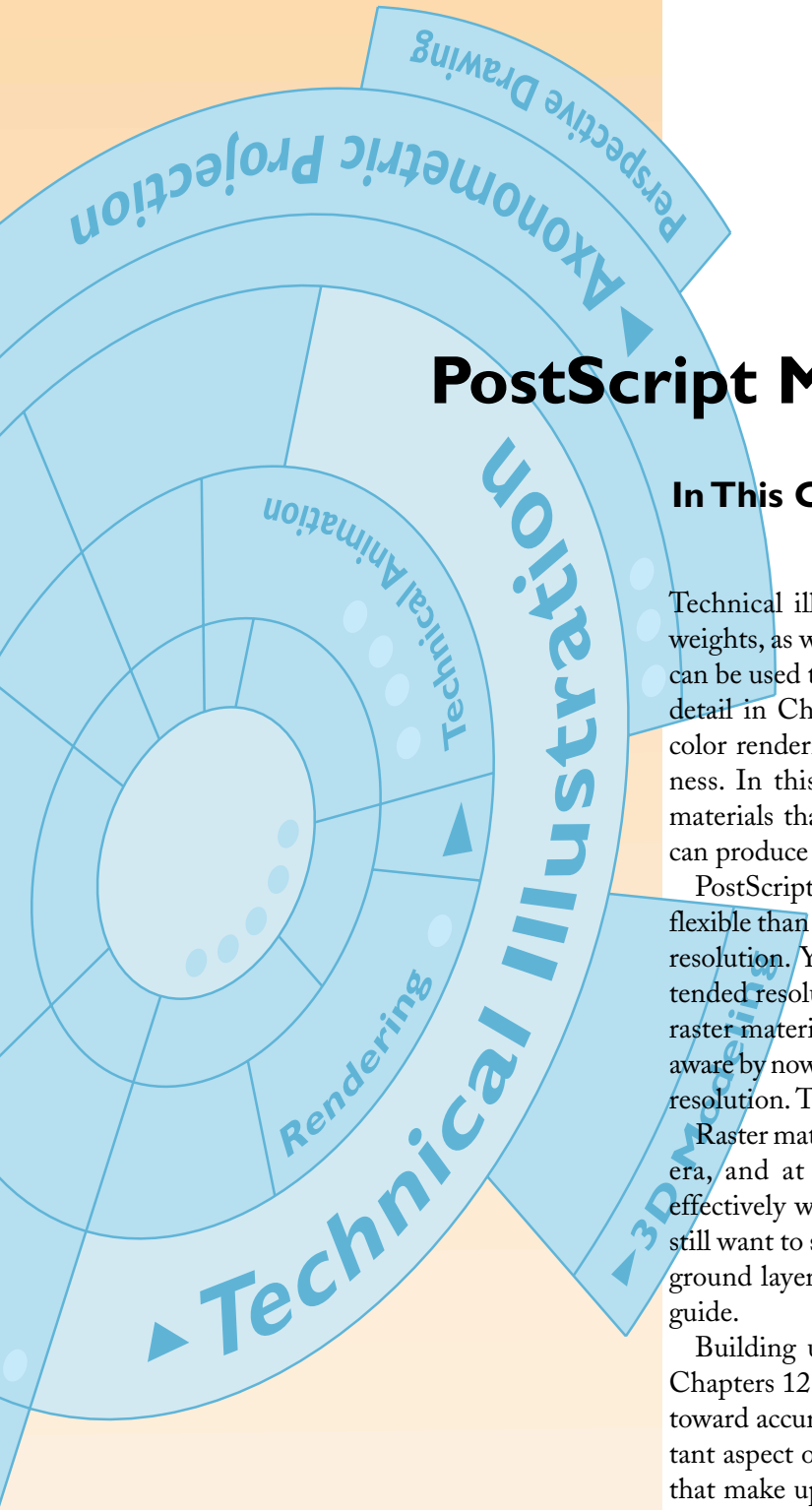


Chapter 14

PostScript Materials

In This Chapter

Technical illustrations may be completed with simple line weights, as was discussed in Chapter 10. Or, individual colors can be used to highlight areas of interest. This was covered in detail in Chapter 12. In Chapter 13, you were shown how color rendering positively impacts an illustration's effectiveness. In this chapter, you will find a library of PostScript materials that, when combined with accurate constructions, can produce the highest-quality technical illustrations.

PostScript materials are, by their nature, more powerful and flexible than are raster materials. Raster materials are of a fixed resolution. You have to be careful to create them at the intended resolution and not enlarge them. When you enlarge a raster material, you decrease the resolution. And you are well aware by now that PostScript materials make use of the printer's resolution. The material itself is described mathematically.

Raster materials can be scanned or captured by a digital camera, and at a high-enough resolution, can be combined effectively with vectors. With PostScript materials, you may still want to start with a scan or digital photograph on a background layer and create the PostScript material using it as a guide.

Building upon the color rendering basics you learned in Chapters 12 and 13, this chapter will take you one more step toward accurately rendered technical illustrations. An important aspect of doing so is to be able to simulate the materials that make up objects—such as wood, various metals, plastic, glass, and rubber. Accurately simulating materials is important and will lend credibility to your illustrations. A good place to begin is to simply be a good observer—visually absorbing

all the materials around you. Make mental notes about what makes these different materials unique and how light interacts with them. With these in mind, you will understand how to replicate a number of materials common to technical illustration.

Chapter Objectives

In this chapter you will understand:

- How to make use of **Swatch**, **Symbol**, **Custom Brushes**, and **Blend** libraries to render a technical illustration
- How PostScript materials for basic geometric forms are created
- That sophisticated materials are many times comprised of several basic materials
- How light and reflected light impacts different materials
- How to make a list of basic materials that you may encounter in technical illustration
- That color and value are used together to differentiate between various materials
- How appropriate colors are used to render materials effectively.

Building Libraries

It would be a shame to have to create a new texture from scratch each time you render a technical illustration. Some materials (colors and gradient fills) can be saved in **Swatch** libraries. You'll find a number of **Custom Brushes** on the accompanying CD-ROM in *tools/brushes*. You can also create libraries of blends as **Symbols** to be used again and again. Although two files can't share the same symbol library, a symbol dropped into one file, copied, and then pasted into another file becomes a symbol in the new file.

