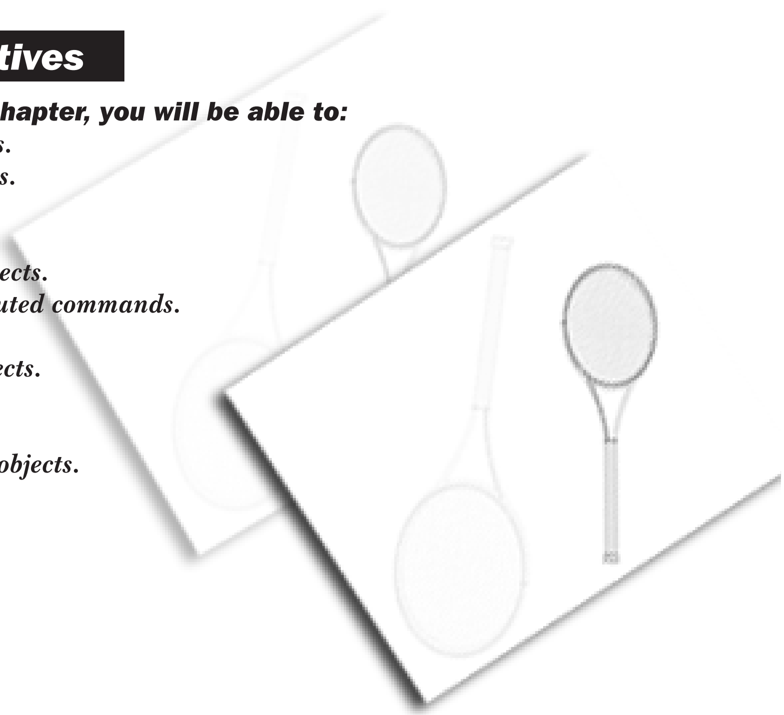
Chapter 3

Working with Surfaces-I

Learning Objectives

After completing this chapter, you will be able to:

- *Create revolved surfaces.*
- *Create extruded surfaces.*
- *Create skin surfaces.*
- *Create planar surfaces.*
- *Cut, copy, and paste objects.*
- *Undo and redo the executed commands.*
- *Edit keypoint curves.*
- *Create construction objects.*
- *Set construction planes.*
- *Preset grids.*
- *Control the visibility of objects.*



CREATING SURFACES

In the previous chapter, you learned about creating curves and primitives, and transforming objects. In this chapter, you will learn to create revolved, extruded, skin, and planar surfaces. The methods of creating these surfaces are discussed next.

Creating a Revolved Surface

Palette: Surfaces > Revolve

A revolved surface is created by sweeping a curve around an axis through a specified angle. In Alias Design, you can create a revolved surface by using the **Revolve** tool. To create a revolved surface, first create a curve, as shown in Figure 3-1. Note that by default the X-axis acts as the axis of revolution. So, you need to create the curve in the **Left** or **Top** window. Also, you may need to change the pivot point position to create the desired revolved feature. Next, choose the **Revolve** tool from the **Surfaces** tab in the **Palette**; you will be prompted to select the curve to revolve. Select the curve from the active window; the revolved surface will be created, as shown in Figure 3-2.

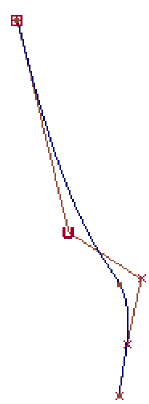


Figure 3-1 *Profile for the revolved surface*

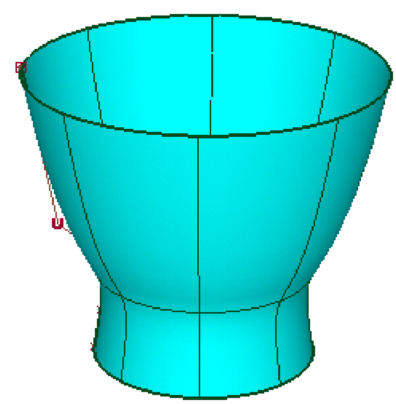


Figure 3-2 *Revolved surface*

To set the parameters of the **Revolve** tool, double-click on the **Revolve** tool; the **Revolve Control** dialog box will be displayed, as shown in Figure 3-3.

The options in the **Revolve Control** dialog box are discussed next.

Periodic

Select this check box to create a full-revolution (360 degrees) revolved feature. When you select this check box, the **Per segment** check box, **Sweep angle**, **Segments,** and **Pitch** edit boxes will become unavailable.

Sweep Angle

The **Sweep Angle** edit box is used to specify the angle of revolution for the revolved surface. By default, 360 is displayed in this edit box. Enter the desired value in this edit box to create a revolved surface.

> **Tip:** *You can also modify the sweep angle of an existing revolved surface by using its manipulator handle. To display the manipulator handle, choose the* ***Query edit*** *tool from the* ***Object Edit*** *tab in the* ***Palette*** *and then select the revolved surface. Next, drag the manipulator handle to the desired position. Alternatively, select the manipulator and enter the desired sweep angle in the promptline or in the* ***Sweep angle*** *edit box. The use of the* ***Query edit*** *tool will be discussed in detail in Chapter 8.*

Figure 3-4 shows the revolved surface with the manipulator handle and sweep angle of -150 degrees.

