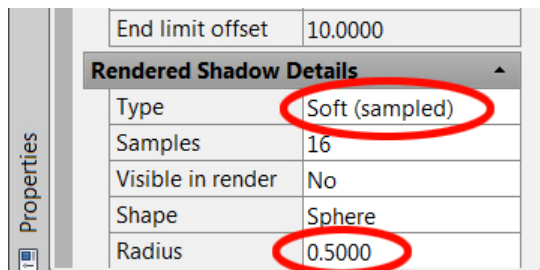
Let’s add another point light to brighten up the shadow areas a little.

Step 6. Run through Steps 3-5 again and create a new point light at the center of circle B. Name it “Secondary Light” and assign it a brightness of 5 candelas.

Tip: Now that we’ve taken charge of the lighting in this model, the working environment in modelspace may seem a little dark. (Remember when we elected to turn off the default lighting?) In the ribbon, expand the Lights panel and select “Default Lighting” to toggle it back on. Note that this setting ONLY affects modelspace, the rendering will still use the inserted light sources.

Render the model again and note how the image is affected by the new light source.

Before we wrap up this exercise, let’s do one more thing to improve the realism. We’ll modify the light sources such that they create soft cast shadows.



Step 7. Select both light sources, and at the very bottom of the Properties Palette, assign them a Soft (sampled) shadow type, and a Radius of .5. (The larger the radius, the softer the shadow’s edge.)

When finished, render the model a final time. (Finished examples can be found on following page.)



Sharp cast shadows



Soft cast shadows

Don't stop here, light sources allow much room for experimentation! Try using some of the other lighting types. Create colorized lights. Try to simulate lighting from a real world light source.

After completing this exercise, you can ...

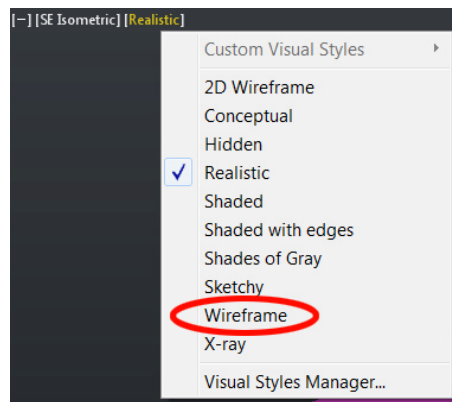
- Illuminate a drawing using point lights
- Edit the properties of a light source
- Create soft cast shadows

Exercise #4 – Customizing Materials to Improve Appearance

Open **04_glass_study.dwg**

Learning goals: Customize material properties. Create new materials from scratch. Use a background to add interest to reflective materials.

Next we're going to take a closer look at how to customize materials. We've already seen how we can select from AutoCAD's extensive library of samples. In this exercise we'll learn how to make those materials work for us!



Start by zooming out and reviewing the contents of the file. Generally speaking, this model represents a soft drink bottle filled with orange soda. If desired, open the Visual Style menu and select Wireframe to see the “beverage geometry” inside the bottle. Switch the visual style back to Realistic when finished.

We'll start by adding some materials to the drawing

Step 1. Open the Materials Browser and load the following materials into the drawing...

Checker Black-White (for the table)

Glass Clear-Light (for the bottle)

Glass Clear-Amber (for the soft drink)

Step 2. Assign the materials to the components.

Tip: It's easier to assign the Glass Clear-Amber material to the soft drink layer, rather than using drag and drop.

When finished, restore the view called “final” and render the drawing. As it's rendering, try and visualize what the image should look like.

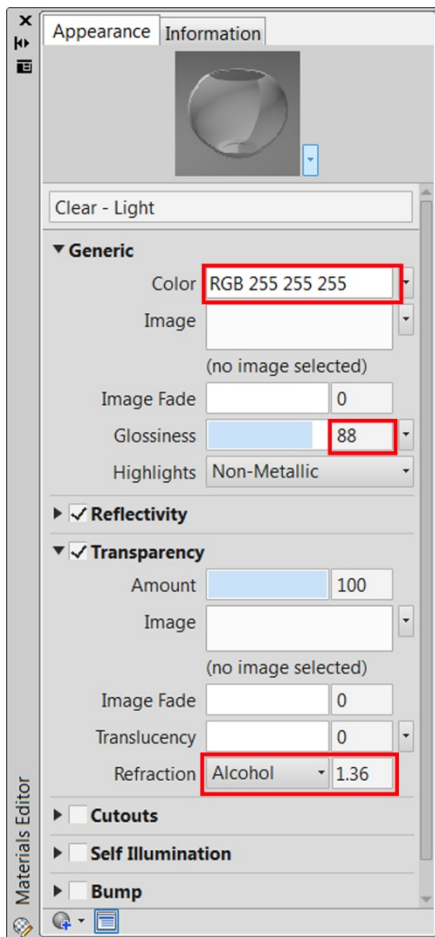
Did you get what you expected? Probably not. Don't worry; this is only a minor setback. Fortunately AutoCAD allows us to modify material properties to meet the needs of a rendering.