Swatches, **Custom Brushes**, **Blends**, and **Symbols** are saved in individual Adobe Illustrator files. For example, you'll find the file *geo_shapes.eps* in *tools/blends*. This Adobe Illustrator file contains a library of basic geometric shape blends that can be copied and pasted from the **Symbol Palette** to an illustration. Once in the illustration, the blend can be scaled and the colors of base objects in the blend adjusted as necessary.

Light and Reflected Light

It is important to recognize how light interacts with different materials when you are rendering technical illustrations in color. Materials around you are affected differently by direct or indirect light, and even by the time of day. Generally, more direct or intense light on an object will generate stark, higher-contrast highlights and shadows. Indirect or diffused light will generate smooth, softer highlights and shadows. Reflected light on the back side of objects will also vary with lighting conditions. Figure 14.1a and 14.1b show the effects of different lighting conditions on the same object.

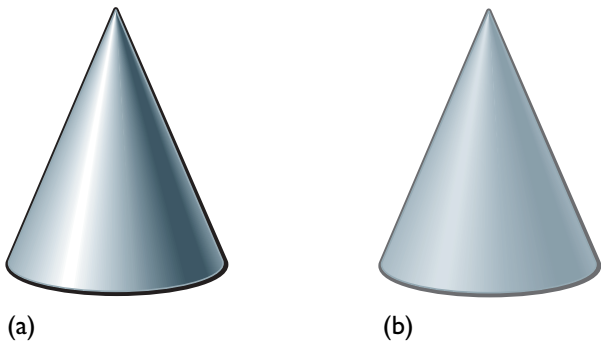


Figure 14.1 (a) Cone in bright, direct light. (b) Cone in low, indirect light.

Material Characteristics

A surface or material with a flat or dull finish may have a slight highlight or even none at all. Materials such as cast metal and raw wood are good examples because of their rough or unfinished surfaces. On the other hand, materials such as glass, chrome, and stainless steel typically reflect much more light due to their smooth or highly polished finishes. The differences between their highlights and shadows are extreme.

A technical illustrator must possess a basic knowledge of the manufacturing processes involved in creating specific materials. For instance, a machined steel shaft is manufactured and finished quite differently than a cast-iron engine block. A firm understanding of these processes will result in more accurately rendered objects.

Basic Materials

As a technical illustrator, you will encounter and be required to render hundreds of different materials in your career. Materials pertaining to technical illustration generally fit into three categories:

- Natural materials
- Man made materials
- Processed materials

Natural materials include human skin and hair, concrete, wood, stone, fluids, and the sky. Human-made materials include fiberglass insulation, cloth, carpet, leather, and building materials such as shingles. Generally, processed materials are rubber, plastic, glass, chrome, iron, steel, aluminum, bronze, and brass.

▼ Note

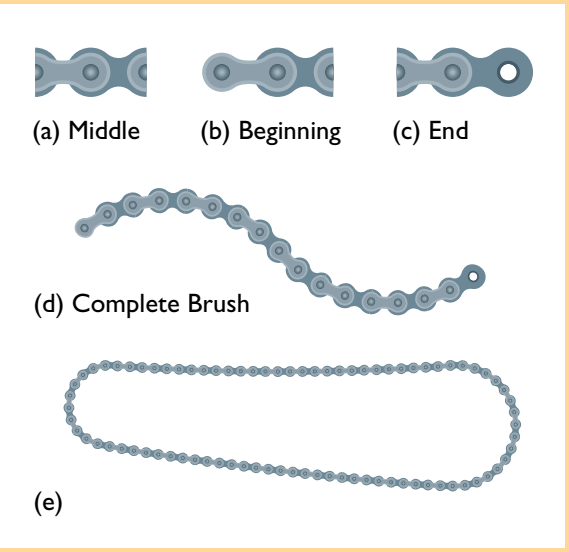
Always save an effective material rendering so it can be used again. Gradients, blends, and transparent overlays can be edited and rescaled, and their colors adjusted, for use over and over again.

The basic materials listed can be broken down further. Various woods, metals, and different types of glass and plastics are all around us. A technical illustrator involved in the engineering or manufacture of a machinery may routinely be called upon to render materials from a particular list, while another illustrator may render materials unique to architectural or medical illustrations. Over time, you will build a list of your own materials that will best suit you and the project at hand.

▼ Illustrator Tip

Repetitive features can be efficiently constructed by creating a **Custom Brush** as in this example of a bicycle chain. You can specify the (a) beginning, (b) middle and (c) end of each brush stroke. (d) You can see that each component tiles seamlessly. (e) When the chain stroke is joined, the beginning and end overlap for a continuous pattern.

Brush strokes, however, lie in the plane of the paper, and although you can shear the stroke path into axonometric projection, the brush that paints the stroke remains orthogonal. The solution is to **Distort** the brush stroke so that the brush shapes are in correct projection.



Describing Materials with Color

In addition to understanding the effects of light and the manufacturing processes, the color component of rendering materials is equally as important. Experienced illustrators know that a different material can be suggested by simply changing a color or intensifying a highlight. The results of a change like this can be realized in the comparison of the siding illustrations in Figure 14.2.

(a) Steel (b) Aluminum (c) Vinyl

Figure 14.2 Modify the color and highlights to suggest different materials.

Pulling It All Together

Let's take a closer look at the shock absorber shown in Figure 14.3. This particular illustration contains several of the more common materials associated with automotive or industrial technical illustrations. Because the shapes are generally cylindrical, a common **Gradient Fill** can be used to represent polished metal, painted metal, and rubber.

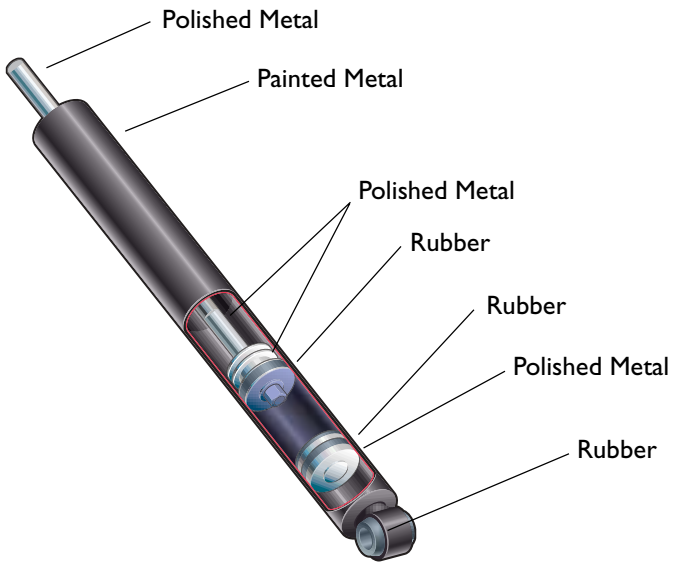


Figure 14.3 Cut-away of a shock absorber.