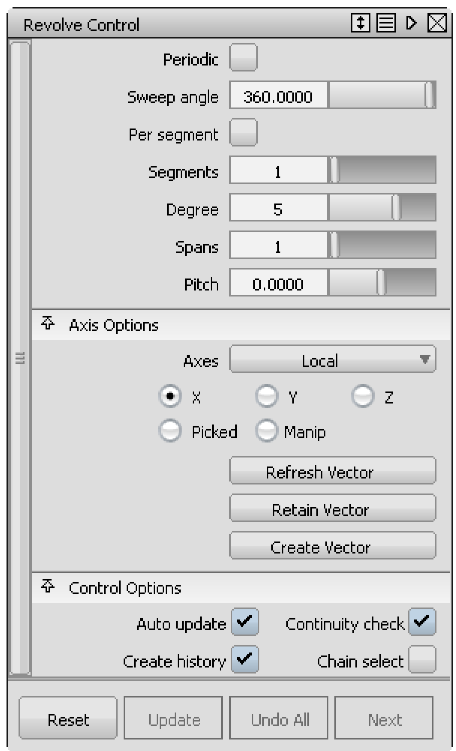


Figure 3-3 *The* ***Revolve Control*** *dialog box*

Per segment

Select this check box to specify the sweep angle per segment instead of the entire revolution.

Segments

This edit box is used to specify the number of segments or individual surfaces that will be used to create the revolved surface. Note that the segments of a revolved surface are always curvature continuous with the adjacent segments. All the segments of a revolved surface are grouped together and revolve through the same angle. Figure 3-5 shows the revolved surface with 5 segments.

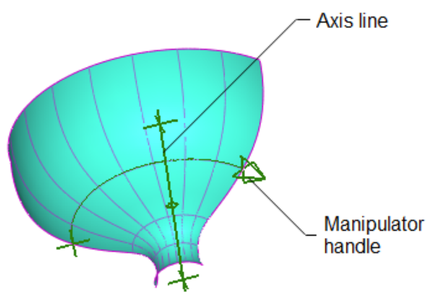


Figure 3-4 *Revolved surface with the manipulator handle and sweep angle of -150 degrees*

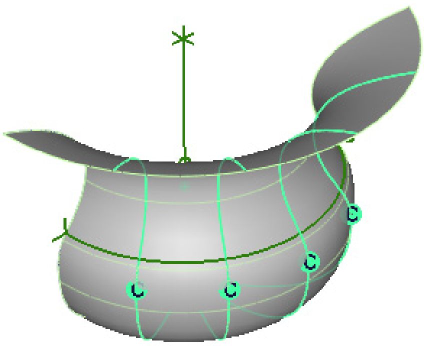


Figure 3-5 *Revolved surface having 5 segments*

Degree

This edit box is used to specify the degree of the revolved surface. The degree of the revolved surface affects its shape. If you enter **1** in this edit box, a rough surface will be created, as shown in Figure 3-6. If you enter a value higher than 1, a smooth surface will be created, as shown in Figure 3-7.

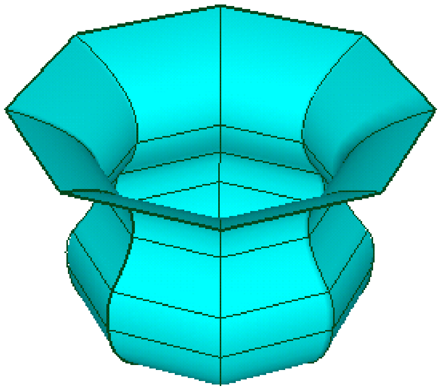


Figure 3-6 *Degree 1 applied on the revolved surface*

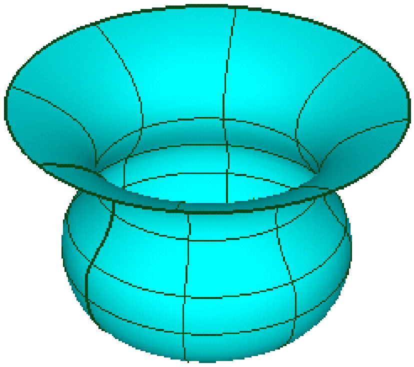


Figure 3-7 *Degree 1 applied on the revolved surface*

Spans

This edit box is used to specify the number of spans in each segment of the revolved surface. You can also change the number of spans by using the slider bar given on the right of this edit box. Generally, the number of sections is kept between 6 to 8. It is recommended that the number of sections should not be more than 12.

Pitch

This edit box is used to specify the displacement of the curves along the axis of revolution and the pitch value entered in the edit box is for one complete revolution.

Axis Options

The Options in this area are discussed next.

Axes

The options in this drop-down list are used to specify the axis of revolution. In the **Axes** drop-down list, there are two options: **Local** and **Global**. These options are discussed next.

Local

The **Local** option is selected by default and is used to revolve the curve around its pivot point or local coordinate axes. While creating a revolved surface using this option, you cannot select multiple curves. To select multiple curves, you need to group them first and then revolve the grouped curves.

Global

Select this option to revolve the curve around the global coordinate system of the current construction plane or axes.

X

This radio button is selected by default and is used to revolve the curve around the X-axis.

Y

Select this radio button to revolve the curve around the Y-axis.