Let's start the material editing process by simplifying what we see on screen.

Step 3. Turn off layer “soft drink”.

Removing this layer from view will make it easier to evaluate the changes we make to the glass material assigned to the bottle.





Step 4. In the Materials Browser, double-click on the Glass Clear-Light material to open it in the Materials Editor.

The Materials Editor gives us a forensic level of control over the appearance of a material. *As a side note, the changes we make to this material only affect the material that is loaded in this drawing; it will NOT affect the original material located in the AutoCAD library. (So go ahead and have fun with the settings!)*

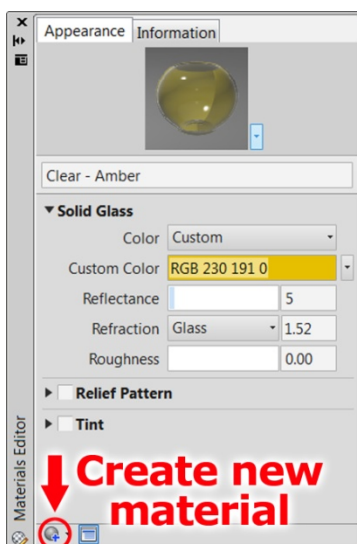
Note that the properties of a material are organized into a series of categories. Click the triangles to open and close a category and view its settings. A checkmark next to the category name identifies that its settings are being applied.

Unfortunately the scope of this class doesn't allow us to talk about all of the settings in this editor. To find out what a setting does, simply hover over it to display a popup with more information. *(Still unclear? Try changing the setting and see how it affects the rendering.)* Experimentation is by far the best way to learn how to these settings work.

With respect to the clear glass material, I'd like to lighten it up, increase its glossiness, and adjust its refraction such that light doesn't bend so much when passing through it.

Step 5. Make the following adjustments to the Glass Clear-Light material: Color = 255,255,255, Glossiness = 88, Refraction = Alcohol.

When finished close the Materials Editor, and render the drawing again.



At this point the bottle looks much better. Now let's turn our attention to the material representing the soft drink.

Step 6. Double-click the Glass Clear-Amber material to open it in the editor.

Notice that this material has fewer settings than the previous one. That's because this material was created from a "template" representing solid glass, much like the wall paint material we saw in a previous exercise.

This material would be fine if we were rendering a clear liquid, (*like apple juice for instance*) however, the orange soda we need to simulate has some translucency.

We'll proceed by creating a brand new material from scratch.

Step 7. Since the Materials Editor is still open, click the Create New Material icon, (*highlighted in the image on the previous page*) and select "New Generic Material" from the menu.

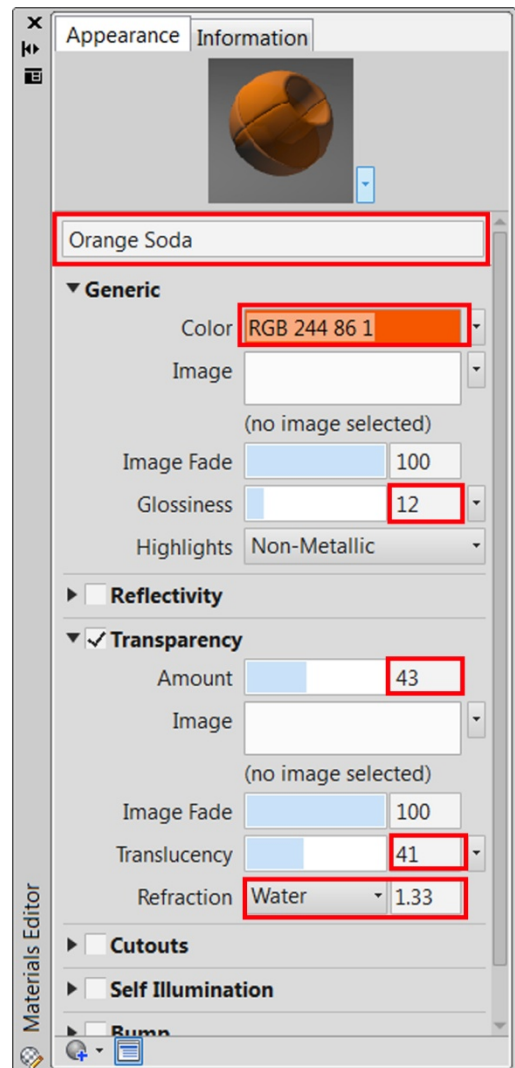
This will close the current material, create a new one, and populate the editor with its settings.

Step 8. Assign the following settings to the new material.

Name = Orange Soda **Color = 244,86,1**
Glossiness = 12 **Transparency = 43**
Translucency = 41 **Refraction = Water**
(represents "clearness")

When finished, close the Materials Editor. Then turn the soft drink layer back on and be sure to assign this new material to the soft drink geometry.