Figure 14.4 Chrome, aluminum, and rubber.

Later in this chapter you will be shown exactly how to represent various metallic materials, but from Figure 14.4 you can quickly see that with a slight change in ambient color as well as the projected and reflected light, dramatic differences in material and finish can be shown.

Chrome Piston

Chrome is a material that is used throughout a variety of industries and therefore is rendered frequently in technical illustrations. (See pages 316 through 319 for a description of both indoor and outdoor chrome.) At first glance, chrome's appearance may seem identical to highly polished steel. However, steel can be rendered to have a polished or dull surface, while chrome is always characterized by a high contrast, polished surface. Another characteristic of chrome is the presence of a horizon line being reflected back onto the surface of the object. This horizon line can be seen in the piston shaft gradient in Figure 14.5, where blue meets dark gray in the gradient color bar. The abrupt change in color is fine-tuned by adjusting the color keys and midpoints. Chrome is further distinguished by a bright, almost white highlight, contrasting dark horizon line, and the reflection of colors from surrounding parts or objects. The shaft of the piston has been isolated in Figure 14.6 to show you the application of the chrome gradient. Note that the reflections are parallel to the axis of the shaft. This is a characteristic of cylindrical materials.

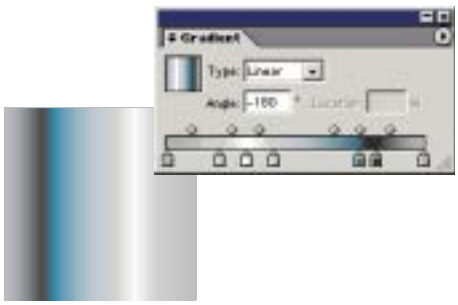


Figure 14.5 Chrome gradient as it appears in the **Gradient** window.

Figure 14.6 Chrome gradient applied.

Painted Aluminum Shell

Aluminum is another material that is very common to technical illustration. It exists in a wide variety of colors and finishes—from dull, matte finishes to glossy, and painted. For the shock bsorber, a warm, gray color was used in various tones to create the gradient. To achieve the glossy surface, a narrow highlight was built into the gradient, as well as a wide band of reflected light to better delineate the cylindrical surface. The aluminum gradient is shown in an interior detail in Figure 14.7, and the gradient is applied to the exterior shell in Figure 14.8.

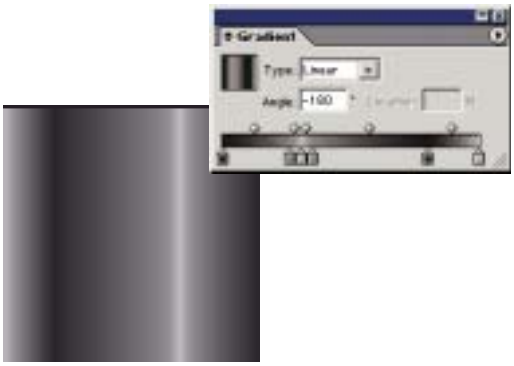


Figure 14.7 Aluminum gradient as it appears in the **Gradient** window.

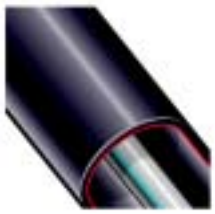


Figure 14.8 Aluminum gradient applied to the exterior shell.

Rubber Bushing

Rubber usually is found in items such as bushings, grommets, weather stripping, moldings, hoses, O-rings, and tires. It generally exists only in a handful of colors—black, and perhaps the occasional deep red or green for hose applications. For the bushing on the shock absorber, a cool, gray color was used in various tones to create the gradient. To achieve a softer, dull surface, a wider highlight was built into the gradient, as opposed to the narrow highlight used in the aluminum gradient. The rubber gradient is shown in detail in Figure 14.9, and the gradient is applied to the bushing in Figure 14.10.

Figure 14.9 Rubber gradient as it appears in the **Gradient** window.

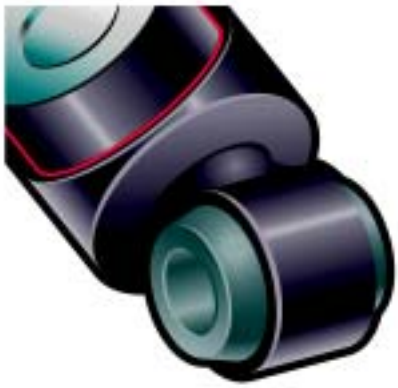
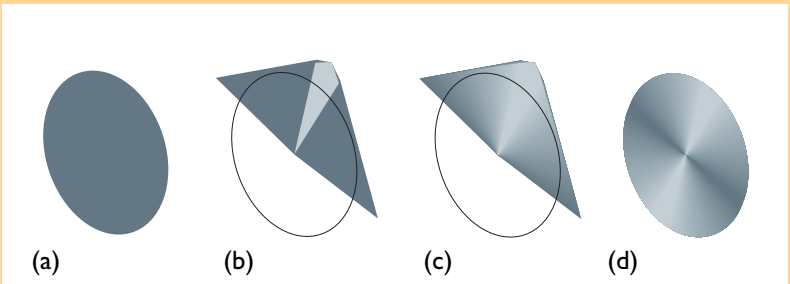


Figure 14.10 Rubber gradient applied to the bushing.

▼ Illustrator Tip

There are situations where a simple linear or radial gradient will not accurately describe a surface. For example, to render the end of a machined shaft, (a) begin with an ellipse filled with a medium base color, like gray. (b) Create two wedge shapes—one large and one small. Place one on top of the other, fill the large shape with the same medium gray as the ellipse, and fill the small shape with a lighter gray. (c) Blend between these shapes to create a smooth transition. (d) **Copy** this blend group and **Rotate** it 180 degrees about the center point. **Mask** the blends with a copy of the ellipse, and place the masked blends directly on top of the medium gray ellipse (d).



