ASCENT
CENTER FOR TECHNICAL KNOWLEDGE

Autodesk® Inventor® 2023 Advanced Part Modeling

Learning Guide

Mixed Units - 1st Edition

AUTODESK
Authorized Publisher

ASCENT - Center for Technical Knowledge®
Autodesk® Inventor® 2023
Advanced Part Modeling

Mixed Units - 1st Edition

Prepared and produced by:

ASCENT Center for Technical Knowledge
630 Peter Jefferson Parkway, Suite 175
Charlottesville, VA 22911

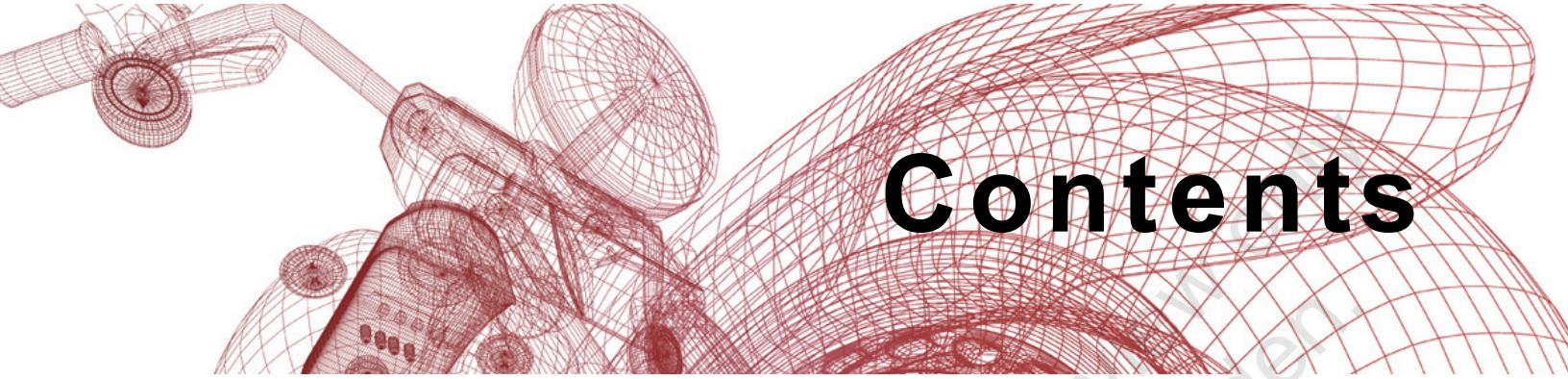
866-527-2368
www.ASCENTed.com

Lead Contributor: Jennifer MacMillan

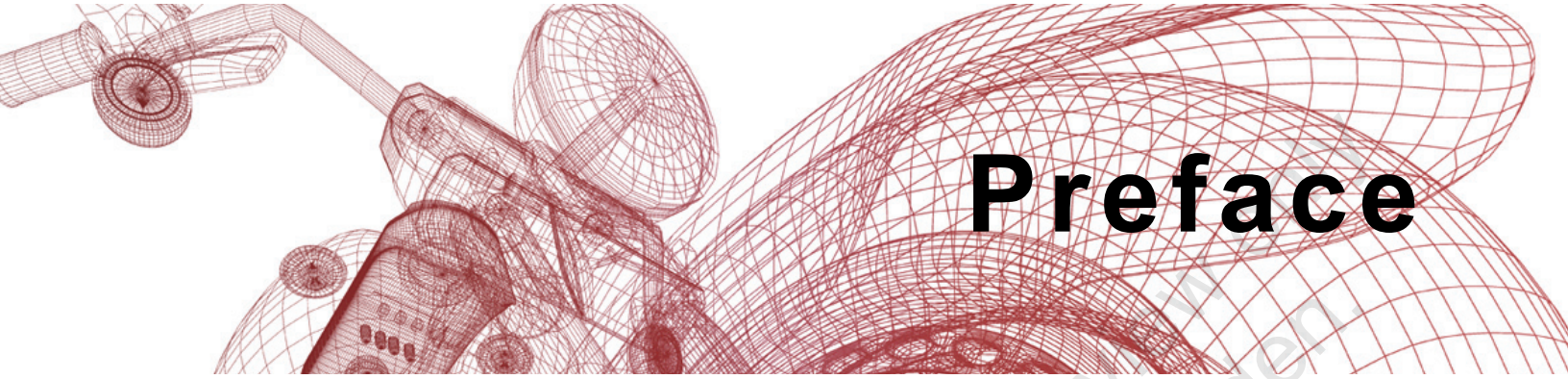
ASCENT - Center for Technical Knowledge (a division of Rand Worldwide Inc.) is a leading developer of professional learning materials and knowledge products for engineering software applications. ASCENT specializes in designing targeted content that facilitates application-based learning with hands-on software experience. For over 25 years, ASCENT has helped users become more productive through tailored custom learning solutions.

We welcome any comments you may have regarding this guide, or any of our products. To contact us please email: feedback@ASCENTed.com.

AS-INV2301-APM1MU-SG // IS-INV2301-APM1MU-SG



Contents



Preface

The *Autodesk® Inventor® 2023: Advanced Part Modeling* guide has been designed to build on the basic skills acquired from the *Autodesk Inventor: Introduction to Solid Modeling* guide. The goal of this guide is to help users achieve a higher level of productivity when designing part models using Inventor.

In this guide, various approaches to part design are covered to expand your basic skills. Specific advanced part modeling techniques covered include bending and unwrapping model geometry, multi-body design, advanced lofts, advanced sweeps, coils, generative shape design, surface modeling, and freeform modeling. The guide explains how to work efficiently with imported data as well as contains other material aimed at increasing efficiency such as Features for frequently used design elements, and model states and iParts for similar designs. Additionally, the guide covers some miscellaneous drawing tools—custom sketched symbols, working with title blocks and borders, and documenting iParts.

Topics Covered

- Advanced model appearance options
- 2D and 3D sketching techniques
- Multi-body part modeling
- Advanced geometry creation tools (bend part, unwrap, work features, area lofts, sweeps, and coils)
- Generative shape design using Shape Generator
- Creating and editing basic surfaces
- Model States
- iFeatures and iParts
- Freeform modeling
- Importing data from other CAD systems and making edits
- Working with AutoCAD DWG files
- Analysis tools
- Emboss and Decal features
- Advanced Drawing tools (iPart tables, surfaces in drawing views, and custom sketched symbols)
- Surface Repair Environment

Prerequisites

- Access to the 2023.0 version of the software, to ensure compatibility with this guide. Future software updates that are released by Autodesk may include changes that are not reflected in this guide. The practices and files included with this guide are not compatible with prior versions (e.g., 2022).
- The material assumes a mastery of Autodesk Inventor basics, as taught in *Autodesk Inventor: Introduction to Solid Modeling*. Users should know how to create and edit parts, use work features, create and annotate drawing views, etc. The use of Microsoft Excel is required for this guide.

Note on Software Setup

This guide assumes a standard installation of the software using the default preferences during installation. Lectures and practices use the standard software templates and default options for the Content Libraries.

Lead Contributor: Jennifer MacMillan

With a dedication for engineering and education, Jennifer has spent over 25 years at ASCENT managing courseware development for various CAD products. Trained in Instructional Design, Jennifer uses her skills to develop instructor-led and web-based training products as well as knowledge profiling tools.

Jennifer has achieved the Autodesk Certified Professional certification for Inventor and is also recognized as an Autodesk Certified Instructor (ACI). She enjoys teaching the training courses that she authors and is also very skilled in providing technical support to end-users.

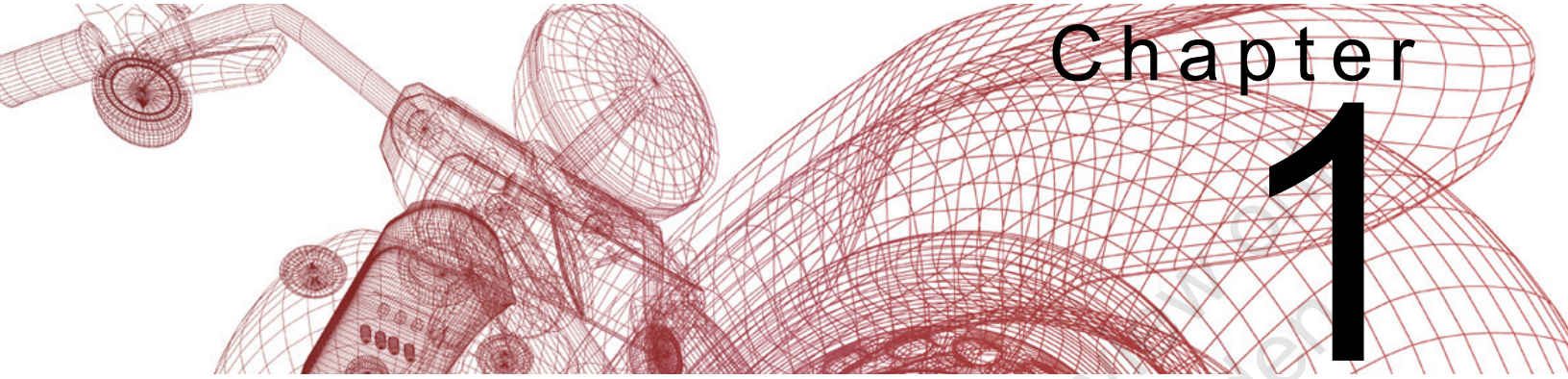
Jennifer holds a Bachelor of Engineering Degree as well as a Bachelor of Science in Mathematics from Dalhousie University, Nova Scotia, Canada.

Jennifer MacMillan has been the Lead Contributor for *Autodesk Inventor: Advanced Part Modeling* since its initial release in 2007.

In This Guide

The following highlights the key features of this guide.

Feature	Description
Practice Files	The Practice Files page includes a link to the practice files and instructions on how to download and install them. The practice files are required to complete the practices in this guide.
Chapters	A chapter consists of the following: Learning Objectives, Instructional Content, Practices, Chapter Review Questions, and Command Summary. • **Learning Objectives** define the skills you can acquire by learning the content provided in the chapter. • **Instructional Content**, which begins right after Learning Objectives, refers to the descriptive and procedural information related to various topics. Each main topic introduces a product feature, discusses various aspects of that feature, and provides step-by-step procedures on how to use that feature. Where relevant, examples, figures, helpful hints, and notes are provided. • **Practice** for a topic follows the instructional content. Practices enable you to use the software to perform a hands-on review of a topic. It is required that you download the practice files (using the link found on the Practice Files page) prior to starting the first practice. • **Chapter Review Questions**, located close to the end of a chapter, enable you to test your knowledge of the key concepts discussed in the chapter. • **Command Summary** concludes a chapter. It contains a list of the software commands that are used throughout the chapter and provides information on where the command can be found in the software.
Appendices	Appendices provide additional information to the main course content. It could be in the form of instructional content, practices, tables, projects, or skills assessment.



Chapter 1

Model Appearance

Modifying the display options or assigning visual appearances can help enhance the model's display for editing or presenting.