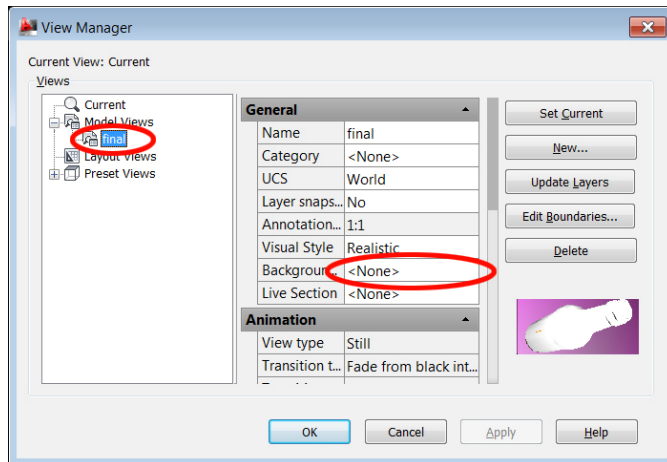
Render the drawing again and review the changes.



As you can see we are moving in the right direction. Let's make one more change before we close out this exercise. Note how dark the glass material looks at the top of the bottle. This is because the overall color of modelspace is nearly black. The glass material is simply reflecting the dark environment that surrounds it.

To give the glass a little more life, we'll assign an image to the modelspace background such that the glass material has something more interesting to reflect.

Step 9. Open the View Controls menu and select View Manager. (*Same place we go to save a view*)



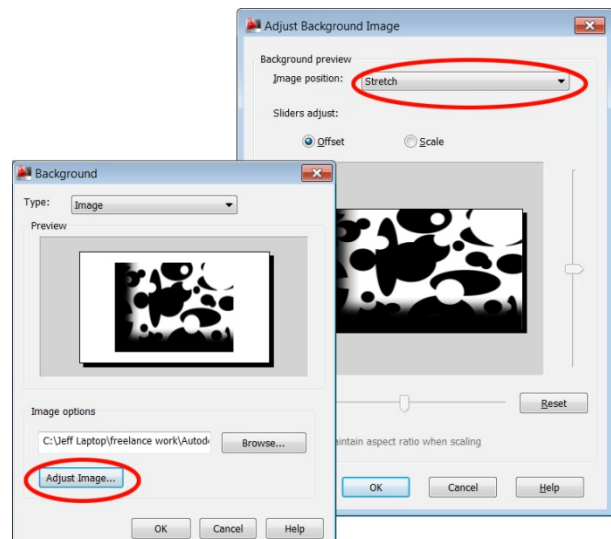
Step 10. On the left side, select the view named “final” to load its properties. Click the **Background** setting and select “Image” from the menu. (Location highlighted in image at left)

Step 11. Click the **Browse** button; locate the image called **bckgnd-dots.jpg** and click **Open**. (Don’t close the dialog box just yet!)

As you can see, the abstract image is loaded as the background for the drawing; however, it isn’t big enough to fill the entire screen. We’ll fix this by stretching it to fit.

Step 12. Click the “Adjust Image” button (shown in the image at right) and select **Stretch** from the **Image Position** menu.

When finished, click **OK** to close all dialog boxes, and then restore the final view.



Render the drawing one last time...

Notice how the glass material can have a more realistic appearance by simply adding something for it to reflect. The depth of control AutoCAD gives us over materials is amazing. The more you explore, the more you’ll find, and the better your renderings will look!

After completing this exercise, you can ...

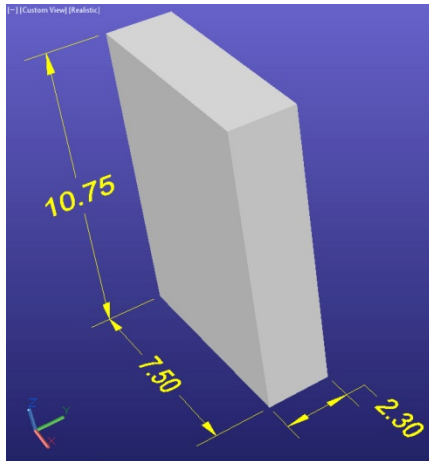
- Customize material properties
- Create new materials from scratch
- Use a background to add interest to reflective materials

Exercise #5 – Mapping Materials to Planar Faces

Open *05_planar_mapping.dwg*

Learning goals: Create materials using images. Apply materials to specific faces using the CTRL key. Adjust planar mapping using the MATERIALMAP tool.

The drawing in this lesson contains a solid primitive representing a typical cereal box. Our goal is to simulate the “packaging” by creating materials for the top, front and right side.



Step 1. Open the Materials Browser and use the Create New Material icon (at the bottom) to create a New Generic Material.

The material we create first will represent the front of the cereal box. We'll use a scanned image as the basis for this material.

Step 2. In the Materials Editor, name the material “Box Front”, and then “click” in the Image field to select an image file. (See example below.) Locate the image called box-front.jpg and click Open to return to the editor.