Material Gallery

The materials rendered in the shock illustration are just a sampling of the materials you will encounter when faced with rendering technical illustrations. Some additional materials are shown in Figures 14.11 to 14.31.

Additional realism can be obtained when rendering some materials by establishing the base geometry and color in Adobe Illustrator first, exporting it to Photoshop, and adding textures and other fine detail. The figures in Chapter 13 demonstrated this. This multi-application approach is well suited for rendering natural or organic objects, when nonmechanical details are not easily achieved in Illustrator.

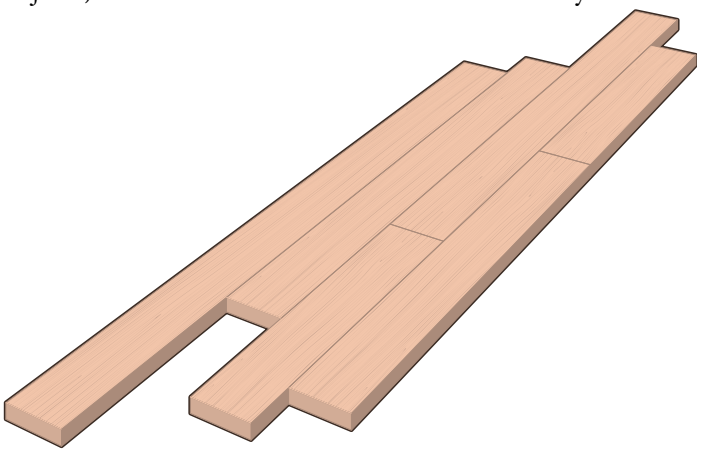


Figure 14.11 Wood flooring.

▼ Illustrator Tip

Illustrator brushes can be used to simplify the construction of more complex objects or surfaces by creating a texture. For instance, (a) a **Pattern Brush** is created from two simple shapes, and (b) then applied to multiple, overlying strokes. The colors are adjusted on random strokes and the brushed strokes are expanded. (c) The resulting pattern uses a **Mask** to match the shape of the object or surface to be filled and **Distort** can twist the shapes into pictorial projection. In this example, this expanding brush technique was used to simulate a commonly used home construction material.

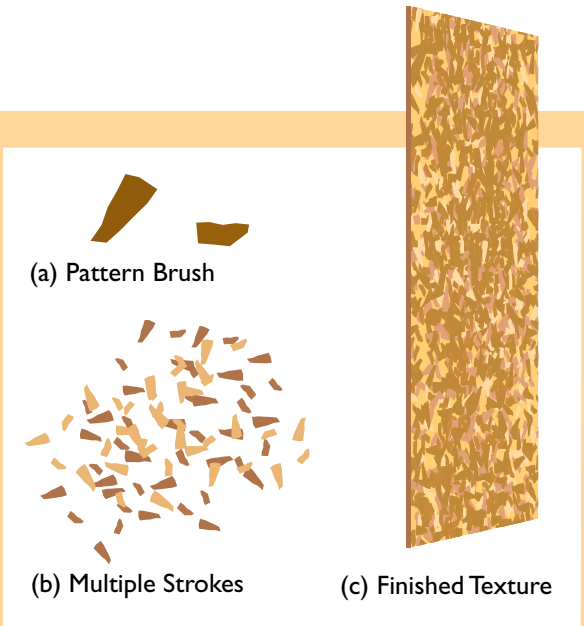


Figure 14.12 Fiberglass insulation.

▼ Illustrator Tip

Often it is easier to construct an object or surface in a plan view first, and then rotate and scale or skew the surface into the desired plane. To render the insulation, rows and columns were added to a simple rectangle using the **Gradient Mesh Tool**. The rows and columns were colored using the three color swatches. Use **Distort** to project this rendered surface onto virtually any plane, and the gradient mesh will go along for the ride.

(a) Three Colors

(b) Orthographic and Pictorial

Round Metal Panel with Joint

Many industrial products require enclosures, packaging, or cases that are comprised of closely fitting panels. If you look at refrigerators, stoves, furnaces, electrical panels, computer cases, or electronic components, you'll see examples of the surface detail similar to Figure 14.13.

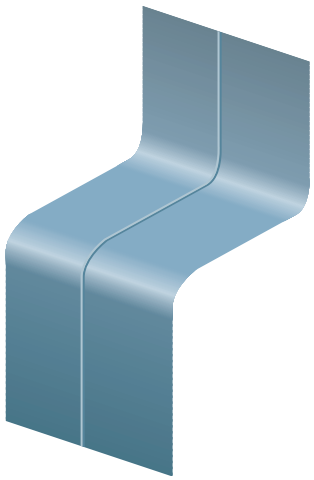


Figure 14.13 A rounded panel with joint.

1. Create the panel profile using any of the axonometric or perspective construction techniques covered in this text (Figure 14.14a). Duplicate this profile and move it to the side to be eventually used as joint lines.

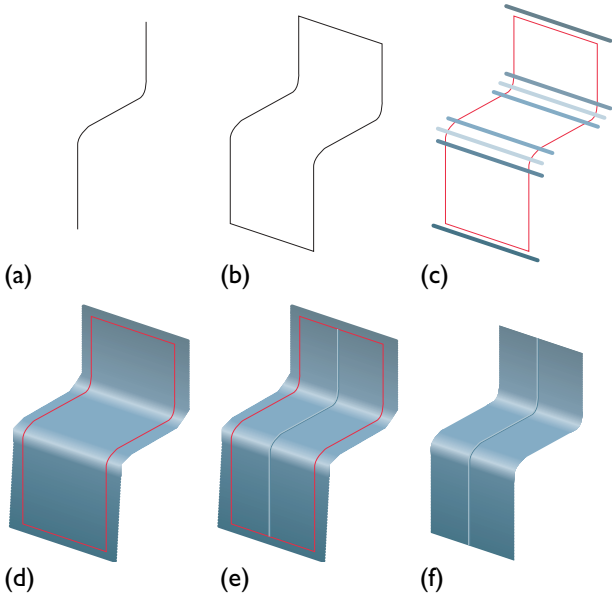


Figure 14.14 Developmental steps for rounded panel with joints.