Learning Objectives in This Chapter

- Enhance the appearance of the surfaces and edges of a model by assigning visual styles, ray tracing, reflections, shadows, and a ground plane to the model.
- Customize and assign lighting styles to control the number, color, and intensity of light sources in a model.
- Manipulate the visual appearance of a material using the in-canvas appearance and texture tools.
- Create, assign, and edit existing appearances in the model using the Appearance Browser.

1.1 Model Appearance: Visual Display Options

There are a number of options that can be used to improve a model's visual display. These options are included on the *View* tab>Appearance panel, as shown in Figure 1–1.

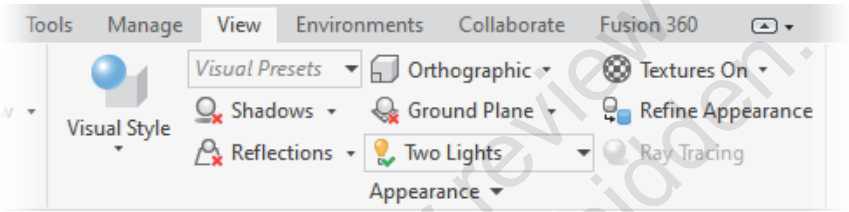


Figure 1–1

Visual Style

The choice of visual style can be dependent on whether you are working on the model's design or presenting the design once it is completed.

The Visual Style drop-down list contains options that can be assigned to provide model surfaces and edges with an enhanced appearance. The available visual styles are shown in Figure 1–2.

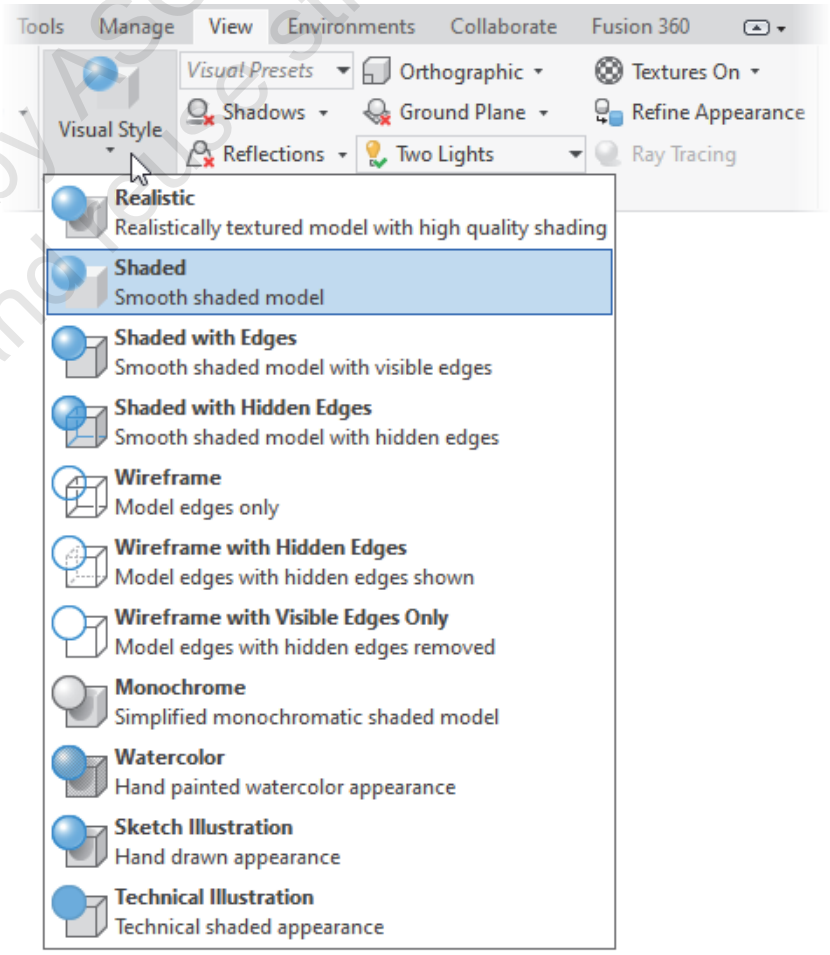


Figure 1–2

Figure 1–3 shows a few of the available visual styles.

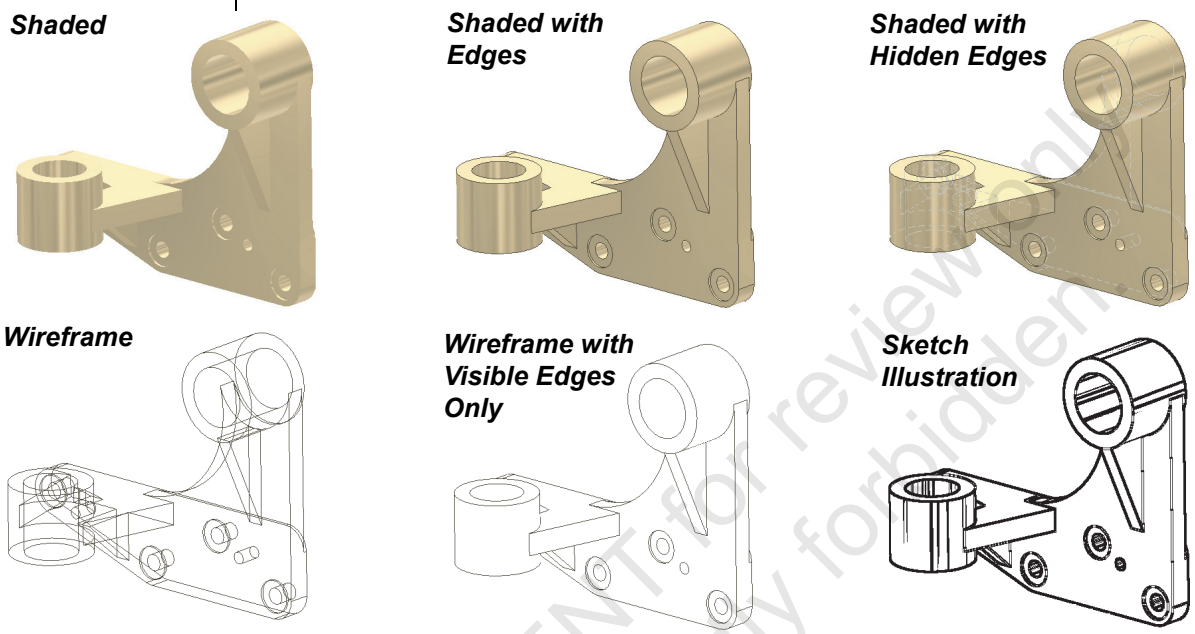


Figure 1–3

Incorporating any of the visual styles with the remaining options on the Appearance panel (e.g., Shadows, Reflections, etc.) can substantially improve the visual appearance of your models.

Ray Tracing

The **Ray Tracing** option enables you to enhance a model's visualization results when using either the **Realistic** or **Monochrome** visual styles. Ray tracing generates images by tracing the path of light through pixels in an image to simulate the effect. This technique produces an image that is highly realistic, without having to render the model in another environment.

To enable Ray tracing, in the *View* tab>Appearance panel, click (Ray Tracing). The Ray Tracing Quality window (shown in Figure 1–4) opens when Ray Tracing is enabled.

The render sample rates are:
***Low:** 4 samples/pixel*
***Draft:** 16 samples/pixel*
***High:** 64 samples/pixel*

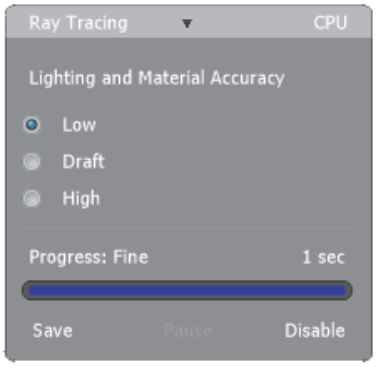
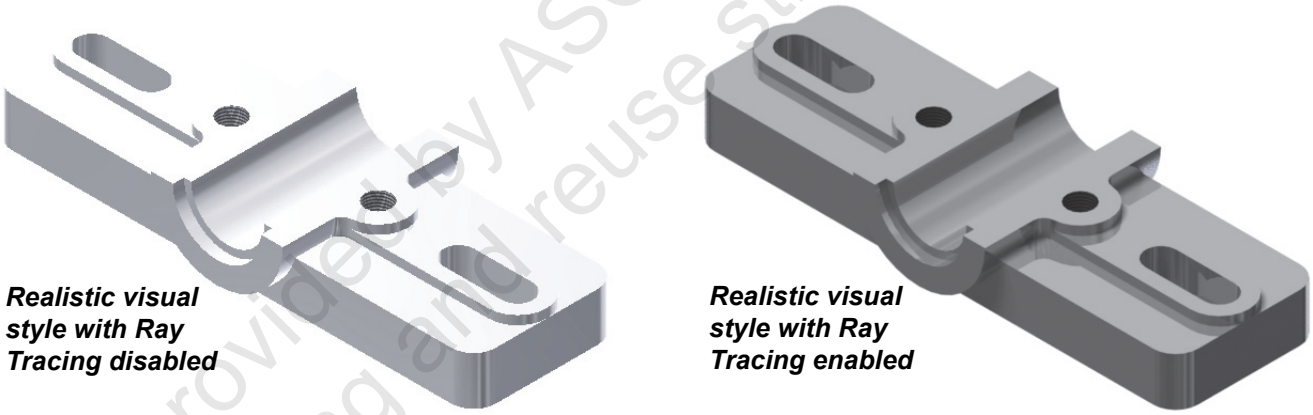


Figure 1–4

- The Progress bar indicates the rendering percentage and time display.
- Hover the cursor over the title bar of the window to expand it to set the quality (Low, Draft, or High) of the image generation.
- Click **Save**, **Pause**, or **Disable** at the bottom of the window, as required. You can also disable the render by selecting **Ray Tracing** on the ribbon.
- While **Ray Tracing** is enabled, the Ray Tracing Quality window remains open. To optimize visual space in the graphics window, it might fade from the display. Hover the cursor over the lower right-hand corner of the graphics window to display it again.

In the examples shown in Figure 1–5, a model has been assigned the **Metal-AL-6061 (Polished)** color, and the visual styles settings have been manipulated to vary the displayed image.



Realistic visual style with Ray Tracing disabled

Realistic visual style with Ray Tracing enabled

Figure 1–5

Ground Plane

In the Appearance panel, the (Ground Plane) option enables you to toggle the display of a plane that represents the ground. The ground plane can be included to help represent the up direction of the model. It is also used in conjunction with shadows and reflection to set realistic visual display settings. Consider the following about the ground plane:

- The ground plane is parallel with the Origin's XZ plane.
- The ground plane is tied to the model. If you rotate the model, the ground plane rotates with it.
- When viewing the ground plane from the top, a plane with a grid is displayed. When viewing the model from beneath the plane, only the exterior outline of the plane is displayed.
- To customize the ground plane, in the *View* tab>Appearance panel, in the Ground Plane drop-down list, select **Settings**. This option enables you to relocate the X, Y, and Z locations, its appearance, grid display, and reflection settings.
- All settings for the ground plane are stored with the document only, and do not affect other models in the current session.