Note that a small preview of the image and its filename now appear in the Image area of the editor.

Step 3. Click the image preview to open the Texture Editor.

(See image on following page.)

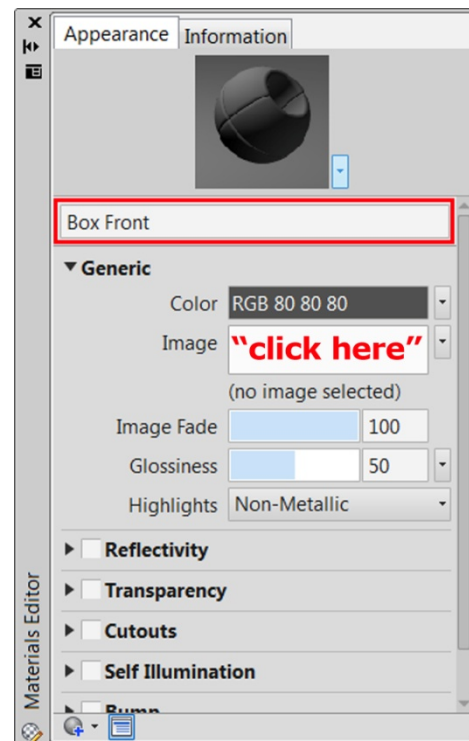
The Texture Editor is where we find controls specific to imagery. Common settings include scale, position, and rotation.

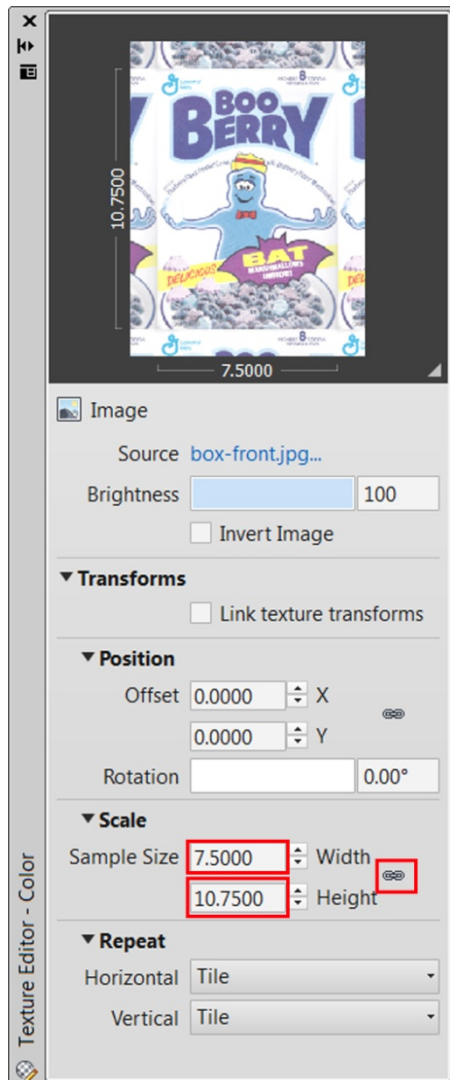
The trick to creating an image based material is knowing the size at which the material will be placed. In this case, the front face of the box measures 7.5” wide by 10.75” tall. For this reason, we'll assign these same dimensions to the material in the Texture Editor.

(Note: The aspect ratio needs to be turned off to allow a material to have an unequal width and height.)

Step 4. In the Scale area of the Texture Editor, turn off the aspect ratio by clicking the small “link” button. Next, assign the material a width of 7.5” and a height of 10.75”. (See example on following page.)

When finished, close the Texture Editor and the Material Editor.





Now that the material is finished, we can apply it to the front face of the model. We'll do this using the CTRL key.

Step 5. Drag and drop the new material from the browser and (while holding down the CTRL key) release the material over the front face of the box.

Using the CTRL key will restrict the application of a material to a single face of a solid model.

At this point, you are now familiar with the workflow necessary to create the remaining materials.



Step 6. Try this! Create a new generic material to be used for the right side of the box. Call it "Box Side", use the box-side.jpg image file, and assign it a width of 2.3" and a height of 10.75". Drag the material to the right side of the box when finished.

Step 7. Create a new generic material to be used for the top of the box. Call it "Box Top", use the box-top.jpg image file, and assign it a width of 2.3" and a height of 7.5". Drag the material to the top of the box when finished.

How did it go? You probably noticed that the top material didn't map as you had expected. In fact it is rotated 90 degrees from how it should be. (Generally speaking this is because the material is defined at a "portrait" orientation, while the face it's mapped to would be considered "landscape".)

Knowing what we know now, we can quickly fix things by simply editing the Box Top material.

Step 8. Double-click the Box Top material in the Browser to open it in the editor. Click the image preview to open the Texture Editor and in the Position area, change the rotation to 90 degrees. (Note how changes display instantly on screen.) Before closing the editor, review some of the other settings.

At this point your model should look similar to the example at right.