Z

Select this radio button to revolve the curve around the Z-axis.

Picked

Select this radio button to specify the axis of the revolved surface. On selecting this radio button, the **Picked Vector** text box will be displayed in the **Revolve Control** dialog box. Select the desired vector from the view window; the name of the selected vector will be displayed in the **Picked Vector** text box. Alternatively, enter the name of the vector in this area and then press ENTER to select the vector.

Manip

This radio button is selected automatically if you use the manipulator to change the revolution axis.

Refresh Vector

Choose this button to update the vector if the axis has been modified. This button is activated only when **X**, **Y**, or **Z** radio button is selected in the **Axis Options** area.

Retain Vector

Choose this button to create a vector for the specified revolution axis.

Create Vector

This button is used to create a vector to use as the revolution axis.

Control Options

The Options in this area are discussed next.

Auto update

This check box is selected by default and updates the revolved surface automatically whenever its parameters are changed. If you clear this check box and modify any parameter in the **Revolve Control** dialog box, then the **Update** button will be activated. Next, choose the **Update** button to update the revolved surface.

Continuity check

Select this check box to display the continuity locators between different segments of the revolved surface. The continuity locators are represented by the alphabet C.

Create history

Select this check box to save the history of the revolved surface so that it can be modified later. If you create a revolved surface with the **Create history** check box selected, you can modify the profile of the revolved surface by modifying edit points or CVs of the curve. Modifications made on the curve will be reflected in the revolved surface.

Chain select

This check box is available in the **Control Options** area of the **Revolve Control** dialog box. After selecting this check box, if you select a curve, all other curves that are tangent continuous with the selected curve will be selected.

Creating an Extruded Surface

Palette:	Surfaces > Swept Surfaces > Extrude

An extruded surface is created by extruding a curve or a profile along a specified path. The curve or profile selected for extrusion is termed as the profile curve. The curve selected for guiding the surface is termed as path curve. Figure 3-8 shows a path curve and a profile curve. You can create an extruded surface by using the **Extrude** tool. To invoke this tool, choose the **Extrude** tool from the **Swept Surfaces** flyout of the **Surfaces** tab in the **Palette**; a flyout will be displayed. Choose the **Extrude** tool from this flyout; you will be prompted to select curve(s) to extrude. These curves can be free curves, curves-on-surface, isoparametric curves, and so on. You can select open, closed, single, or multiple curves as profile curves. Select the profile curve; the **Go** button will be displayed at the lower right corner of the active window. Choose the **Go** button; you will be prompted to select the path curve. Select the path curve; the profile curve will be extruded along the path curve to create an extruded surface, as shown in Figure 3-9.

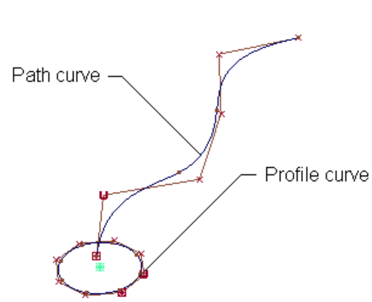


Figure 3-8 Profile and path curves

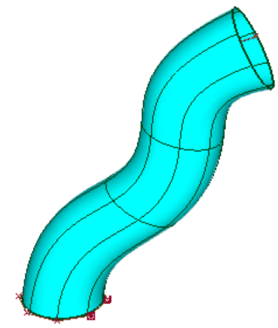


Figure 3-9 Extruded surface

To set the parameters of the **Extrude** tool, double-click on the **Extrude** tool; the **Extrude Options** dialog box will be displayed, as shown in Figure 3-10.

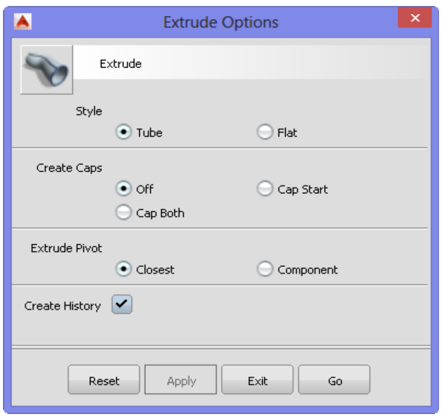


*Figure 3-10 The **Extrude Options** dialog box*

The options in the **Extrude Options** dialog box are discussed next.

Style

The **Style** area is used to specify the profile of the surface when the profile curve is extruded along the path curve. The type of surface that is generated by specifying the profile depends on the orientation of the curve. The radio buttons in the **Style** area are discussed next.

Tube

This radio button is selected by default and is used to extrude the surface with the profile, maintaining its orientation with the path curve. In other words, the profile rotates with respect to the path curve, as shown in Figure 3-11.

Flat

Select the **Flat** radio button to extrude the surface such that the profile maintains its original orientation. In other words, the profile does not rotate while extruding along the path curve, as shown in Figure 3-12.

Create Caps

The **Create Caps** area is used to specify whether the caps will be created at the ends of the extruded surface. The radio buttons in this area play a significant role in case of surfaces that are created by using the closed profile curves. The radio buttons in this area are discussed next.

Off

This radio button is selected by default and is used to create an extruded surface that is open at both ends.