An example of a model with its ground plane displayed is shown in Figure 1–6.

The ground plane does not need to be displayed in order for ground shadows and reflections to be used.

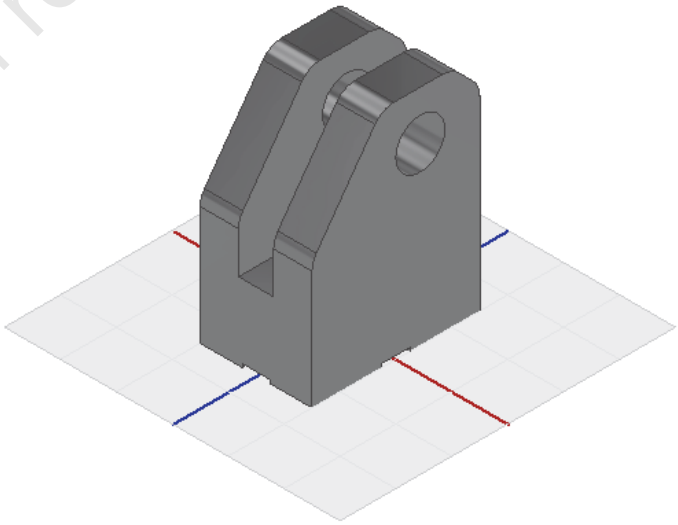


Figure 1–6

Shadows

The Shadows drop-down list ( ) enables you to control the shadows that are assigned in a model for enhanced model visualization. Shadows can be enabled so they display on the ground, on the object, or so that ambient shadows are used. Shadows can be enabled individually or in any combination of the three shadow types. Figure 1–7 displays a model with the various shadowing effects.

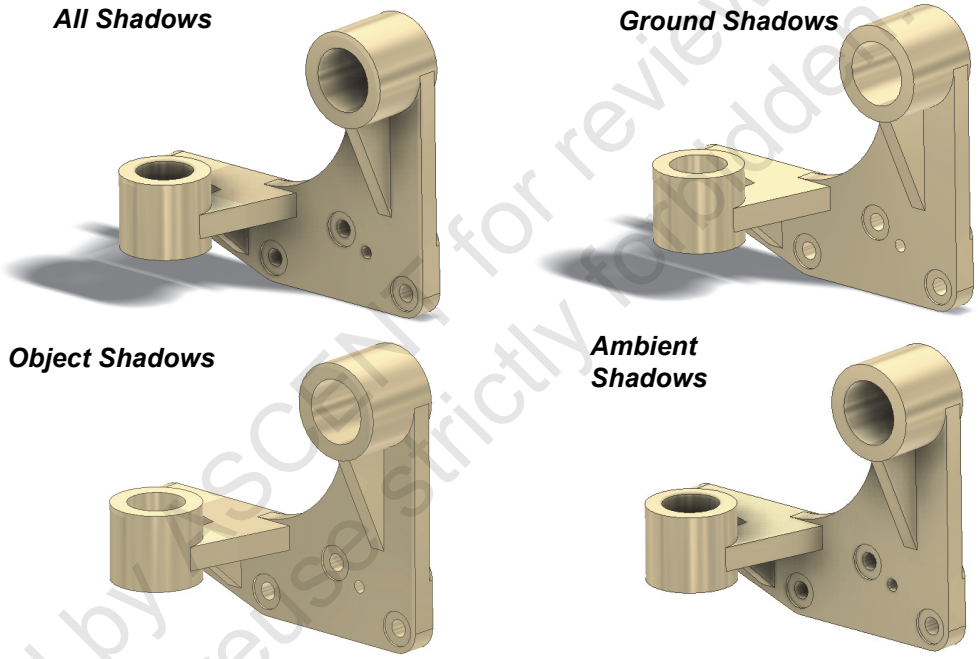


Figure 1–7

To customize shadow settings, in the Shadows ( ) drop-down list, select **Settings** to access the active Lighting Style. Customize the shadow values in the *Shadows* tab for the active Lighting Style.

Reflections

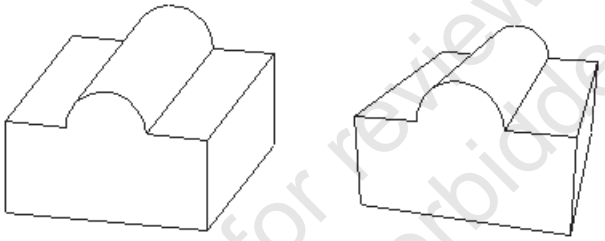
Reflections can be cast on the ground plane by enabling (Reflections) in the Appearance panel on the *View* tab. Shadows reflect the visual style that is set in the model. By changing the Z location of the ground plane, the resulting reflection is varied. The **Settings** option in the Reflection drop-down list enables you to customize the Ground Plane which affects reflections.

Note that the ground plane does not need to be displayed in order for ground reflections to be assigned in the model.

Perspective and Orthographic Views

Traditional mechanical drawings show parts in orthographic (parallel) views, where parallel edges on the part display parallel in the drawing. Perspective views display the way that the eye sees, where parallel edges seem to converge at a vanishing point, as shown in Figure 1–8. To change to a perspective view, select the *View* tab. In the Appearance panel, expand  (Orthographic) and click  (Perspective).

While in a perspective view, you can zoom, pan, and rotate, but the results may differ slightly than that in an Orthographic view. Refer to the "About Perspective Views" Help topic for more information on view manipulation for Perspective views.



Orthographic View ***Perspective View***

Figure 1–8

The  (Perspective with Ortho Faces) option enables you to view the model in perspective view while the model is in a 3D orientation and in orthographic view when in a 2D view.

1.2 Model Appearance: Lighting

The appearance of parts can be changed by adjusting the lighting style. In a lighting style, you can control the number, color, and intensity of light sources for a file, as well as assign image-based lighting and shadows. Use the Lighting Style drop-down list (shown in Figure 1–9) to quickly assign a lighting style as an alternative to the Style and Standard Editor.

Lighting styles can be set in a part, assembly, or presentation.

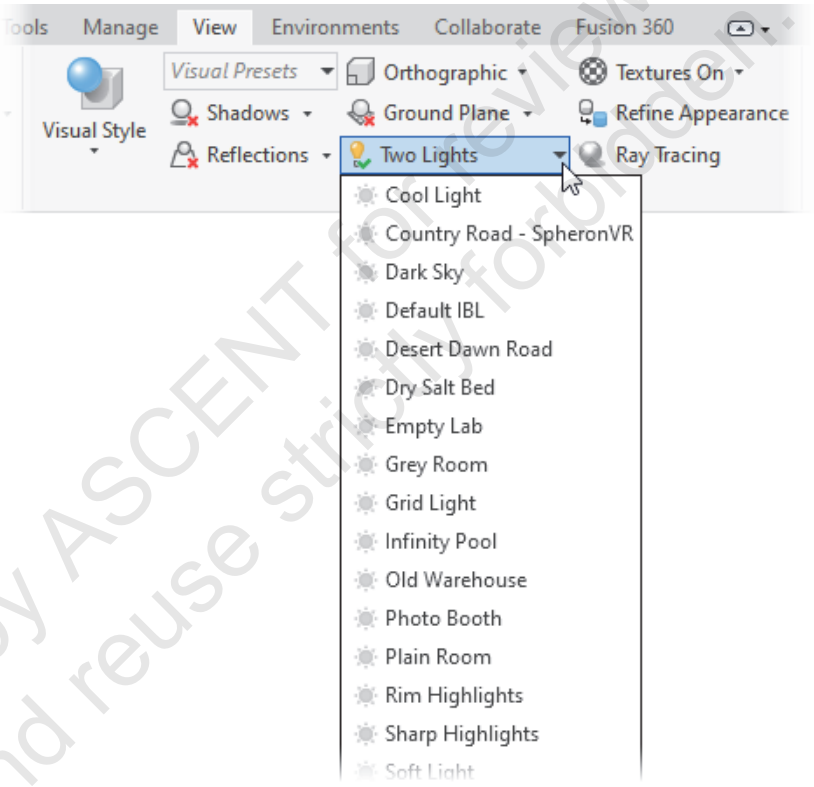


Figure 1–9

For image-based lighting styles, use the Perspective orientation to improve realism.

Many styles assign an image, as shown in the **Old Warehouse** and **Empty Lab** styles shown in Figure 1–10. Models can be positioned relative to the image to enhance model realism.

Figure 1–10

If a new lighting style is required, you can use either of the following techniques to access the Style and Standard Editor:

- In the *View* tab>Appearance panel, in the Lighting drop-down list, select **Settings**.
- In the *Manage* tab>Styles and Standards panel, click (Styles Editor).

The Style and Standard Editor opens as shown in Figure 1–11.