You'll find that it's easy to map image based materials to faces that are aligned nicely with the X, Y, or Z axis. In the likely event you are working with faces that are skewed, or rotated in 3D space, material mapping requires a little more work.

Let's simulate the challenges posed when working with rotated faces.

Step 9. Turn off layer "dimensions" and layer "box1". Turn on layer "box2". Orbit the drawing if necessary and center the geometry on screen.

As you can see, we are working with an identical box; however, this one has been rotated in 3D space.

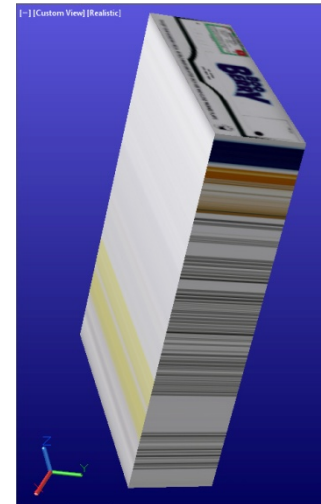
Step 10. Drag and drop the appropriate materials to the top, front and right side of the box.

(Don't forget to use the CTRL key!.)

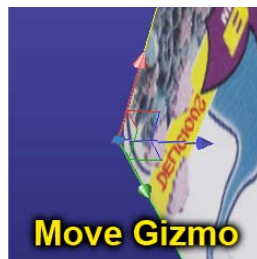
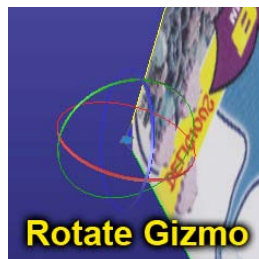
When finished, your box will look similar to the example at right.

It's obvious that in this case, the default mapping isn't going to work.

To fix things we'll use the MATERIALMAP tool.



Step 11. In the Materials panel of the ribbon, open the Material Mapping flyout and select "Planar". *(This tool specializes in correcting materials mapped to flat planes.)* **At the "Select faces or objects" prompt, hold the CTRL key and click the front face of the box. Press Enter when finished.**



You'll find the Box Front material is now properly oriented to the face, AND there is a new "tool" showing up at the lower left corner. This tool is called a Gizmo. Gizmos allow us to further refine the mapping of a material. *(If you're familiar with the Gizmos used to edit geometry you'll find the mapping Gizmos work the same way.)* There are two mapping Gizmos to choose from, Move and Rotate.

Simply right-click on the Gizmo to switch between the two tools.

Step 12. Using the Rotate Gizmo, select the BLUE ring to lock the rotation to that axis and rotate the material counter-clockwise approximately 90 degrees.

(Unfortunately you CANNOT specify this angle, just "click" when you are satisfied with the rotation.)

At this point, the drawing will look similar to the image at right. All we have to do is flip the material over so it reads correctly. This is an easy fix using the Rotate Gizmo.

Step 13. Using the Rotate Gizmo, select the GREEN ring and rotate the material approximately 180 degrees, thus, flipping it over on the front of the box. Press Enter to accept the final mapping.

One more material to correct and we'll be finished!



Step 14. Using the skills learned in Steps 11-13; see if you can correct the mapping of the material on the right side of the box. (*Hint: Don't assume you will be selecting the same color rings to rotate the material.*)

When finished, feel free to render the drawing from any view.



You'll find that using Mapping Gizmos is more of an art than a science. In your experimentation, try selecting some of the other grips and see how they can be used to distort or stretch a material. If you are willing to put some time and effort into working with this "sometimes quirky" tool, it WILL allow you to map anything onto almost anything.

After completing this exercise, you can ...

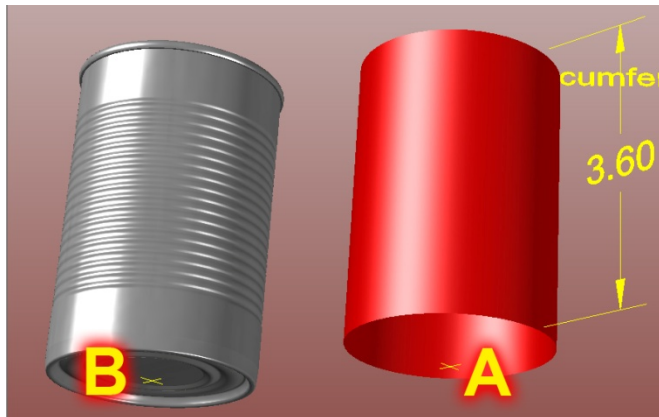
- Create materials using images
- Apply materials to specific faces using the CTRL key
- Adjust planar mapping using the MATERIALMAP tool

Exercise #6 – Mapping Materials Cylindrically

Open *06_cylindrical_mapping.dwg*

Learning goals: Properly scale cylindrically mapped materials. Control materials applied to rotated cylinders.

The drawing in this exercise contains the components of a traditional soup can. We have a solid model representing the tin can, and a surface representing the label. Our goal is to simulate the packaging by creating and mapping a material “cylindrically” around the label.