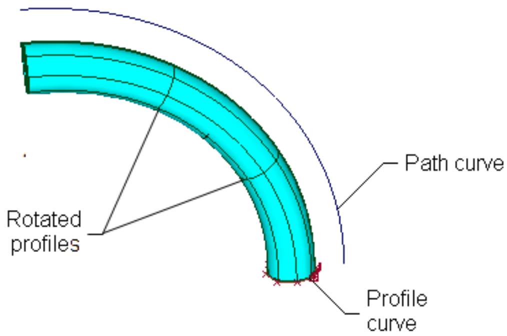


Figure 3-11 Surface extruded with the ***Tube*** *radio button selected*

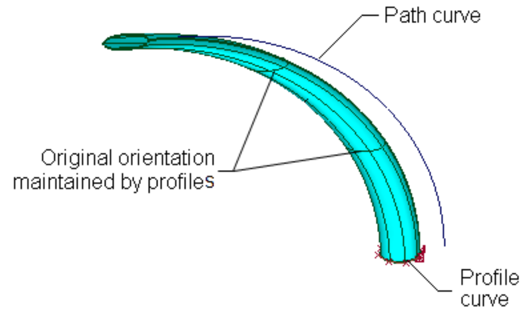


Figure 3-12 Surface extruded with the ***Flat*** *radio button selected*

Cap Start
Select this radio button to create the extruded surface with a cap at the first end, as shown in Figure 3-13.

Cap Both
Select this radio button to create the extruded surface with caps at both ends, as shown in Figure 3-14.

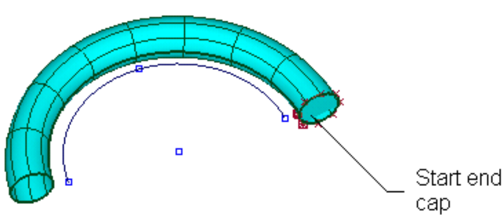


Figure 3-13 Extruded surface created with the ***Cap Start*** *radio button selected*

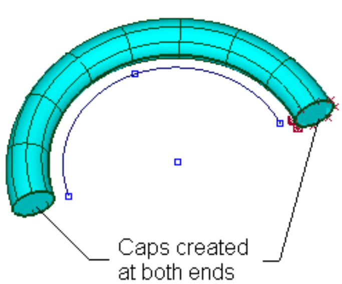


Figure 3-14 Extruded surface created with the ***Cap Both*** *radio button selected*

Extrude Pivot

This area is used to choose the pivot point if there are more profile curves. This area will be available only when the **Tube** radio button is selected from the **Style** area. The radio buttons in the **Extrude Pivot** area are discussed next.

Closest
The **Closest** radio button is selected by default. As a result, the profile curves are pivoted at the endpoint of the path curve that is closest to the bounding box of all profile curve. For better results, create the profile near the start point or endpoint of the path curve.

Component
On selecting the **Component** radio button, the profile curves pivot around their individual pivot points.

Figure 3-15 shows the profile and path curves and Figure 3-16 shows the closest pivot and component pivot extruded surfaces.

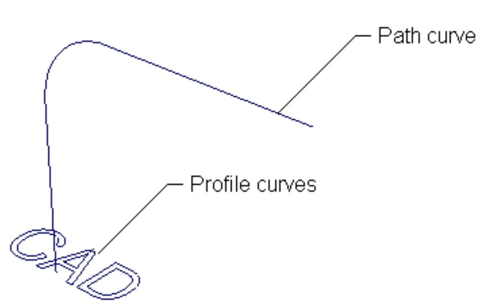


***Figure 3-15** The profile and path curves*

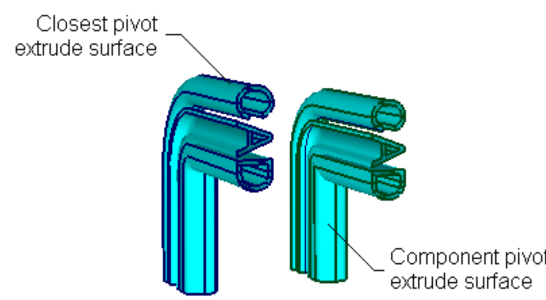


***Figure 3-16** The closest pivot and component pivot extrude surfaces*

Tip: *Create the path curve with less number of twists and bends to avoid creating an unwanted twisted surface. Also, it is not mandatory for the profile curve to lie on the path curve.*

Create History
Select this check box to save the history of the extruded surface so that it can be modified later. If you create the extruded surface with the **Create History** check box selected, you can modify the profile of the extruded surface by modifying the edit points and CVs of the profile curve. The modifications made in the profile curve will be reflected in the extruded surface.

Creating a Skin Surface Using the Skin 2012 Tool

Palette: Surfaces > Skin Surfaces > Skin 2012

You can create a surface between two or more profile curves by using the **Skin 2012** tool. This tool allows you to create a freeform surface between the selected curves. Before invoking this tool, create two or more curves. Next, choose the **Skin 2012** tool from the **Skin Surfaces** flyout of the **Surfaces** tab; you will be prompted to select the first curve. Select one of the curves; you will be prompted to select the next curve or re-select the first curve to undo its selection. Select the other curve from the active window; the skin surface will be created, as shown in Figure 3-17.