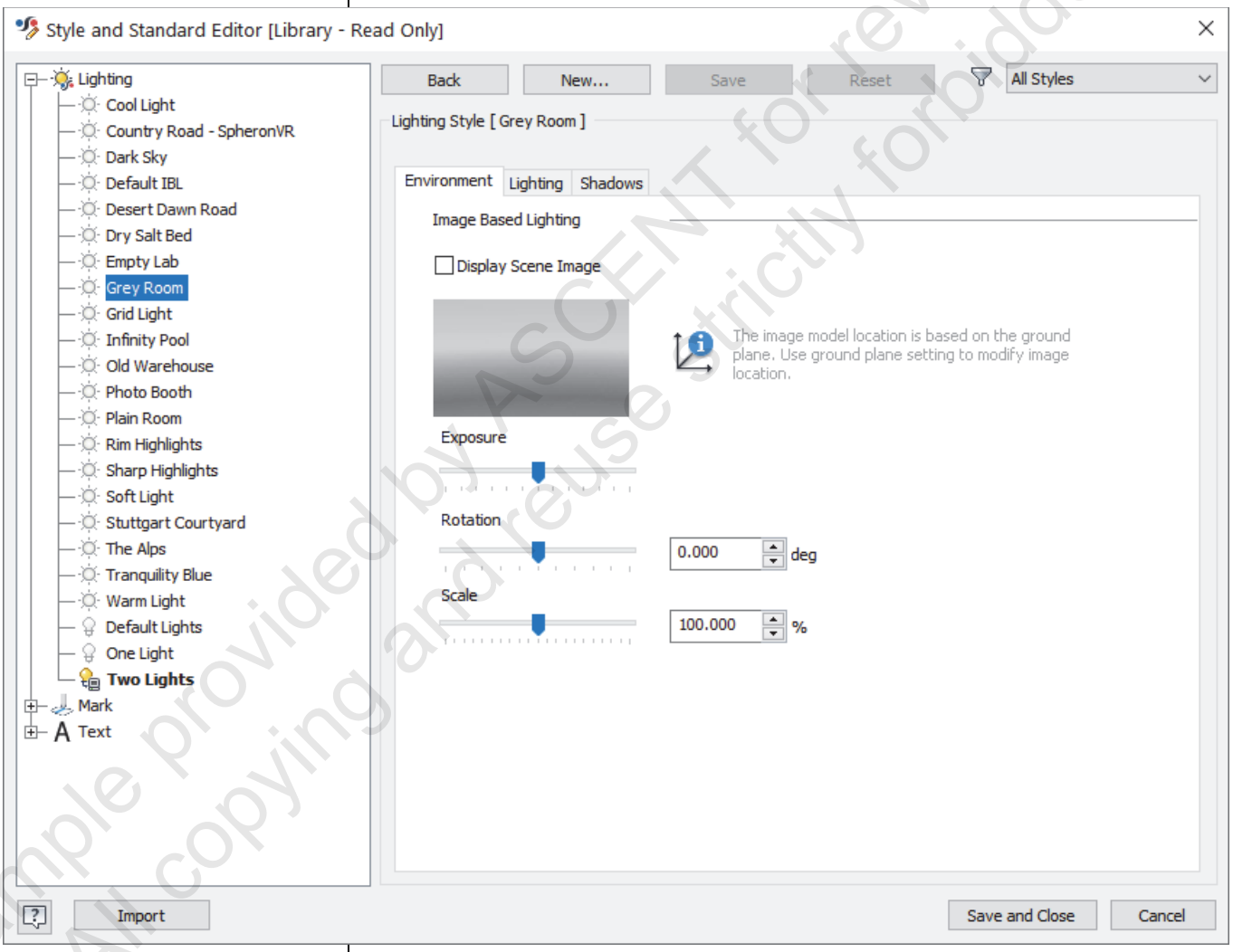


Figure 1–11

Select a lighting style to edit or create a new style. To create a new style, right-click on an existing style and select **New Style**. The selected style is copied and can be used as a starting point for the creation of the new style.

The table below describes the lighting style settings.

Tabs		Description
***Environment* tab**		
	Image Based Lighting	Set the image-based lighting effects for the active light style. This tab is only available if an image has been assigned to the lighting style. To display the image in the actual scene, select **Display Scene Image**. Without this option enabled, the image is not displayed; however, by toggling this option on and off, you can control the image-based lighting effect without losing all of the specified settings. You can also adjust its exposure, rotation, and scale.
***Lighting* tab**		
	Light# tabs	Select a light number tab to activate it for editing. Click  on each tab to toggle the specific light source on or off.
	Standard Light Settings	Control the horizontal/vertical position of the active light source using the sliders that surround the image of the light. You can also select the color and control the brightness of the light source. Using the two Relative movement options, you can specify that the light is fixed to the view's camera () or that the light maintains a fixed direction relative to the Viewcube ().
	All Lights	Control the brightness and ambience of the light sources for all standard lights. Use the *Brightness* slider to control the light intensity and use the *Ambience* slider to set the contrast between lit and unlit areas in the scene.
***Shadows* tab**		
	Shadow Settings	Set the lighting style's shadow setting by selecting from a predefined list of shadow directions. You can also specify the shadow's density, softness, and ambient shadow intensity.

Edits you make in the dialog box are dynamically displayed on the part. You must save the edits to preserve them. Edits are saved to the active lighting style in the file.

1.3 Model Appearance: Color and Texture

Colors and textures can be added to a model to further enhance its visualization. Color and texture are combined within the appearance definition of a material. When a material is assigned, the visual appearance specified for that material is assigned to the model. The Materials and Appearance Override drop-down lists in the Quick Access Toolbar display the current material and its appearance, as shown in Figure 1–12.

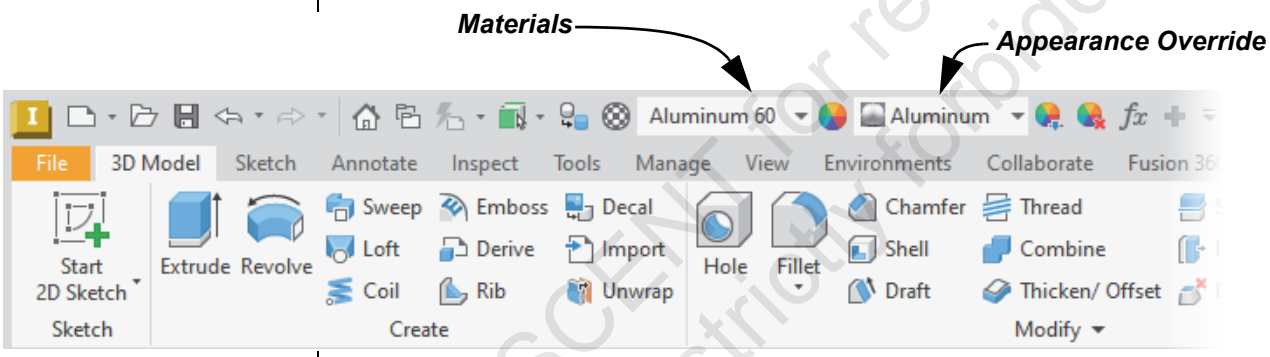


Figure 1–12

To assign a different appearance to the model while maintaining the material setting and therefore its iProperty data, select an alternate material in the Appearance Override drop-down list, as shown in Figure 1–13.

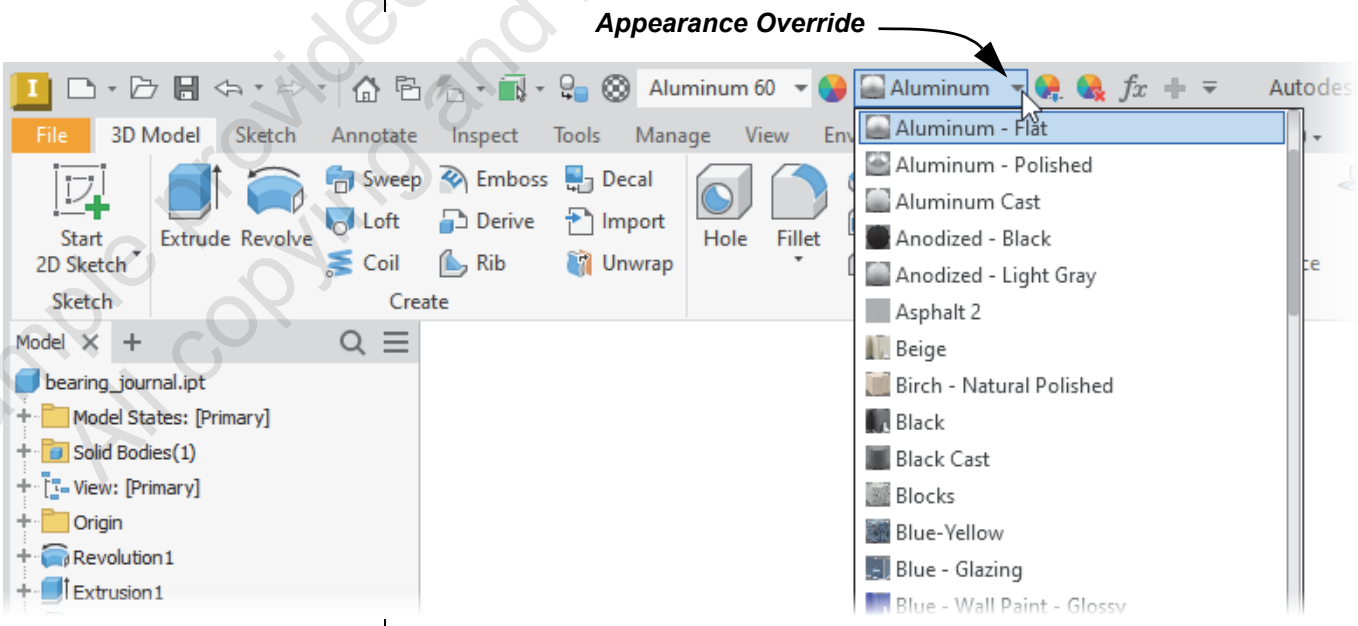


Figure 1–13

The default library can be set in the Project File.

The predefined list of appearances provided in the Appearance Override drop-down list are pulled from provided libraries. By default, the Inventor Material Library is set as the active library. To switch between libraries in the drop-down list, select an alternate library name, as shown in Figure 1–14.

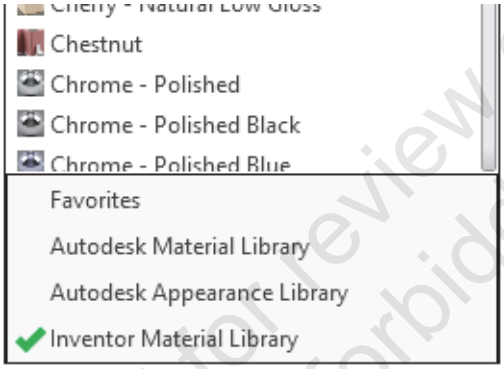


Figure 1–14

To quickly manipulate the assigned appearance, you can use the in-canvas tools.

In-Canvas Appearance and Texture Tools

The in-canvas appearance and texture tools provide you with a convenient way to change the color of an appearance or the texture mapping on the model. The tools are provided in a mini-toolbar and the icons can be used directly on the model.

How To: Edit the Existing Appearance Using the In-Canvas Tools

1. In the *Tools* tab>Material and Appearance panel, click (Adjust). The Appearance mini-toolbar opens as shown in Figure 1–15.

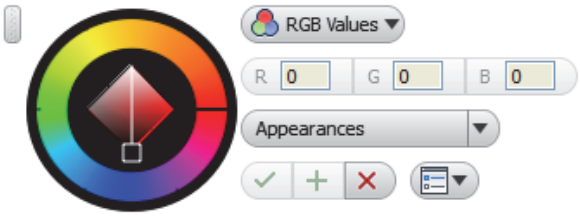


Figure 1–15

2. Using the model, select the appearance that is to be edited. You can select directly on the model when the cursor displays as the eyedropper ( ), or you can select the appearance from the Appearances drop-down list in the mini-toolbar.

- When using the cursor, if you want to edit the color of the entire model, ensure that you select the entire model.
- To change only selected faces, surfaces, bodies, or features, select them individually. Use the Select Other drop-down list to select the required option.
- Selecting the appearance in the Appearances drop-down list enables you to first edit the Appearance and then apply it to the model.

3. Select the method for defining the color.
   - Defining the color as a red, green, and blue value (**RGB Values**) is the default option.
   - Select the RGB Values drop-down list and select **HSL Values** to define the color with a hue, saturation, and lightness value.
4. For either the **RGB** or **HSL Values** options, use the color wheel to define its values.
   - Drag the line around its perimeter to change the value.
   - To refine the color, activate and drag the square node on the internal diamond shape at the center of the color wheel.
   - If the appearance was selected directly from the model, it will update as you are changing the color.
5. If you selected the appearance from the drop-down list, you are required to assign it to the model. Using the cursor, now displayed as a paint can (), select the model or individual faces, surfaces, bodies, or features, to assign the edited appearance.
6. If the Appearance has a texture assigned to it, you can scale and rotate the texture using the  and  icons that display once the model or individual faces, surfaces, bodies, or features are selected.
   - Hover the cursor over the icons until they are active (yellow) and then press and hold the mouse button to scale and rotate.