Let's start by assembling the components of the model.

Step 1. Orbit the drawing so you can see the targets beneath the geometry. Move the label (and the dimensions) from the node at point A to the node at point B. When finished, Orbit the drawing so you can read the dimensions and center the geometry on screen.

Before we create a material, let's turn off the tin can to make it easier when the time comes to map the material to the label.

Step 2. Remove the can from view by turning off layer “tin can”.

Step 3. Open the Materials Browser and create a New Generic Material. Name the material “Soup Label” and then click the Image field to select an image. Choose the soup-label.jpg file and click **Open**. (If necessary, click the image preview to open the Texture Editor.)

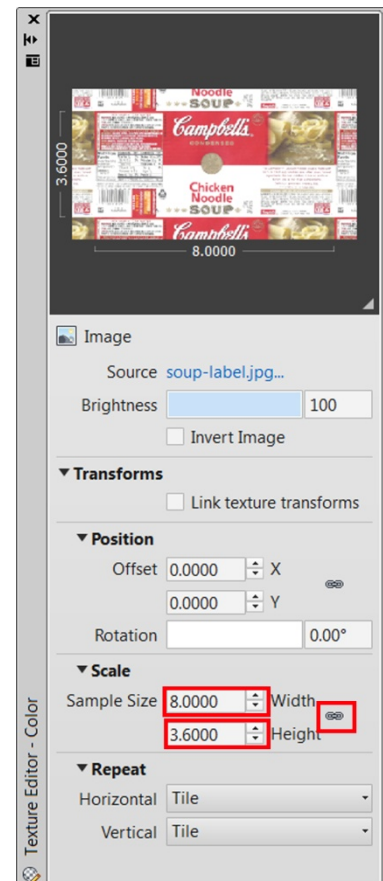
At this point we'll assign real world measurements to the material.

Step 4. Turn off the aspect ratio link, and assign the material a width of 8” (matches circumference) and a height of 3.6”.

When finished, close the Texture Editor and Materials Editor. Finally we'll drag the new material to the label.

Step 5. Drag and drop the material to the label. **(DO NOT use the CTRL key. Remember this is a surface, not a solid.)**

At first glance, the material appears to have worked well. (See example on following page.) A closer inspection however, reveals portions of the material being repeated around the label.





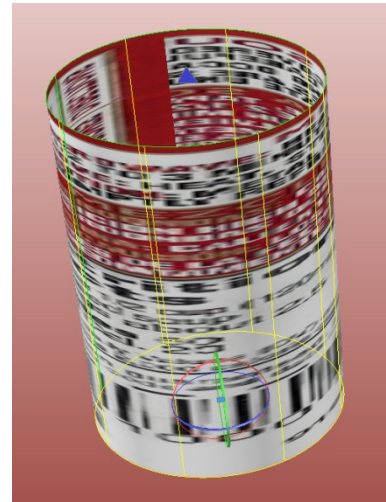
If the material in this example represented wood grain, this problem might not even be noticeable. Since we are working with a recognizable image, the error is obvious.

To correct the mapping, we'll use the MATERIALMAP tool.

Step 6. In the Materials panel of the ribbon, open the Material Mapping menu and select "Cylindrical". At the "Select faces or objects" prompt, click on the surface and press Enter.

(DO NOT use the CTRL key.)

At this point, your drawing will look similar to the image at right. As you can see, just as with planar mapping, Gizmos can be used to correct cylindrically mapped materials.



Believe it or not, even though the mapping appears to need additional tweaking, it's actually just fine.

Step 7. Make NO CHANGES using the Gizmos! Simply press Enter to accept the mapping.

The problem here is with our original material. Remember when it was defined, we assigned real world dimensions to it. This is the correct workflow in MOST cases; however, in the event you are creating a material to be mapped cylindrically, the width needs to be set to 1.

Step 8. Double-click the Soup Label material in the Materials Browser and click the Image preview to open the Texture Editor. In the Scale area, change the width to 1". Technically this number acts as a scale, so 1 (or 100%) means the material's width wraps "once" around the cylinder. Change the value to .5 and you'll see two versions of the label, etc.



Step 9. Turn on layer "tin can" and render the drawing using the view of your choice.

As a bonus, I have included a second (rotated) label in this drawing on layer "label-rotated". See if you can use the skills you've learned to successfully map the material to a rotated cylinder. (Hint: You may need to use a different image.)

After completing this exercise, you can ...

- Properly scale cylindrically mapped images
- Control materials applied to rotated cylinders

Exercise #7 – Strategically Placing Materials Using IMPRINT

Open *07_imprinting_faces.dwg*

Learning goals: Create custom faces using IMPRINT. Adjust the resolution of a rendered image. Save rendered images to disc.

In previous exercises we've seen that a material can be applied to a specific face using the CTRL key. In this lesson we'll learn how to create a custom face onto which we can apply a material.

Let's start by rendering this drawing to establish a starting point.