Note

*1. The display of CVs, hulls, and edit points in Figure 3-17 has been turned off by using the options in the **Display** area of the **Control Panel**.*

2. For creating a skin surface with more than two curves, press the SHIFT key while selecting the curves after the selection of the second curve.

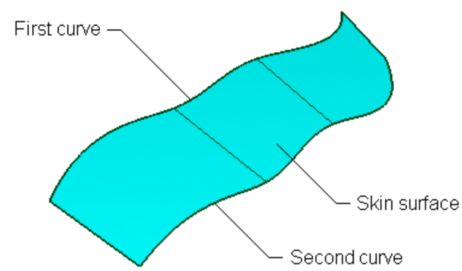


Figure 3-17 *Skin surface*

To set the parameters of the **Skin 2012** tool, double-click on the **Skin 2012** tool; the **Skinning Options** dialog box will be displayed, as shown in Figure 3-18.

The options in the **Skinning Options** dialog box are discussed next.

Skinning Mode

A curve consists of a number of points that can be defined with the help of the U and V parameters. The value of the U and V parameters ranges from 0 to 1. A curve with constant U or constant V parameter is known as isoparametric curve. These parameters are used in mathematical definition of the surface and also for defining paths on the surface. These parameters are not spaced proportionally along the surface. The **Skinning Mode** area is used to control the V parameter of the skin surface. The radio buttons in this area are discussed next.

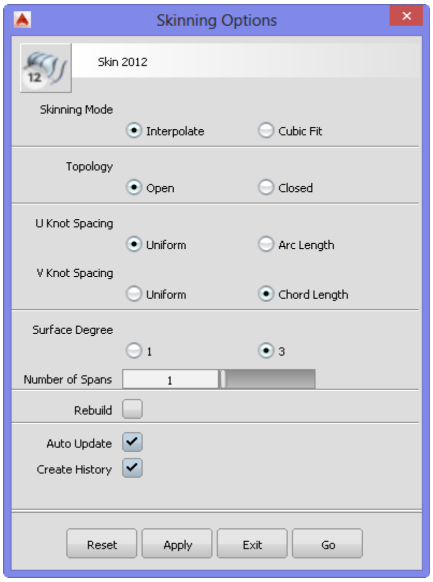


Figure 3-18 *The **Skinning Options** dialog box*

Interpolate

This radio button is selected by default and is used to place V isoparametric curves on original curves. This option gives results only in the case of the curves that have more than one degree.

Cubic Fit

On selecting this radio button, V isoparametric curves will be placed on surfaces according to the fitting algorithm.

Note

You can increase the number of V isoparametric curves by changing the number of spans in the ***Pick*** *area of the* ***Control Panel****.*

Topology

Topology specifies the relationship between objects such as curves, surfaces, boundaries, and so on in a model. The options in the **Topology** area are used to control the spatial relationship between curves used for creating the skin surface. The radio buttons in this dialog box are discussed next.

Open

This radio button is selected by default and is used to create an open skin surface.

Closed

Select this radio button to create a closed periodic skin surface. Using this radio button, you can connect the first curve to the last curve. Figure 3-19 shows the three lines to be selected for creating a skin surface. Figure 3-20 shows the open and closed skin surfaces created.

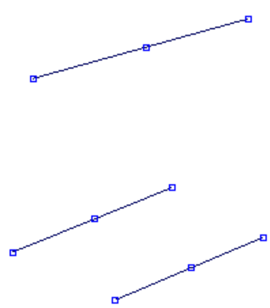


Figure 3-19 *Lines to be selected for creating a skin surface*

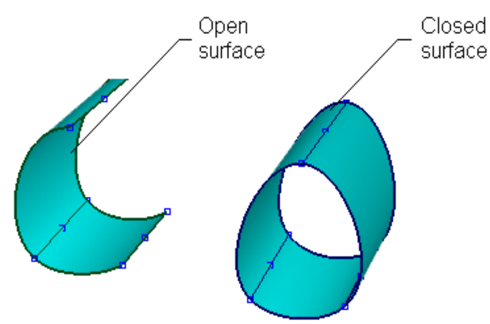


Figure 3-20 *Open and closed skin surfaces created*

Note

The skin surfaces in Figure 3-20 have been created by selecting lines with the SHIFT key pressed. Therefore, a continuous skin surface is created from a set of more than two curves.

U Knot Spacing

A surface has two directions, U and V. The U direction runs along the length of the curve. The **U Knot Spacing** area controls the U parameters in relation to the actual surface. The options in this area are used to control the texture mapping while rendering a model. These options are discussed next.

Uniform

The **Uniform** radio button is selected by default. As a result, the isoparametric curves in the U direction will have parameter values in the integer format such as 1.0, 2.0, 3.0, and so on. Isoparametric curves are spaced unevenly across the surface. As a result, the texture assigned to the curves stretches to fit evenly between the isoparametric curves, as shown in Figure 3-21.

Arc Length

On selecting this radio button, the edit points of isoparametric curves will be parameterized by average length through original construction curves. The parameter value of the starting edge of the surface is 0.0 and the parameter value at the opposite edge of the surface is equal to the average total length through original construction curves. As parameterization is based on length, isoparms are spaced evenly. As a result, the assigned texture is spaced evenly across the entire surface without stretching, as shown in Figure 3-22.