The scale and rotate icons are displayed for non-textured appearances. Manipulating these icons will not affect the overall appearance.

7. If the Appearance has a texture assigned to it, you can vary how it is mapped to the surface of the model. Expand the  drop-down list and select a mapping option.
   - By default, **Automatic** is used and generally provides a good representation of the texture on the model.
   - Hovering the cursor over the other mapping options displays them in the model.
8. Click  to complete the edit and close the mini-toolbar.

Once an appearance is adjusted using the in-canvas tools, a new appearance is created that has (1) appended to the end of the name. For example, if you were adjusting the Red appearance, the adjusted appearance would be called Red(1).

Appearance Browser

The Appearance Browser (shown in Figure 1–16) is used as an alternative to the Appearance Override drop-down list to assign appearances. It can also be used to create new appearances. The (Change Your View) drop-down list can be used to customize the display of the Appearance Browser areas. For example, it can show whether the appearances display as detailed lists or as thumbnail images.

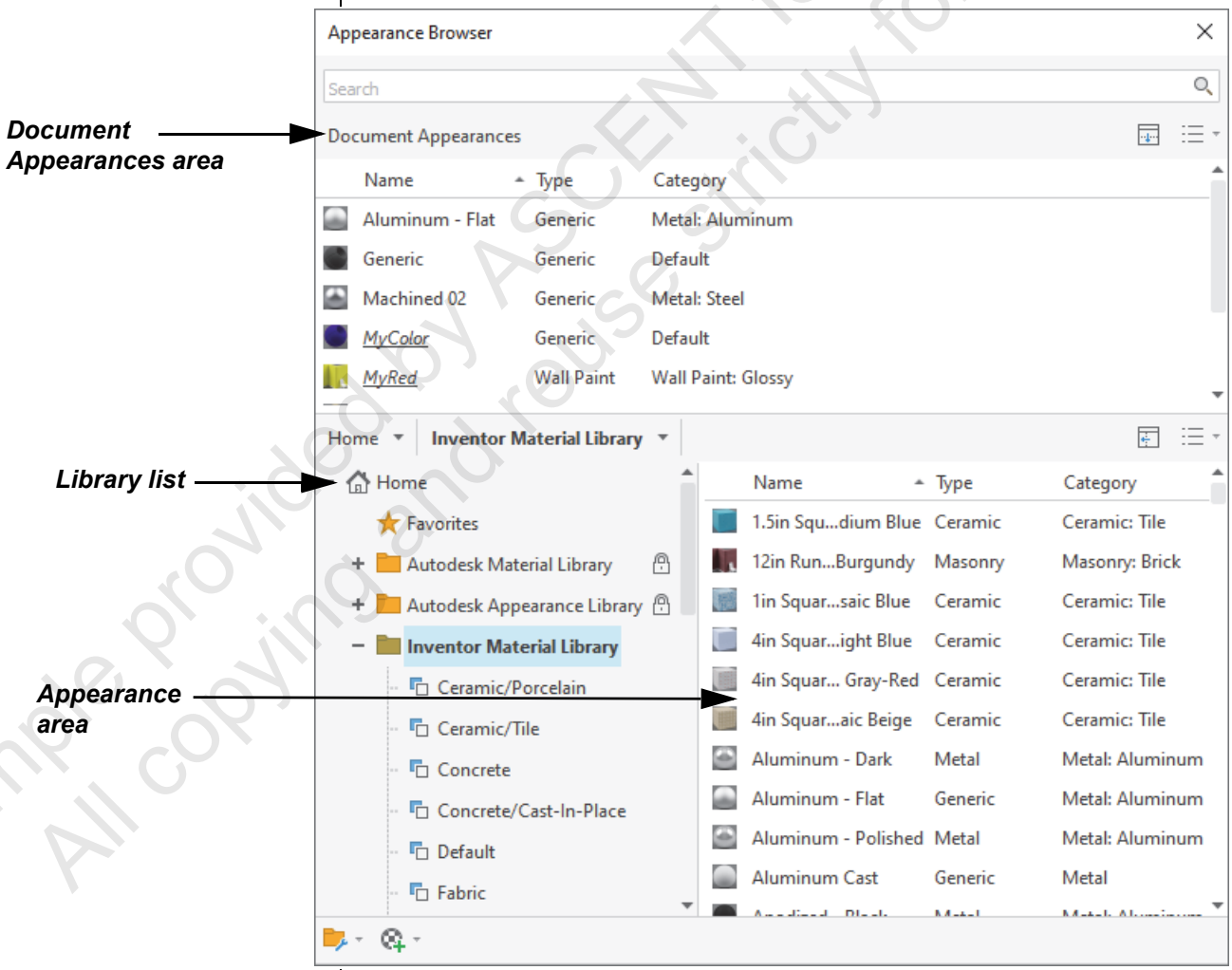


Figure 1–16

Create a New Appearance

The Appearance Browser is divided into the following areas:

- *Document Appearances* area - This area includes all appearances that have been assigned to the model.
- Library list - The library list enables you to select the libraries where you want to look for different appearances. The Favorites node enables you to quickly access any of the appearances from the three libraries that you have marked as Favorites.
- *Appearance* area - Once a library is expanded and a group type selected, its appearances are displayed in the *Appearance* area. Using this area, appearances can be added to the *Document Appearances* area for use.

How To: Use the Appearance Browser to Create a New Appearance

1. In the *Tools* tab>Material and Appearance panel, click  (Appearance). The Appearance Browser opens as shown in Figure 1–17. The current file only has one appearance that was assigned to it (Default), as shown in the *Document Appearances* area, and the **Inventor Material Library** is selected. If an appearance override was assigned, it would also be displayed here.

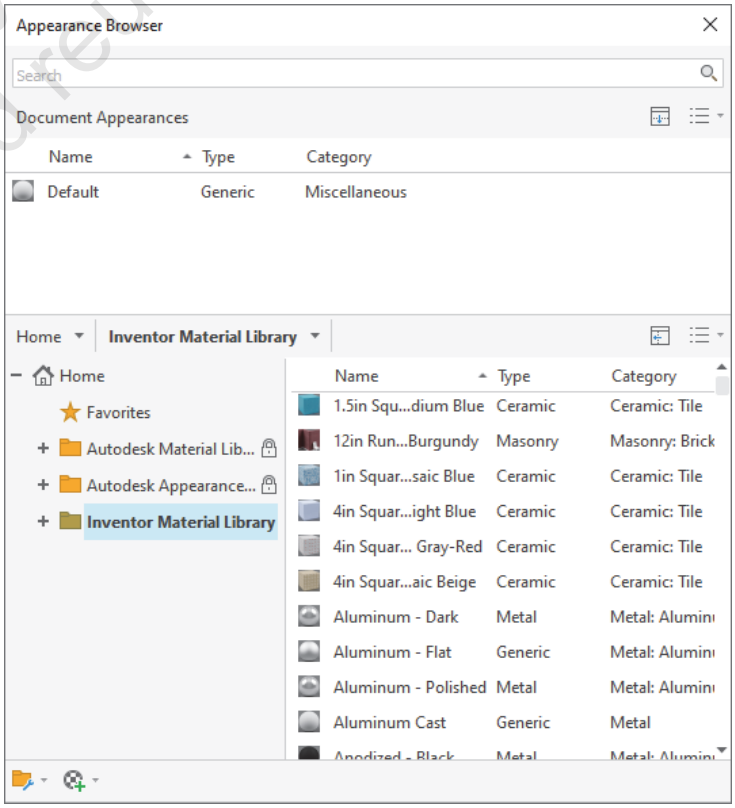


Figure 1–17

2. Right-click on an existing appearance in the *Document Appearances* area and select **Duplicate** to create its copy. The selected appearance should be one that closely resembles the settings that you want as a new appearance.

   Alternatively, click at the bottom of the Appearance Browser and select a type to start a new appearance.
3. Select the default name, right-click on it, and select Rename. Enter a new name for the appearance.
4. Right-click on the new appearance and select **Edit** to open the Appearance Editor, similar to that shown in Figure 1–18. Depending on the material type, the options and settings vary.

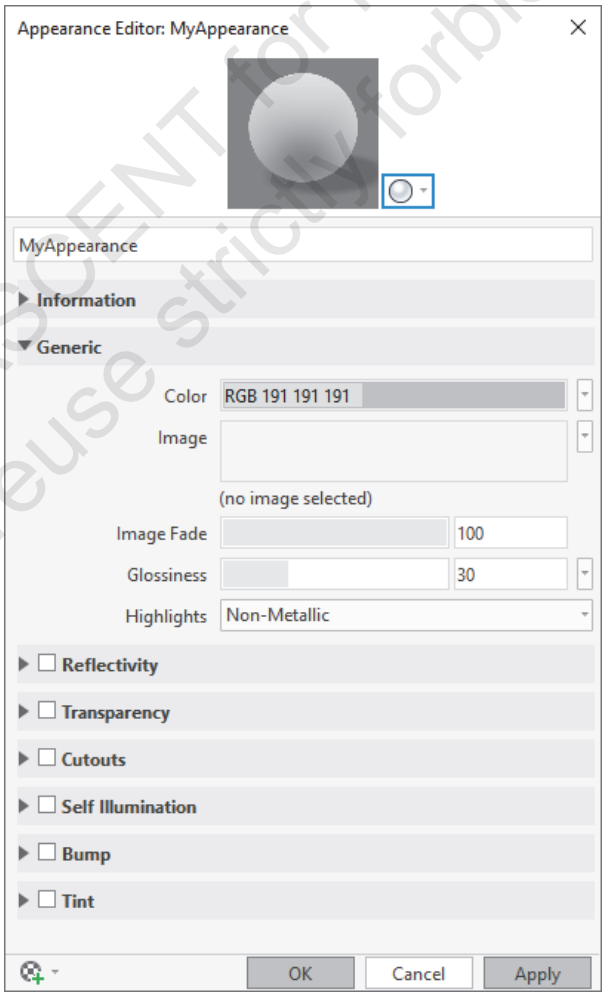


Figure 1–18

5. Define the appearance, as required.
   - Select in the *Color* field to access the Color dialog box to select or customize a new color.
   - Select in the *Image* field to import a texture for the appearance.

- Change the settings of the *Image Fade*, *Glossiness*, and *Highlights* to customize the appearance of the texture.
- Use other options in the Appearance Editor to further customize the new appearance by adding reflectivity, transparency, bump maps, self illumination, etc.

6. Click **OK** to complete the creation of the new appearance. The thumbnail image in the *Document Appearances* area updates to reflect the changes that were made in the Appearance Editor.

To edit an existing appearance, right-click on the appearance name in the *Document Appearances* area of the Appearance Browser and select **Edit**. Edit the options, as required, to reflect the required change.