2. Duplicate the original profile along the receding axis and connect the tops and bottoms with a straight line. Join these corners into a contiguous shape (Figure 14.14b). This will serve as the shape for a **Clipping Mask.**
3. Create lines at the receding axis angle that are slightly wider than the panel shape (Figure 14.14c).

- Determine a base object color. In this case we are using a blue metallic color with HSB values of 200, 40, 40.
- Place a line with the base color at each transition position. Assign highlight color (almost white) to the lines at the center of the fillet and round.
- The two vertical surfaces of the panel are essentially the same color, with a slight color transition between the top and bottom.
- The horizontal surface's color is between the highlight and the base color.
- Use **Blend Options|Specified Steps** because of the significant difference in blend distances between the flat areas of the panels and the fillet and round. The fillet and round require approximately a quarter the number of steps. The finished blend is shown in (Figure 14.14d).

4. Move the panel profile to the middle of the blend and bring it to the front of the stack. This is your joint line (Figure 14.14e).
   - Align the top of the joint line to the top of the mask shape.
   - Duplicate the joint. Offset so that both are visible and aligned to the top of the mask shape.
   - Select the right joint line and pick up the deepest shade color in the blend with the **Eyedropper Tool**. This is the joint shadow.
   - Repeat this process for the left joint line with the lightest color in the blend. This is the joint highlight. Group the blend and the panel joints.
5. Move the mask shape to in front of the blend and select both. Choose **Object|Clipping Mask|Make**. The blend is clipped to the panel (Figure 14.14f).

Window/Interior Detail

Many large industrial products such as automobiles, trucks, aircraft, and construction equipment include operator compartments that feature glass windows. To show these effectively, you must be able to render the glass windows and the interior (Figure 14.15). The glass will have more or less reflections, depending on the surrounding environment and whether or not the window is tinted. Of course, this also depends on how clean the window is. The interior will have more or less detail depending on window tinting, reflections, the color of interior ob jects, and the scale. Figures 14.16 through 14.21 record the development of this rendering technique.

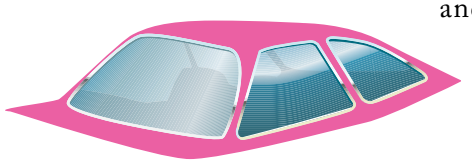


Figure 14.15 Automotive windows with interior in background.

1. Create paths that describe the exterior of the subject, the window openings, and the interior. Place each of these components on separate layers for selective display as shown in Figure 14.16.

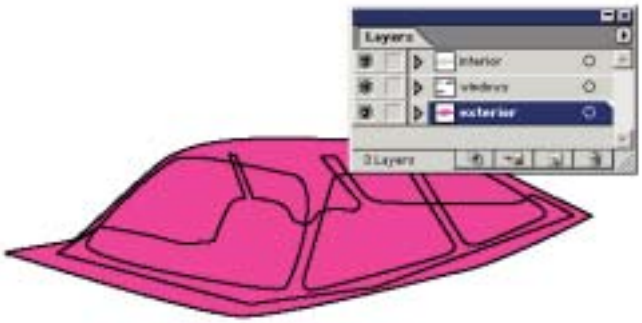


Figure 14.16 Exterior (filled), interior, and window paths.

2. Move a copy of the windows off to the side for later use. Duplicate this again.
3. Create a **Compound Object** that opens the windows in the exterior.
   - ▼ Hide the interior layer.
   - ▼ Assure that the windows layer is above the exterior layer. This will subtract the windows from the exterior.
   - ▼ Choose **Object|Compound Object|Make**. The windows are subtracted from the exterior (Figure 14.17).

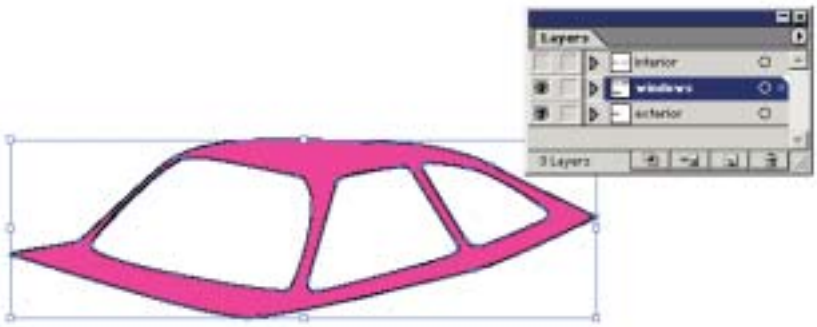


Figure 14.17 Windows are subtracted from the body.

4. Create the visibility of the interior by moving the interior layer to the bottom of the layer list. The interior is now correctly masked by the **Compound Object** (Figure 14.18).

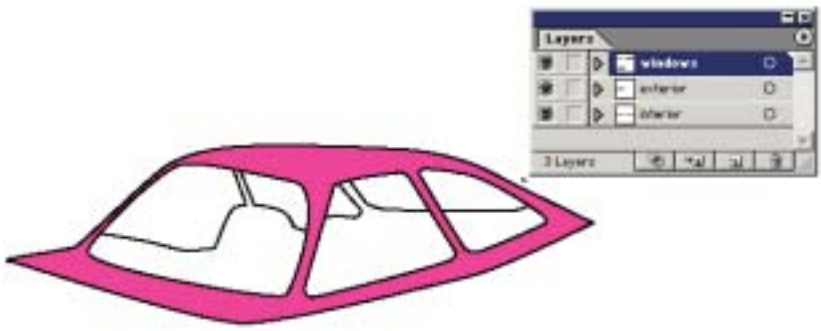


Figure 14.18 Interior is shown correctly through the window openings.

5. Using the duplicate copies of the window outlines as **Clipping Masks**, create blends for the windshield and the side glass (Figure 14.19).
   - ▼ Create base objects for the blends and position them appropriately. The windshield is pointed more toward the sun.