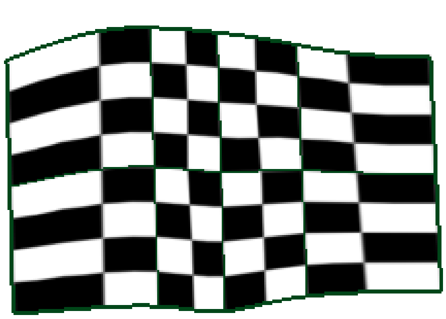


Figure 3-21 *Assigned texture stretched to fit evenly between the isoparametric curves*

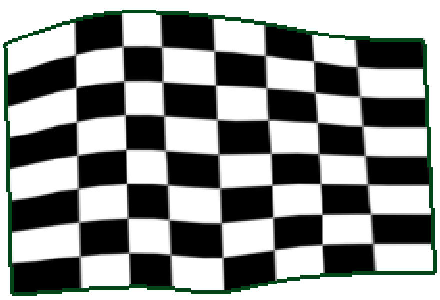


Figure 3-22 *Assigned texture spaced evenly across the entire surface without stretching*

V Knot Spacing

The **V Knot Spacing** area is used to control the V parameter in relation to the actual surface. The V direction runs across the original construction curves that connect the edit points of the original construction curves. The radio buttons in this area are discussed next.

Uniform

On selecting the **Uniform** radio button, the parameter values of isoparametric curves in the V direction will be in the integer format such as 1.0, 2.0, 3.0, and so on. In other words, the isoparametric curves will be parameterized uniformly among the original construction curves through their edit points. This option will be applied only when you select the **Interpolate** radio button from the **Skinning Mode** area.

Chord Length

This radio button is selected by default. As a result, the edit points of the isoparametric curves will be parameterized by the chord length of the surface. The parameter value of the surface at starting edge is 0.0 and at the opposite edge is equal to the total length of the surface.

Surface Degree

This area will be displayed only when you select the **Interpolate** radio button from the **Skinning Mode** area. The **Surface Degree** area can be used to specify the degree of surface in the V direction. By default, the **3** radio button is selected and is used to create a cubic surface.

Number of Spans

The **Number of Spans** edit box is used to specify the number of spans between original isoparametric curves of the skin surface. You can create a surface with a number of spans ranging from 1 to 100. You can also change the number of spans by using the slider bar given on the right of the **Number of Spans** edit box. The default value in this edit box is 1. With this value, only one span can be created on the surface and no additional isoparametric curve will be inserted in the surface. On entering 2 in the edit box, a surface with two spans will be created. In this case, one additional isoparametric curve will be inserted into the surface, as shown in Figure 3-23. Similarly, on entering 3 in the edit box, a surface with three spans will be created. In this case, two additional isoparametric curves will be inserted into the surface, as shown in Figure 3-24.

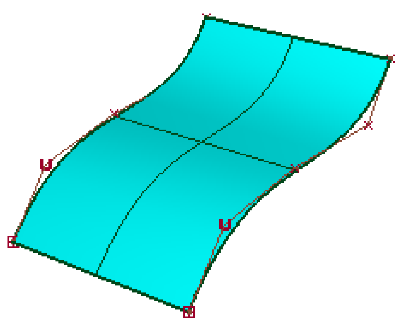


Figure 3-23 *Surface with two spans created*

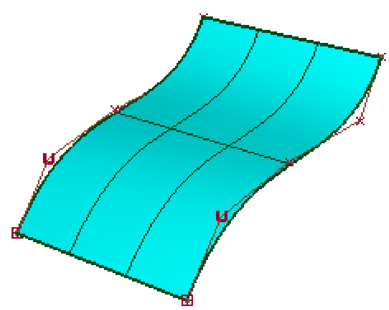


Figure 3-24 *Surface with three spans created*

Rebuild

Select the **Rebuild** check box to match the parameterization of the surface with the first curve. This check box should be selected only when you are sure that the parameterization of the curve and the surface created match each other.

Auto Update

The **Auto Update** check box is selected by default and is used to update a surface while adding curves to it. If you clear this check box and select the curves, the **Go** button will be displayed at the lower right corner of the active window. In this case, you need to choose the **Go** button to create the surface.

Create History

This check box is selected by default and is used to save the history of the skin surface so that it can be modified later. If you create the skin surface keeping the **Create History** check box selected, you can modify the profile of the skin surface by modifying the edit points and CVs of the curves that were used to create it. Modifications made on the curves will be reflected in the skinned surface.

Creating a Skin Surface Using the Skin Tool

Palette: Surfaces > Skin Surfaces > Skin

The **Skin** tool is the enhanced version of the **Skin 2012** tool. Using this tool, you can create single skin with G1 continuity by using multiple curves. Also, you can redefine the construction of a surface. To create a skin surface, choose the **Skin** tool from the **Skin Surfaces** flyout of the **Surfaces** tab; you will be prompted to select the first curve. Select one of the curves from the active window; you will be prompted to select the next curve or re-select the first curve to undo its selection. Select the other curve from the active window; the skin surface will be created. You can also select multiple curves to create skin surface. To select multiple curves, press the SHIFT key. Figure 3-25 shows skin surface created by selecting multiple curves.

To set the parameters of the **Skin** tool, double-click on the **Skin** tool; the **Skin Control** dialog box will be displayed, as shown in Figure 3-26.