Textures

Textures are files that can be added to any appearance. Bump maps enable you to further control the display of an image by assigning a bumpiness value. Texture images are assigned in the Generic node while bump maps are assigned in the Bump node. Similarly, maps can be assigned to other nodes.

To assign an image, select in the *Image* field for the node and use the Material Editor Open File to browse to and select an image.

To modify the placement of the image, right-click on the *Image* field and select **Edit Image**. The Texture Editor opens and you can refine the image's position, rotation, scale, and repeat and (in the case of a bump map) vary the amount of bumpiness.

Assign an Appearance

Alternatively, you can assign the new appearance using the Material Override drop-down list in the Quick Access Toolbar. Once assigned, the appearance is automatically added to the Document Appearances area.

How To: Use the Appearance Browser to Assign an Appearance to the Model

1. In the *Tools* tab>Material and Appearance panel, click  (Appearance).
2. To assign a new appearance, select the entire model or individual surfaces on the model, right-click on the appearance thumbnail in the *Document Appearances* area and select **Assign to Selection**.
   - To help identify what is being selected in the model, before selecting, hover the cursor over the model so that the preview displays the entire model (dashed lines) or individual surfaces (solid lines).
3. Click × to close the Appearance Browser.

Adding Appearances to the Document

How To: Use the Appearance Browser to Add a Material from a Library to the Document Appearances Area

1. In the *Tools* tab>Material and Appearance panel, click  (Appearance).
2. Expand the appropriate library in the Library list.
3. Select an appearance type. The list of appearances associated with the selected type display in the *Appearance* area on the right side of the Appearance Browser.
4. Right-click an appearance and select **Add To>Document Materials** to add it to the *Document Appearances* area for use in the model.

To display the model so that any of the image's texturing settings are consistently displayed, set the *Visual Style* to **Realistic**. If not, only the color of the appearance might display on the model.

Practice 1a

Create a Lighting Style

Practice Objectives

- Create a new lighting style based on an existing style.
- Edit a lighting style to change its ambiance setting and include multiple colored lights.
- Change the lighting style that is applied to the model using the Styles and Standards Editor and the options in the Appearance panel.

In this practice, you will create a new lighting style and assign it for use with a part file. The part is shown in Figure 1–19.

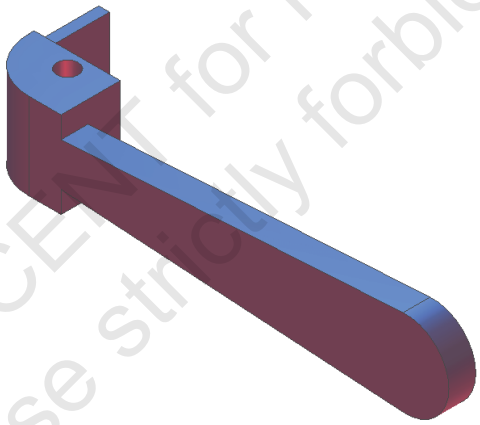


Figure 1–19

Task 1 - Open a part file and create a new lighting style.

This project file is used for the entire learning guide.

1. On the Home page, select (Projects and Settings) > **Settings** to open the Projects dialog box. Project files identify folders that contain the required models.
2. Click **Browse**. In the practice files folder, select **Advanced Part.ipj**. Click **Open**. The Projects dialog box updates and a checkmark displays next to the new project name, indicating that it is the active project. The project file tells Autodesk Inventor where your files are stored. Click **Done**.
3. Open **handle.ipt**.
4. In the *Manage* tab>Styles and Standards panel, click (Styles Editor). The Style and Standard Editor dialog box opens.
5. Expand the **Lighting** branch and select **Two Lights**.

6. Click **New**. The New Local Style dialog box opens.
7. Enter **handle** in the *Name* field and click **OK**. The handle style is now listed in the Lighting branch.
8. Double-click on **handle** in the list to activate it. The active style is bold in the list and is applied to the model.
9. Move the *Ambience* slider to increase the amount of ambient light on the screen for all lights. Note how the model updates as you move the slider.
10. Return the *Ambience* slider to approximately the middle of the scale.
11. In the *Standard Lights* area of the *Lighting* tab, ensure that the *Light 1* tab is selected and that the  (yellow light bulb) icon is active. This represents the first direct light.
12. Move the vertical slider on the right side of the image to the top and the slider on the bottom to the left side to place the light.
13. Click the **Color** icon located above the *Brightness* slider. Select one of the blue colors from the color palette. Click **OK**. Note the effect on the part.
14. Select the *Light 2* tab to activate it. Ensure that the  icon is enabled (yellow). Select it, if not. The blue light you created in the last step will now have less influence on the part. Change the color of the second light to red, and move the sliders to the bottom and right positions to place this light.
15. Click **Save and Close**. Note the effect on the part.
16. Rotate the part. You will see different shades and colors on the part, depending on where you placed the lights.

Task 2 - Manipulate the appearance of the model.

1. Select the *View* tab.
2. In the Appearance panel, note that the **handle** light style is currently active. In the Lighting Style drop-down list, select **Two Lights**. Note how the model updates to reflect the settings in this style.
3. Select some of the various options in the Visual Style drop-down list to manipulate the model's appearance. Leave the style set to **Shaded with Edges.**

4. In the Lighting Style drop-down list, select **Empty Lab**.
5. The default scale of the model relative to the image is incorrect. In the Lighting Style drop-down list, select **Settings**. In the *Image Based Lighting* area in the *Environment* tab, reduce the *Scale* to approximately **15%**. Click **Save and Close**.
6. In the Orthographic drop-down list, select **Perspective** to obtain a more realistic image.
7. Zoom in and orient the model. The **Shaded with Edges** visual style is not very realistic for product presentation. Change the visual style to **Realistic**.
8. Select a darker color in the Appearance Override drop-down list in the Quick Access Toolbar, shown in Figure 1–20.

Figure 1–20

9. The model should display similar to that shown in Figure 1–21.

Figure 1–21

10. Save the part and close the window.

Practice 1b

Working with Appearances

Practice Objectives

- Override the visual appearance of a material.
- Create, edit, and assign appearances to a model using the Appearance Browser and the Appearance Override drop-down list.

In this practice, you will assign a material to a model and then override its visual appearance. You will apply appearances to the entire model as well as individual surfaces. The final model is shown in Figure 1–22.

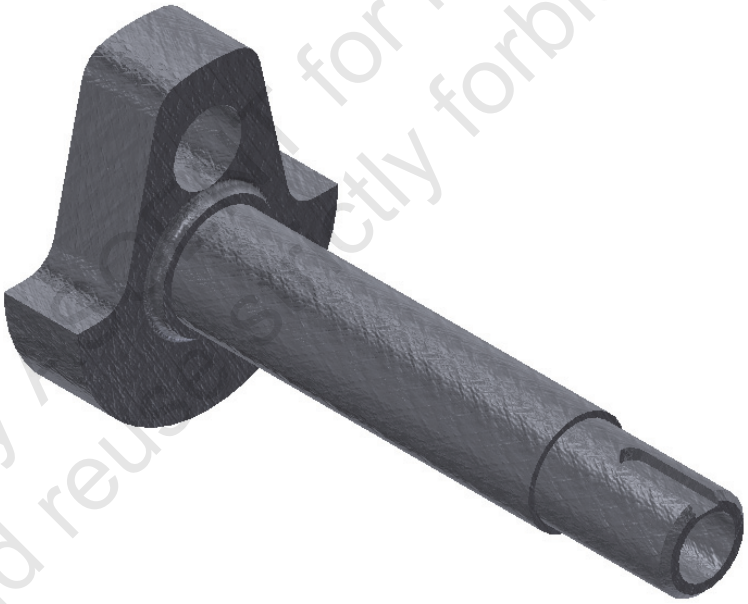


Figure 1–22

Task 1 - Open a model and assign a material.

1. Open **bearing_journal.ipt**. The part is currently assigned the Generic material and visual appearance, as shown in the Material and Appearance Override drop-down lists in the Quick Access Toolbar in Figure 1–23.

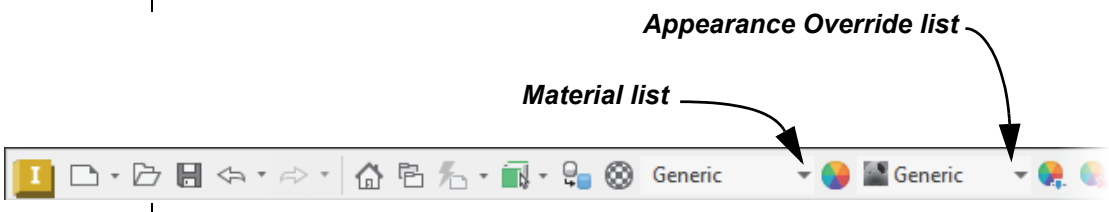


Figure 1–23

2. In the Quick Access Toolbar, in the Material drop-down list, set the material to **Stainless Steel**. The visual appearance is set as Semi-Polished which is the default setting for the Stainless Steel material. The model displays as shown in Figure 1–24.

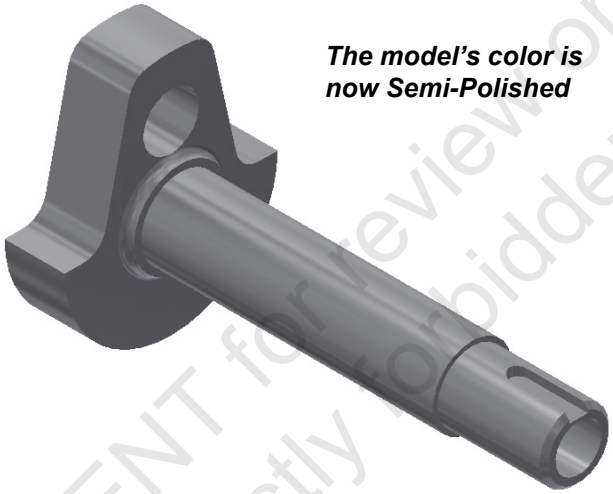


Figure 1–24

Task 2 - Assign and new visual appearance and edit it.

1. In the Quick Access Toolbar, in the Appearance Override drop-down list, set the color to **Yellow**. The visual appearance of the model changes to yellow, as shown in Figure 1–25, but the material remains Stainless Steel.