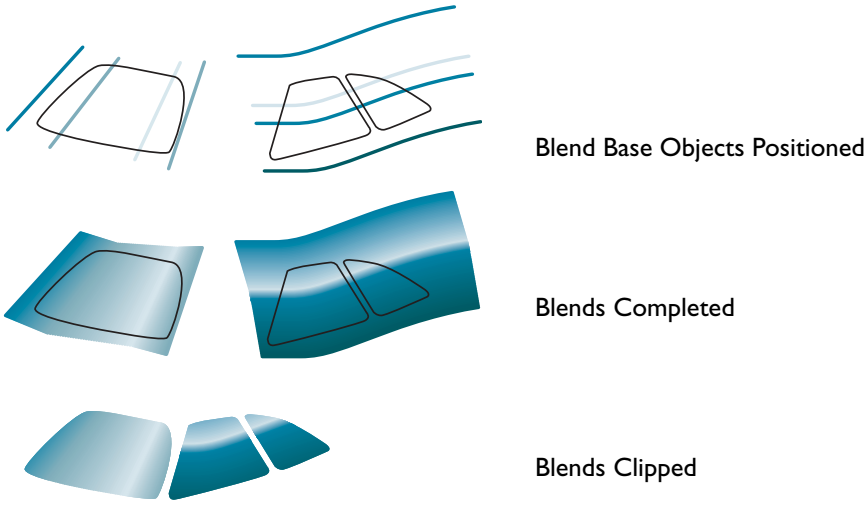


Figure 14.19 Window blends use window shapes to clip to the outline.

   - ▼ Create the blends with the **Blend Tool** and **Blend Options** set to **Specified Steps**. Choose a number of steps that produces a smooth blend.
   - ▼ Use the windshield as a **Clipping Mask** for the windshield blend.
   - ▼ Select the two side windows and make them a **Compound Path** so they will function as a single **Clipping Mask**.
6. Turn the stroke off for the exterior and interior. Assign a 60 percent black to the interior as shown in Figure 14.20.

- Make sure that the windows are on the window layer.
- Pick an anchor to match on both a window blend and the compound path of the car body.
- Adjust the transparency of the windows to get the level of reflectivity and opacity you desire (Figure 14.21).

Figure 14.20 Interior is filled with shadow color.

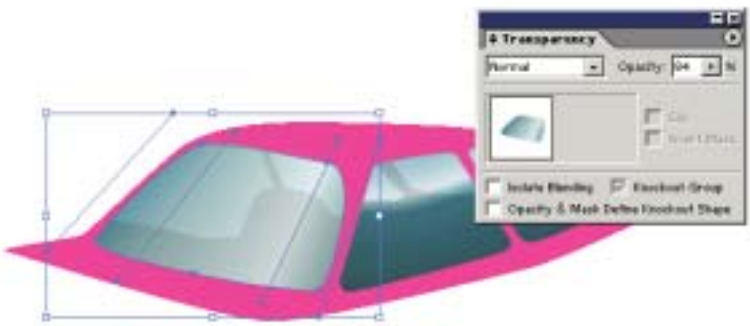


Figure 14.21 Transparency of window blend is adjusted.

Metallic Textures

A large percentage of products shown in technical illustrations are metal. This includes polished chrome, brushed aluminum, painted metals, and metal that has been rough cast. There are several techniques that can be used to create metallic textures: **Gradient Fill**, **Line** and **Shape Blends**, and **Custom Brushes**. But because metallic surfaces are very predictable, and some illustrations may have hundreds of chrome pieces, you want to use the most efficient method. When these are linear—as is the case with cylinders and flat plates—the chrome reflections will be linear also. For these reasons we will demonstrate metallic textures using **Gradient Fill**.

Figure 14.22 shows the **Gradient Fill** for an inside chrome texture. Chrome that is indoors has a hard, cold appearance and is usually completely devoid of color.

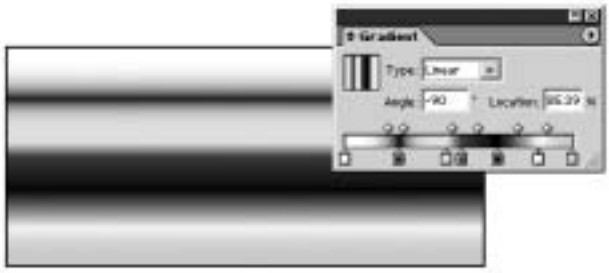


Figure 14.22 Indoor chrome gradient.

1. Begin by creating a shape that will hold the chrome gradient. In this case, we use a rectangle, a shape that might be considered the front view of a cylinder.
2. Double-click the **Gradient Tool** and click below the color bar to place the color keys.
   - ▼ The inside chrome texture will have a centered dominant black reflection.
   - ▼ Place another thin, black reflection on the upper half.
   - ▼ Place a thin, white reflection on the lower half.
   - ▼ Adjust the midpoint diamonds to sharpen the transitions (Figure 14.22).
3. Create a path to hold the gradient (Figure 14.23a).
   - ▼ Duplicate the cylinder.
   - ▼ Trim the elliptical ends.
   - ▼ Connect the elliptical ends with limiting elements.
   - ▼ **Join** the ellipses and limiting elements.
4. Fill the path with the gradient (Figure 14.23b) .
   - ▼ Set **Edit|Preferences|General|Constrain Angle** to 90 + the axis angle. *Note*: A cylinder facing to the left will require a 90 - the axis angle. This constrains the **Gradient Tool** to an angle perpendicular to the thrust axis.
   - ▼ Click on the cylinder shape, and then click on the **Gradient Tool**.
   - ▼ Hold down the **Shift** key and drag across the cylinder. If you start on the top limit and drag to the bottom limit before releasing the mouse button, the gradient will be distributed across the area. If you start outside or inside the selected path, the path will be filled differently.

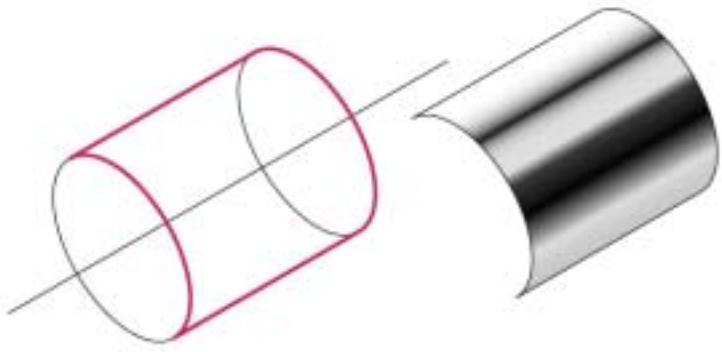


Figure 14.23 (a) Path to hold the gradient. (b) Gradient constrained to the thrust axis perpendicular.