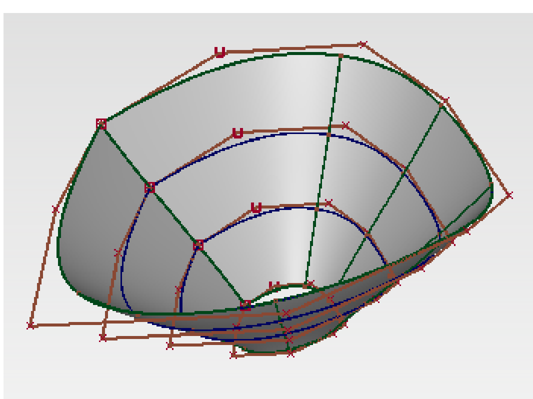


__Figure 3-25__ Skin surface created using enhanced __Skin__ tool

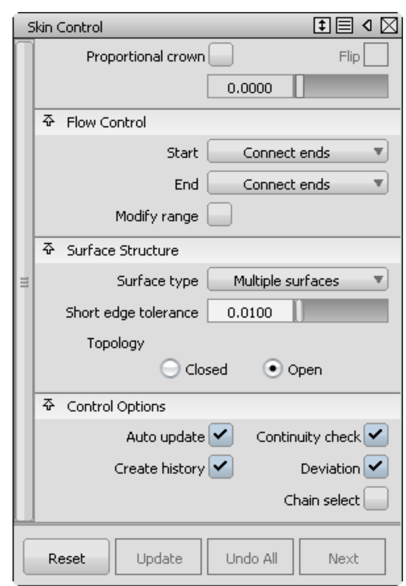


__Figure 3-26__ The __Skin Control__ dialog box

The options in the **Skin Control** dialog box are discussed next.

Proportional crown

Select this check box to raise or lower the midpoint of the surface between two input curve sets so that the height or crown of the surface increase or decrease proportionally to the distance between the curves. This option is not available when more than two curve sets are selected.

To adjust the height or crown of the surface, you can use the slider or directly put the value in the edit box.

Flip

Select this check box to flip the direction of crown.

Flow Control

The options in this area are discussed next.

Start

The options in this drop-down list are used to define the extent of the surface through a snapping point on each input curve set. The different snapping point options present in the **Start** drop-down list are discussed next.

Default

Use this option to create a type of surface in which the extent of the surface is defined as the closest point from one curve set endpoint to the second curve set, so that the control layout remains normal to curve sets.

Extend

On selecting this option, you can create a surface in which surface can be extended to match the endpoint of the opposite surface. In this case also, the control layout remains normal to the curve sets.

Connect ends

The **Connect ends** option is selected by default and it allows you to connect endpoint of the initial curves set to the endpoint of the second curve set.

Note

*The options present in the **End** drop-down list are similar to the options in the **Start** drop-down list.*

Modify range

Select this check box to modify the input curve of the surface by using the range manipulators.

Surface Structure

The options in this area are discussed next.

Surface type
The options in this drop-down list are used to define the type of the surface to be used to create the skin surface. The different options present in the **Surface type** drop-down list are discussed next.

Single surface
Select the **Single surface** option from the **Surface type** drop-down list to create a single skin surface.

Multiple surface
This option is chosen by default and is used to create multiple skin surfaces for each of the input curves you selected.

Short Edge Tolerance
The minimum distance that is allowed in the span of a surface where cross-knot occurs is called short edge tolerance. You can change the short edge tolerance value by using the **Short Edge Tolerance** edit box.

Topology
The options in this area have been already explained in the **Skin 2012** tool section.

Control Options
The options in this area are discussed next.

Auto update
This check box is selected by default and updates the skin surface automatically whenever its parameters are changed. If you clear this check box and modify any parameter in the **Skin Control** dialog box, then the **Update** button will be activated. Next, choose the **Update** button to update the skin surface.

Continuity check
Select this check box to display the continuity locators between different segments of the revolved surface. The continuity locators are represented by the alphabet P, T, and C for positional, tangent, and curvature continuity respectively.

Create history
Select this check box to save the history of the skin surface so that it can be modified later. If you create a skin surface with the **Create history** check box selected, you can modify the profile of the skin surface by modifying edit points or CVs of the curve. Modifications made on the curve will be reflected in the skin surface.

Deviation
Select this check box to display the maximum deviation indicator. But the indicator will only be displayed when deviation is set not 0.

Chain select
If you select this check box and then select a curve, all other curves that are tangent continuous with the selected curve will be selected.

Creating a Planar Surface

Palette:	Surfaces > Planer Surfaces > Set Planar

Planar surfaces are the trimmed NURBS surfaces that are created from the curves lying on the same plane. You can create these surfaces by using the **Set Planar** tool. This tool functions only when the selected curves form a closed profile. To create a planar surface, choose the **Set Planar** tool from the **Planer Surfaces** flyout of the **Surfaces** tab in the **Palette**; you will be prompted to select the first curve. Select the first curve from the active window; you will be prompted to select the other curve(s). You will notice that the **Go** button is displayed on selecting the profile curve(s), refer to Figure 3-27. Select the curves in such a way that they form a closed profile. Choose the **Go** button after selecting all curves; the planar surface will be created, as shown in Figure 3-28.