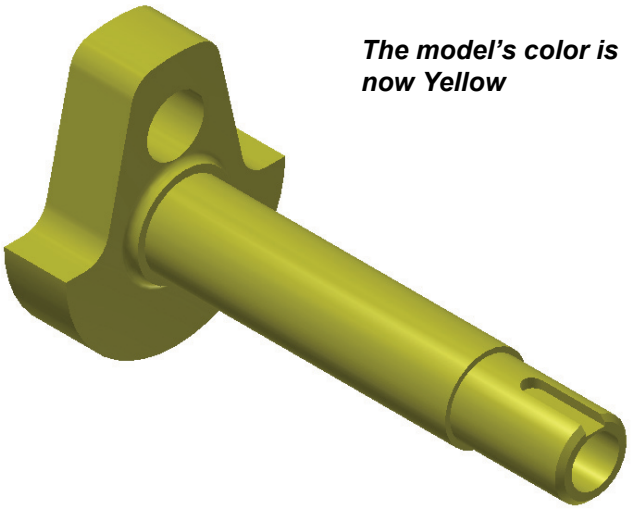


Figure 1–25

2. In the *Tools* tab>Material and Appearance panel, click (Adjust) to open the appearance mini-toolbar.

3. Hold <Ctrl> and select the two surfaces shown in Figure 1–26.

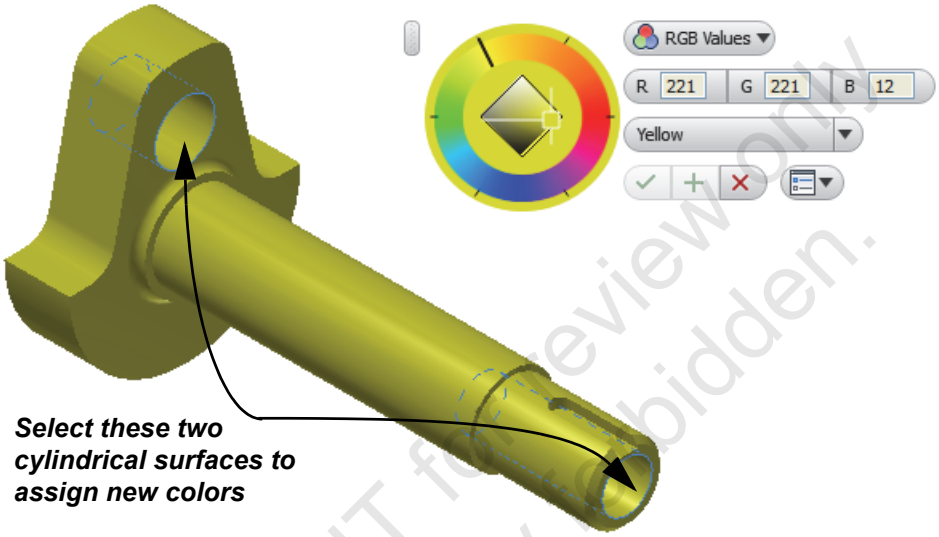


Figure 1–26

4. Maintain the RGB Values setting and use the color wheel to define the values. Drag the line around its perimeter to change the value to red. Because the surfaces were preselected, the surfaces update as you change the RGB value.

5. Click to complete the change and close the mini-toolbar. The model should display similar to that shown in Figure 1–27.

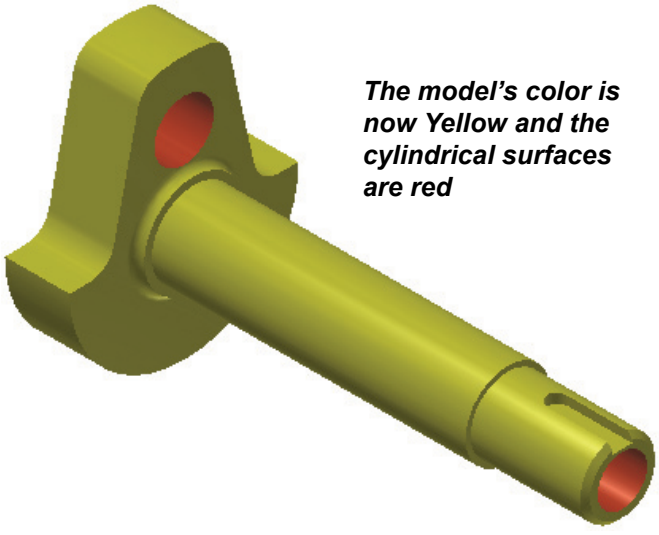
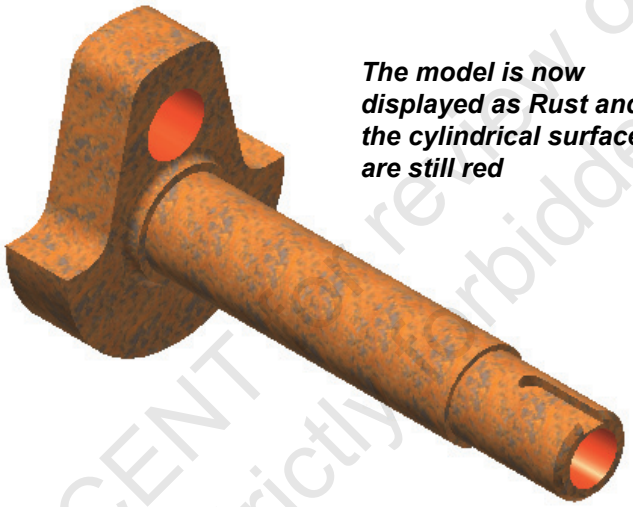


Figure 1–27

6. In the Appearance Override drop-down list, select **Rust**. The model should display similar to that shown in Figure 1–28. Note that the surface overrides on the internal surfaces that were changed to red are maintained and the Rust appearance is applied to the rest of the model. The Rust appearance was created using a texture image.



The model is now displayed as Rust and the cylindrical surfaces are still red

Figure 1–28

7. In the *Tools* tab>Material and Appearance panel, click (Adjust) to open the appearance mini-toolbar.
8. Hover the cursor over the model so that its entire boundary is highlighted in dashed red lines and click to select the model. If required, use the Select Other drop-down list to select the solid in order to highlight all the geometry. This enables you to edit the Rust appearance on the entire model.
9. Try and change the color of the appearance. Note how it does not change because this appearance is using a texture image.
10. Click to open the drop-down list and roll the cursor over each of the mapping options. By default, **Automatic** is used and it provides a good representation of the rust texture on the model. Depending on the surface and model shapes being assigned a textured appearance the other options might provide better representations.
11. Hover the mouse over the icon until the cursor changes to the icon. This indicates that you can now scale the texture. Drag the cursor to scale the texture.

12. Hover the cursor over the icon until the cursor changes to the icon indicating that you can now rotate the texture. Drag the cursor to rotate the texture.

13. Click to cancel the edit and close the mini-toolbar. The original texture scale and rotation is maintained.

Task 3 - Create a new appearance and assign it to the model.

1. In the *Tools* tab>Material and Appearance panel, click (Appearance) to open the Appearance Browser.

   Alternatively, you can also click in the Quick Access Toolbar. The Appearance Browser displays as shown in Figure 1–29.

The (Change Your View) drop-down list can be used to customize the display of the Appearance Browser. For example, it can show whether the appearances display as a detailed list or as thumbnail images.

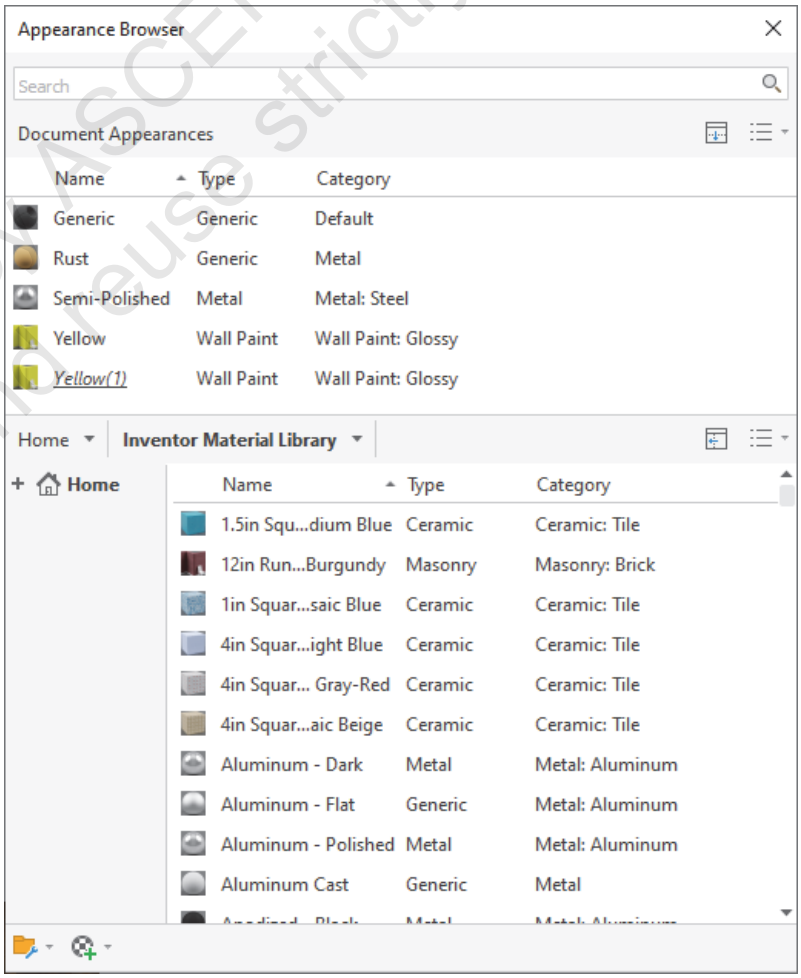


Figure 1–29

Note that there are currently five appearances listed in the *Document Appearances* area. These correspond to all of the appearances that you have assigned to the model. **Generic** was the appearance that was set when the file was opened, **Semi-Polished** was used when the material was set to Stainless Steel, **Yellow** was used to override the visual appearance of the Stainless Steel Material, and **Yellow(1)** represents the edits that were made using the mini-toolbar to create the red color. Finally, **Rust** was the final override material that was used. Only appearances that have been used in the model are shown here.

2. Right-click on **Yellow(1)** and select **Rename**. Enter **MyRed** as the new name.
3. Right-click on **Generic** and select **Duplicate**. This creates a copy of the Generic appearance that you can use it as the base for a new appearance.
4. Right-click on **Generic(1)** and select **Rename**. Enter **MyColor** as the new name for the duplicated appearance.
5. Double-click on **MyColor** to open the Appearance Editor.
6. Select in the *Color* field and assign a new color to the appearance using the Color dialog box. Increase the *Glossiness* value and change the *Highlights* to **Metallic**. Additional settings can be made using other nodes in the Appearance Editor to further customize the appearance.
7. Click **OK** to complete the edit and close the Appearance Editor.
8. Hover the cursor over the model so that its entire boundary is highlighted in dashed lines and click to select the model.
9. In the Appearance Browser, right-click on **MyColor** and select **Assign to Selection** to assign the new appearance to the model. Note that the red surface overrides are still maintained.
10. Click × to close the Appearance Browser.

Task 4 - Clear appearance overrides.

1. In the *Tools* tab>Material and Appearance panel, click (Clear) to open the mini-toolbar.
2. Press and hold <Ctrl> and select the two surfaces that were assigned the **MyRed** appearance.
3. Click to clear the appearance override on these surfaces. Note that the entire model now has the **MyColor** appearance assigned.
4. In the *Tools* tab>Material and Appearance panel, click (Clear) to open the mini-toolbar again.
5. Click **Select All** in mini-toolbar and click to clear all overrides in the model. This returns the visual appearance back to Semi-Polished, which was assigned with the Stainless Steel material.