5. Complete the end of the cylinder (Figure 14.24). In this case we have added a small chamfer.

   ▼ Drag the **Gradient Tool** across the chamfer so that a light portion of the gradient is next to the dark part of the cylinder. Adjust the color keys and midpoint diamonds so that dark is next to light and light is next to dark.

   ▼ Repeat the same operation for the cylinder's flat end. Change the angle so that the gradient is roughly parallel to the cylinder's elliptical major axis.

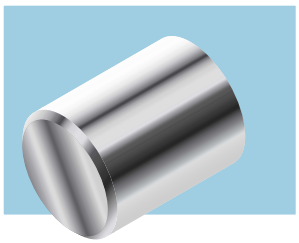


Figure 14.24 Gradient applied to chamfer end.

This base chrome texture can be used as the basis of other metallic finishes. Figure 14.25 shows how the color keys of the indoor chrome can be edited to render outside chrome. The changes include:

▼ Blue reflection from the sky

▼ Brown-yellow reflection from the ground

▼ White reflection at the horizon

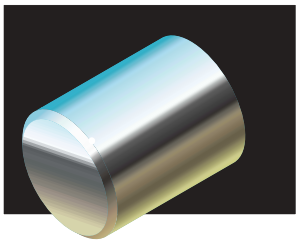


Figure 14.25 Outdoor chrome material.

Brushed aluminum is similar to indoor chrome but does not have the hard surface finish that causes stark black and white reflections. The changes (Figure 14.26) include:

- Dark reflections are lightened.
- Light reflections are made light gray.
- A small amount of blue is added in light and dark reflections.

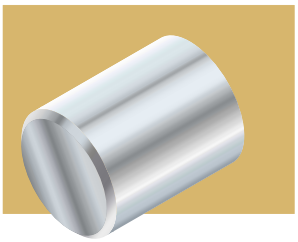


Figure 14.26 Brushed aluminum material.

Painted metal (Figure 14.27) has the softest of the surfaces:

- Light and dark reflections approach the same value.
- There are fewer color keys.
- Keys are added at the top and bottom to frame the edges.

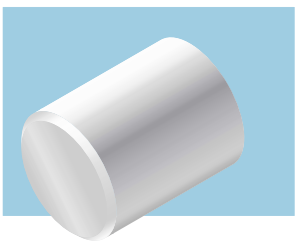


Figure 14.27 Painted metal material.

Transparent Blends

Transparent blends are easy and convenient to make in Adobe Illustrator. Figure 14.28 shows a direction arrow that blends from transparent to opaque. In this example, a direction arrow overlays a panel with text. Were the arrow to be opaque, it would have to be repositioned or the text behind the arrow would be unreadable. The solution is to create an arrow that smoothly blends from transparent to opaque.

Figure 14.28 Transparent blend.

▼ Tech Tip

Transparent blends can also be used to make more complex **Clipping Mask** backgrounds. By overlaying a series of more or less transparent blends, you can create greater texture depth than can be achieved by a single blend.

Figure 14.29 shows the development of a transparent blend and its use as the background for a mask.

- The arrow will be used as a clipping mask (Figure 14.29a). Duplicate the arrow and place it on the paste board so that it can be edited later for shadow edges.
- Create beginning and ending base objects for the blend and assign both the same color (Figure 14.29b). This should be the ambient color of the arrow.
- Set the transparency of the base object on the tail of the arrow to zero. The transparent base object is shown in red.
- Set **Blend Options** to an appropriate **Specified Steps** value based on the width of the base objects and the blend distance.

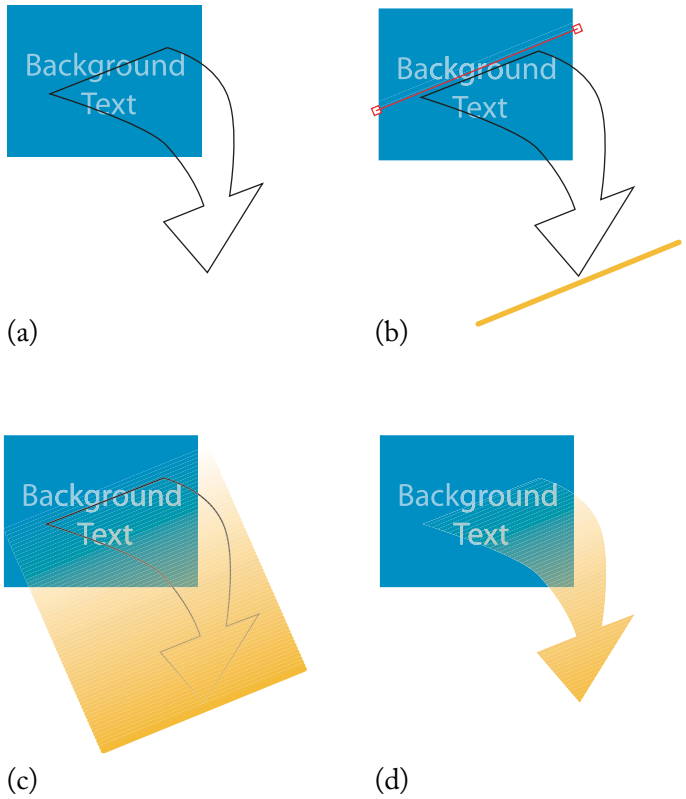


Figure 14.29 Transparent blend development.

- When you make the blend, it will begin opaque at the arrow head and blend smoothly to transparent (Figure 14.29c). Duplicate this blend and set it aside to use for the arrow's thickness.
- Move the arrow path to the front. Select both the arrow and the blend object and choose **Object|Clipping Mask|Make**. The arrow masks the blend, and the text on the panel is readable through the direction arrow (Figure 14.29d).