Step 1. Restore the view named "final shot2" and render the drawing.



This model represents a classic roadster pedal car. Our goal in this lesson is to add some flames to the paint job. While something like this could be accomplished by mapping a photograph to the side of the car, it would likely require significant Gizmo editing to get the positioning right.

Instead, we are going to create a custom face that perfectly matches the shape of the flames. Then we can simply apply a material to that face. Let's press on!

Step 2. Make the following adjustments...

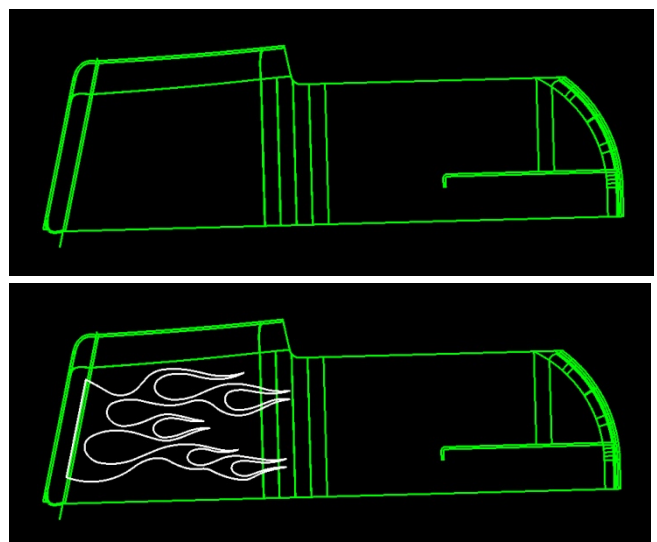
- A. Change the Visual Style to Wireframe**
- B. Select the BACK view from the ViewCube, and then right click ViewCube and select Parallel**
- C. Zoom in and center the car on screen**
- D. Finally, open the Layer Properties Palette, press ALT+S, and restore the saved layer state called "working state"**

At this point, your screen should look similar to the image at right.

Now that things are "visually simplified", turn on the layer called "**body flames**". You should now see the geometry we'll be using to create the custom paint scheme.

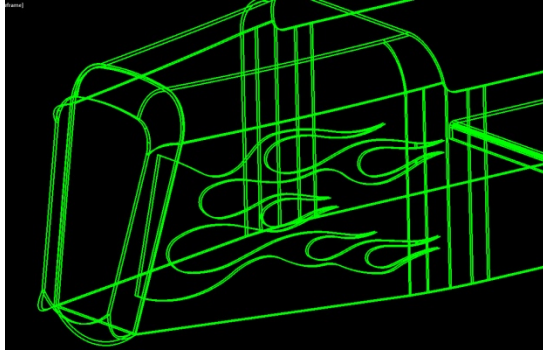
Just for a second, imagine creating this geometry as a polyline and then extruding it such that it becomes a solid. That is exactly what has been done.

Let's orbit the view and take a look.



Step 3. Orbit view and note the extruded flame geometry passes through the side of the car.

What we'll do now is use the IMPRINT command to imprint the flame geometry onto the car's body.



Step 4. Type IMPRINT and press Enter, then select the car, followed by the flames, and then select <Y> to erase the source object. *When finished, your drawing will look similar to the one at left.*

We now have custom faces that can receive their own materials. Next, let's adjust the visual style so we can see the black paint on the car body while also seeing the line work representing these new faces.

Step 5. Change the Visual Style to X-Ray

Finally we'll create some yellow paint for the flames.

Step 6. Open the Materials Browser and look for the material called "Glazed – Black". *(This material represents the glossy black paint applied to the car.)* **Right-click on this material and select "Duplicate" from the menu. Name the new material "Glazed Yellow" and press Enter. Finally, double-click on the new material to open it in the Materials Editor.**

Step 7. Assign the Glazed Yellow material a color of 255,255,0.

Now it's just a matter of dragging this material *(using the CTRL key)* and dropping it on the newly created faces.

Step 8. While holding CTRL, drag the Glazed Yellow material and release it over a new face.

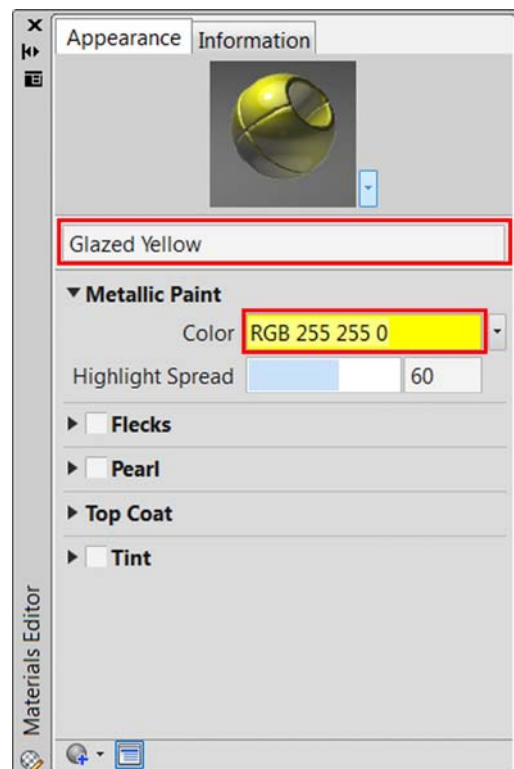
Note: *Be patient! The material may take several seconds to display AND you will have to run through the process a couple times to cover all of the flame faces.*

Now that our work is finished, let's restore the layers and the view, and produce a final rendering.