Task 5 - Add an appearance from the Inventor Material Library to the model.

1. In the *Tools* tab>Material and Appearance panel, click (Appearance) to open the Appearance Browser.
2. In the lower portion of the Appearance Browser, select the Home (Home) drop-down list and select **Inventor Material Library** to display a list of materials in this library. You can also expand the **Home** node and select **Inventor Material Library**.
3. Further expand the **Inventor Material Library** folder, as shown in Figure 1–30.

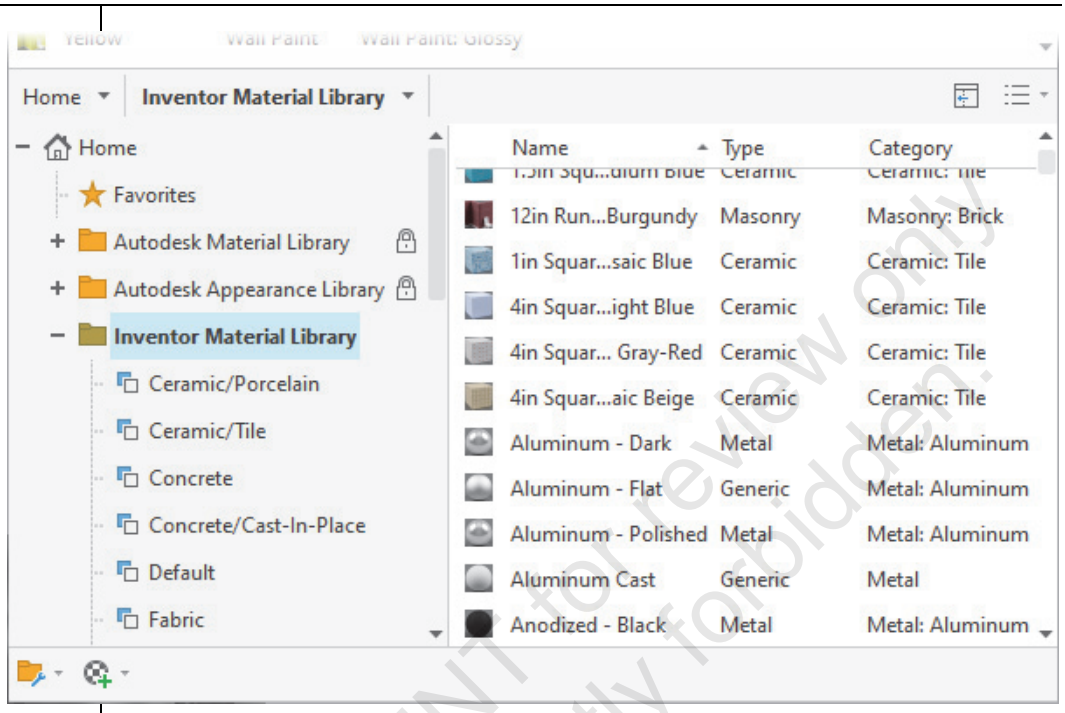
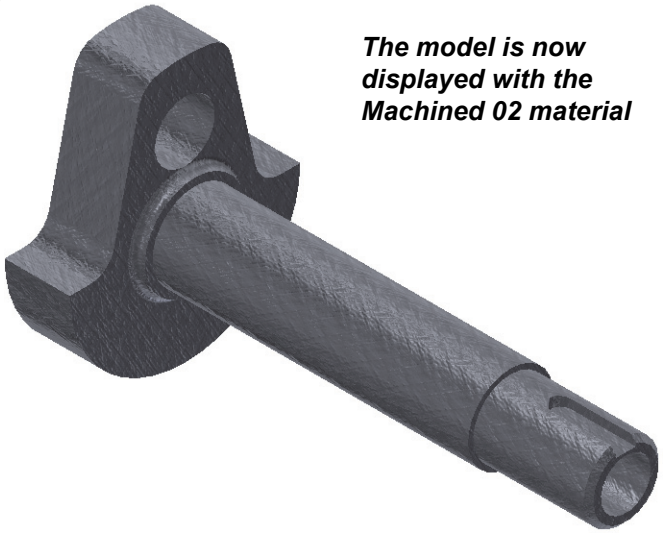


Figure 1–30

4. Select **Metal/Steel** to display the list of appearances in the Metal/Steel category.
5. Right-click the **Machined 02** appearance and select **Add to>Document Materials**.
6. Select the model and assign the **Machined 02** appearance to the selection. The model updates as shown in Figure 1–31.



The model is now displayed with the Machined 02 material

Figure 1–31

7. Close the Appearance Browser.

The additional material libraries can also be expanded and used to access other appearances. By default, their appearances are not listed in the appearance override drop-down list so they must be added through the Appearance Browser.

The appearance could also have been assigned by selecting it and using the Appearance Override drop-down list to select the **Machined 02** appearance. In this case, once selected it would have been assigned and added to the *Document Appearances* area. This is an alternative method to adding materials using the Appearance Browser. The benefit of the Appearance Browser is that you can review the thumbnail images and copy existing materials to use as a base for new appearances.

8. Save the part and close the window.

Chapter Review Questions

1. Which of the following Appearance tools are available when the Visual Style for the model is set as **Shaded**? (Select all that apply.)
   a. Shadows
   b. Reflections
   c. Lights
   d. Ground Plane
   e. Ray Tracing
2. The ground plane must be enabled (displayed) for the shadows and ground reflections to be visible in the model.
   a. True
   b. False
3. Which of the following statements are true regarding lighting styles. (Select all that apply.)
   a. An Image-based lighting style enables you to use a predefined background image in the style.
   b. Multiple standard lights can be combined in a single lighting style.
   c. Multiple lighting styles can be applied at one time.
   d. Shadow settings are controlled in a lighting style.
4. The following icons display when working with the in-canvas appearance and texture tool. Which icon enables you to scale a texture in a material?
   a. 
   b. 
   c. 
   d. 

5. Which of the following statements are true regarding the Appearance Browser dialog box shown in Figure 1–32? (Select all that apply.)

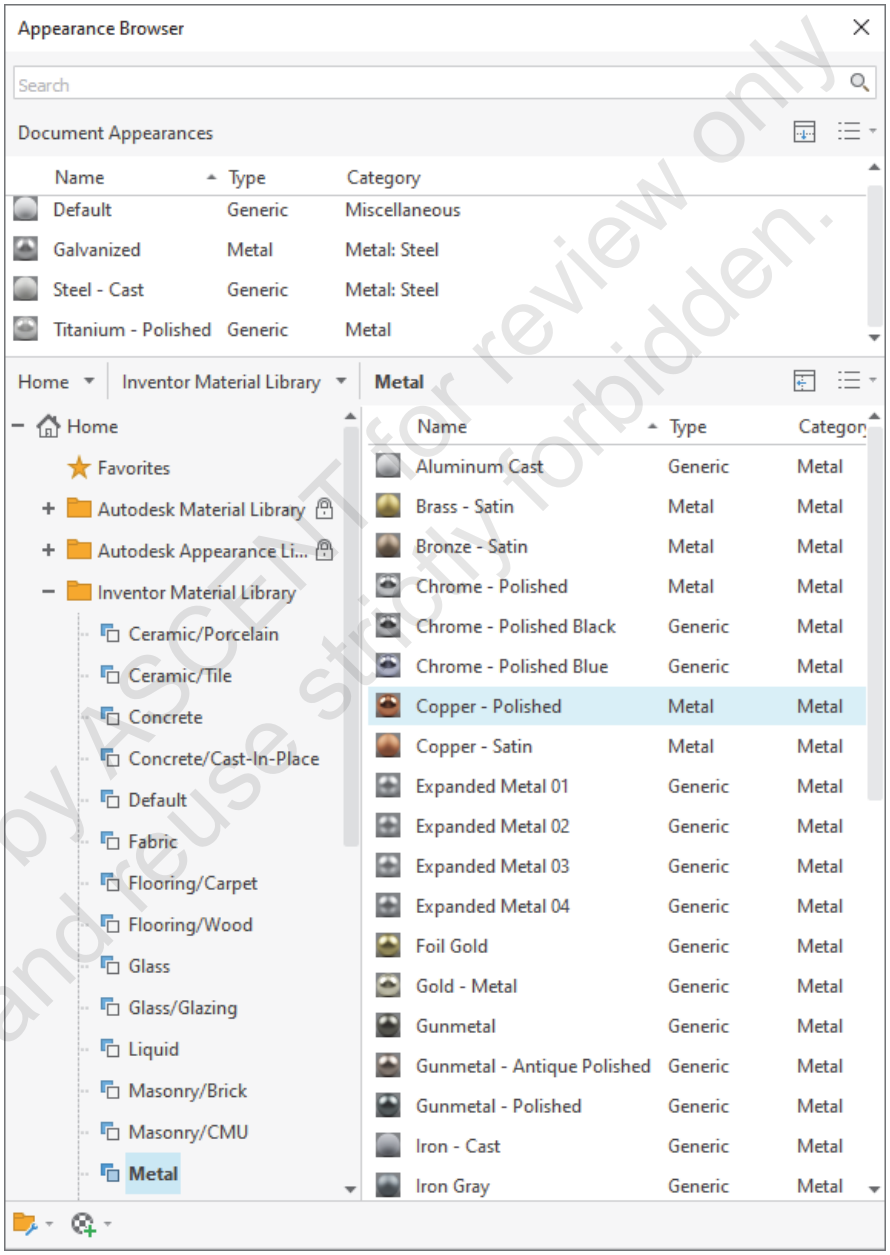


Figure 1–32

a. Four appearances have been applied to the model.

b. The Favorites list is currently being displayed in the *Appearance* area.

c. The Metal category in the Inventor Material Library is currently active.

d. The Copper - Polished material is the currently assigned material to the model.

Command Summary

Button	Command	Location
	**Adjust** (color)	• **Ribbon:** *Tools* tab>Appearance panel
	**Appearance (Browser)**	• **Ribbon:** *Tools* tab>Appearance panel
N/A	**Appearance Override**	• **Quick Access Toolbar** • **Appearance Browser**
	**Clear** (color)	• **Ribbon:** *Tools* tab>Appearance panel
	**Ground Plane**	• **Ribbon:** *View* tab>Appearance panel
N/A	**Lighting Styles**	• **Ribbon:** *View* tab>Appearance panel
	**Orthographic**	• **Ribbon:** *View* tab>Appearance panel
	**Perspective**	• **Ribbon:** *View* tab>Appearance panel
	**Perspective with Ortho Faces**	• **Ribbon:** *View* tab>Appearance panel
	**Ray Tracing**	• **Ribbon:** *View* tab>Appearance panel
	**Reflections**	• **Ribbon:** *View* tab>Appearance panel
	**Shadows**	• **Ribbon:** *View* tab>Appearance panel
	**Styles Editor** (lighting)	• **Ribbon:** *Manage* tab>Styles and Standards panel
	**Visual Style**	• **Ribbon:** *View* tab>Appearance panel