A nice finishing touch is the shadow edge thickness shown in Figure 14.28. Because the arrow blends to transparent, you can't simply trim the arrow path you created at the start of this exercise and assign a shade color. This is because the edge has to blend from opaque to transparent just as the arrow does. Lines, unfortunately, cannot be stroked with a gradient. There is a way around this:

- Trim the duplicate arrow path and keep the portion that shows thickness on the left side.
- Select the line and choose **Object|Path|Outline Stroke**. The line is converted to a closed path. Turn the stroke off. This path can serve as a

Clipping Mask for a blend that starts out as the shade color and ends transparent.

- Position the duplicate blend behind the thickness line and adjust the opaque base object's color by dialing down the brightness using the HSB color model.
- Bring the line to the front and position it on the arrow. The arrow and its edge now blend out to transparent.

Wires, Hoses, and Tubes

One of the most simple yet critical components of a technical illustration are wires, hoses, and tubes. Any deviation from parallelism in the opposing sides of such objects will be easily detected and take away from the effectiveness of the illustration. Luckily, there are several techniques in Adobe Illustrator that assure accurate geometry. Figure 14.30 records the development of a wire.

- With the **Pen Tool**, create a path that defines the centerline of the wire (Figure 14.30a).
- Select the path and choose **Object|Path|Offset Path**. Enter a value equal to one-half the wire's diameter as the offset distance. As shown in Figure 14.30b, a new path is created with the top and bottom parallel to the original line.
- **Trim** the ends from the offset path. These lines can be assigned different line weights for a simple rendering treatment (Figure 14.30c).
- To render the wire in continuous tone, use the top, centerline, and bottom as base objects for a blend (Figure 14.30d). Choose colors and values that describe the wire material.

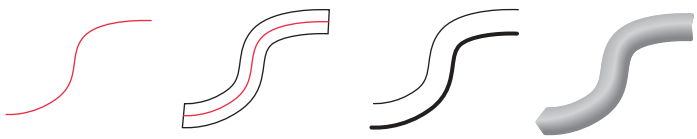


Figure 14.30 Construction and rendering of a simple wire.

As long as objects such as wires are relatively flat and don't loop around on themselves, rendering with blends is straightforward. However, when a wire loops around in front of itself, the rendering becomes much more complex. Figure 14.31 shows the construction necessary to create a looping wire and render it.

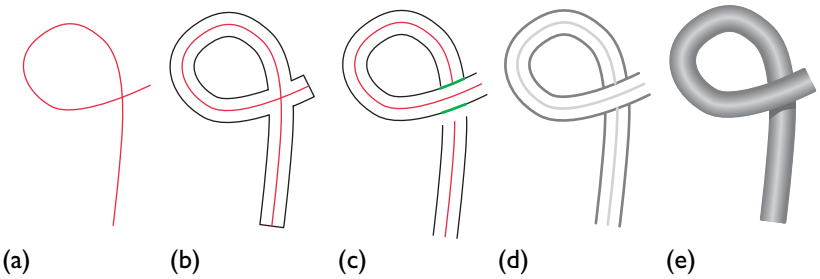


Figure 14.31 Transparent blend development.

- Create the wire centerline as shown in Figure 14.31a.
- Select the path and choose **Object|Path|Offset Path**. Enter a value equal to one-half the wire's diameter as the offset distance. As shown in Figure 14.31b, a new path is created parallel to the original line. Note that the wire us simply outlined and the spatial positioning of the loop has been lost.
- This is a **Compound Path**. Choose **Object|Compound Path|Release** in order to edit the shape.
- **Trim** the ends of the wire away. **Trim** (break) the shapes and add the green connectors shown in Figure 14.31c. Make sure that these green connectors actually complete the paths.
- Assign color and stroke to the outside base objects. Assign a lighter color to the centerline which becomes the highlight base object (Figure 14.31d).
- Perform a blend between these three base objects (Figure 14.31e). Add a small shadow to further give the impression that the wire bends around in front of itself.

Review

Second only to solidly built geometry, accurately rendered object materials can make or break technical illustrations. We have only touched on the infinite number of materials possible in technical illustrations. However, armed with the approaches covered on these pages, you'll quickly find yourself creating your own materials and textures. You will start to take notice and make mental notes of the materials that exist in the real world, so they can be recalled to render a great variety of subjects. Determining the placement of a highlight on an object and its corresponding shadow, selecting the proper base color to represent a steel shaft, or applying the appropriate texture to fiberglass insulation will require you to visually absorb the materials around you.

Text Resources

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Blatner, David, and Fraser, Bruce. *Real World Adobe Photoshop 7*. Peachpit Press. Berkeley. 2002.

Johnson, Harald. *Mastering Digital Printing: The Photographer's and Artist's Guide to High-Quality Digital Output*. Muska & Lipman. Cincinnati. 2002.

Kieran, Michael. *Photoshop Color Correction*. Peachpit Press. Berkeley. 2002.

McClelland, Deke. *Real World Adobe Illustrator 10*. Peachpit Press. Berkeley. 2002.

Steuer, Sharon. *The Illustrator 10 WOW! Book*. Peachpit Press. Berkeley. 2002.

Internet Resources

Adobe Illustrator Tips and Techniques. Retrieved from: *http://www.desktoppublishing.com/tipsillustr.html.* February 2003.

Adobe Illustrator Tutorials. Retrieved from: *http://graphicssoft.about.com/cs/illustratorart/*. February 2003.

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CAD Tools for Adobe Illustrator. Retrieved from: *http://www.hotdoor.com/*CADtools/. February 2003.

Daniels and Daniels Illustration. Retrieved from: *http://www.beaudaniels.com*. February 2003.

Kevin Hulsey Technical Illustration. Retrieved from: *http://www.khulsey.com*. February 2002.

Nidus Technical Illustration. Retrieved from: *http://www.nidus-corp.com/cutp.html*. February 2003.

On the CD-ROM

For those of you who would like to try out the procedures described in this chapter, several resources have been provided on the CD-ROM. Look in *exercises/ch14* for the following files:

arrow.eps	Transparent arrow example
flooring.eps	Wood flooring illustration
geo_shapes.eps	Basic geometric shape blends for your use
insulation.eps	Fiberglass insulation illustration
panel.eps	Rounded and filleted panel illustration
shock.eps	Shock absorber illustration
shock_grad.eps	Material gradients used in the shock absorber illustration
siding.eps	Varying color and highlights
window.eps	Automotive window illustration
wire.eps	Straight and looping wire exercise