Step 9. Make the following adjustments...

- A. Open the Layer Properties Palette, press ALT+S, and restore the "Initial Layer State"**
- B. Restore the view called "final shot2"**
- C. Render the drawing**

(Finished example on following page.)





After all of the exercises we've done, one thing has remained consistent. Every image has been rendered using the Medium render preset at a low resolution.

At this point, you may be wondering if it's possible to increase the quality and resolution of an image.

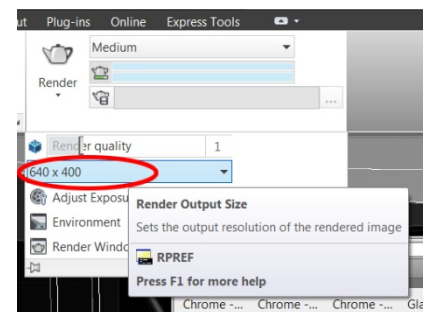
Here's how...

First, we'll talk about resolution.

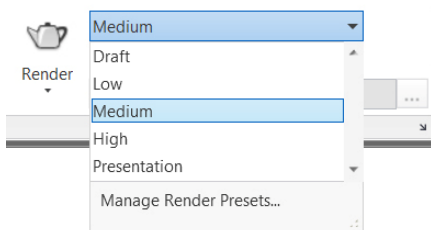
Step 10. Expand the Render panel and open the Render Output Size menu.

From here you can choose several canned resolutions, or you can select **Specify Image Size** to choose the exact resolution for your needs. (My monitor resolution measures 1680x1050 so I frequently render at that size.)

Note: The higher you set the resolution, the longer the drawing will take to render so it's best to keep working renderings small, and save the high resolution settings for a final rendering.



Next, we'll look at how we can improve the appearance of the materials.



Step 11. In the Render panel, click to open the Render Presets menu.

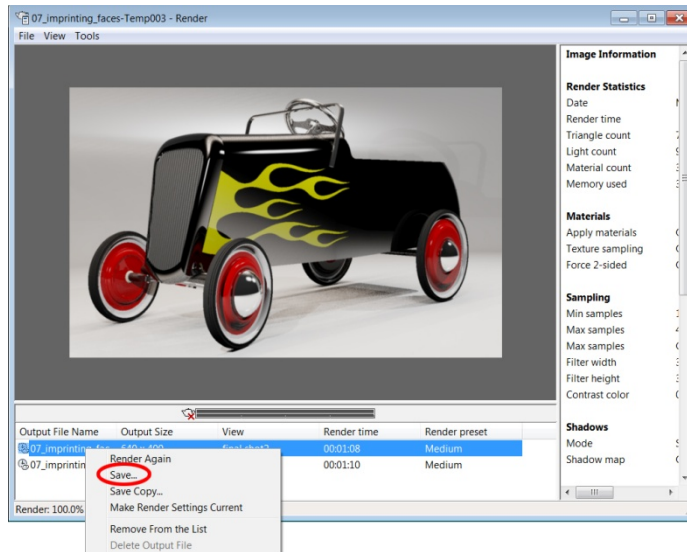
Notice that you can use this menu to change the quality of the rendered image. **Note:** The higher you set the quality, the better the photorealistic materials and lighting will look. As a side effect, it will also increase the time it takes to render.

If you want even more control over image quality, select Manage

Render Presets and tweak the render settings at a more granular level. Familiarize yourself with these extra controls and you can take your renderings to another level entirely!

Finally, how do we save these renderings as images?

Step 12. Render the drawing one last time, and in the Render Window, look at the list of output files beneath the rendered image. Each output file represents a rendering you created of the model. Right-click on an output file and choose Save, to save the image to your hard drive using the file format of your choice. (See example on following page.)



After completing this exercise, you can ...

- Create custom faces using IMPRINT
- Adjust the resolution of a rendered image
- Save rendered images as to disk

Well, we have certainly covered a lot of ground since our first exercise! Hopefully our journey has inspired you to further explore the world of AutoCAD rendering.

*Want to take your skills even farther? Please investigate the AU 2012 course **AC1607 - "Take Your AutoCAD® 2013 Renderings to the Next Level"**. AC1607 takes a more advanced approach to rendering, and it is designed to be a continuation of this course!*

I wish you the best of luck with your future visualizations. If you get an opportunity, I'd love to see some of your rendered work!

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