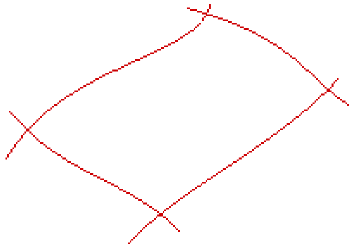


Figure 3-27 *Profile curves selected*

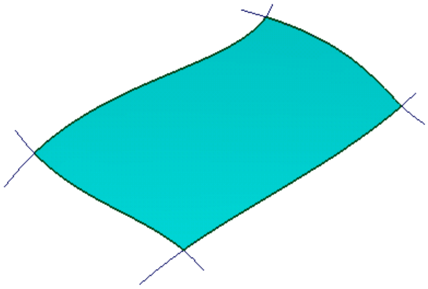


Figure 3-28 *Planar surface created*

Note

The display of CVs, hulls, and edit points in Figures 3-27 and 3-28 has been turned off for a better display of curves and surface. Also, the planar surface in Figure 3-28 has been shaded.

To set the parameters of the **Set Planar** tool, double-click on the **Set Planar** tool; the **Planar Surface Options** dialog box will be displayed, as shown in Figure 3-29. The options in this dialog box have already been explained in the previous topic.

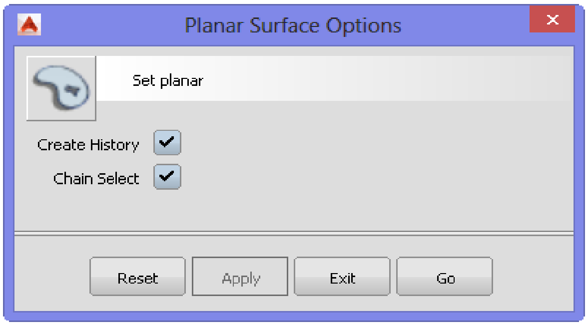


Figure 3-29 *The **Planar Surface Options** dialog box*

EDITING FEATURES

You can cut, copy, and paste the objects created by using the options in the **Edit** menu. These options are discussed next.

Removing an Object

Menu bar:	Edit > Cut

You can temporarily remove an object, component, or feature from the active window. After removing the object, you can copy it to a temporary memory location and paste to other location. To remove an object, select it and then choose **Edit > Cut** from the menu bar; the selected object will be removed from the active window. Alternatively, press CTRL+X to cut the selected object from the active window.

Copying an Object

Menu bar:	Edit > Copy

You can copy an object, component, or a feature from the active window. To do so, first select an object and then choose **Edit > Copy** from the menu bar; the selected object will be copied. Alternatively, press CTRL+C to copy the selected object from the active window.

Pasting an Object

Menu bar:	Edit > Paste

You can paste a copied or cut object in the active window. To do so, first cut or copy an object and then choose **Edit > Paste** from the menu bar; the object will be pasted at the location of the original object. Alternatively, press CTRL+V to paste a copied or cut object in the active window. You can move the copied object away from the original object by using the **Move** tool.

To set the parameters of the **Paste** option, click on the box given on its right; the **Paste Options** dialog box will be displayed, as shown in Figure 3-30.

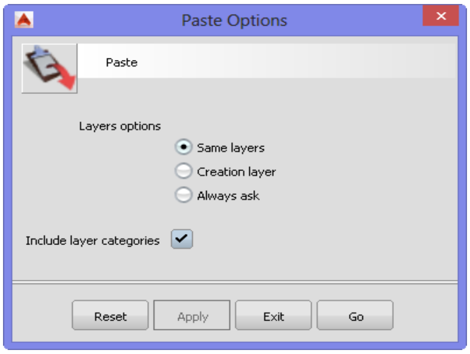


*Figure 3-30 The **Paste Options** dialog box*

The options in this dialog box are discussed next.

Layers options

This area is used to specify the layers in which the copied or cut objects will be pasted. The radio buttons in this area are discussed next.

Same layers

This radio button is selected by default and is used to paste the object in the same layer from where it was copied or cut.

Creation layer

Select this radio button to paste the object in the current layer. The current layer will be highlighted in yellow color in the layers bar.

Always ask

Select this radio button and then choose the **Go** button; the **Paste options** menu will be displayed, as shown in Figure 3-31. The options in this menu are used to specify the layer where the objects will be pasted. Choose the **same layers** option to paste the object in the layer from where it was copied or cut. Choose the **duplicate layers** option to paste the object in a duplicate layer. This layer is named identical to the existing layer. For example, if the existing layer is named as Line, the object will be pasted in a duplicate layer named Line#2. Choose the **new layer** option to paste the object in a new layer. You can specify the name of a new layer in the **Create a new layer** edit box of the **confirm** message box that will be displayed when you choose the **new layer** option from the menu. Choose the **DefaultLayer** option to paste the copied or cut object in the default layer. If there are existing layers, the menu will allow you to choose the required layer in which the copied or cut object will get pasted. You can cancel the pasting of the selected object by choosing the **Cancel** option.

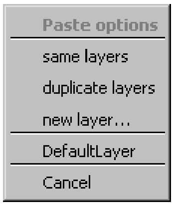


***Figure 3-31** The **Paste options** menu*

Reverting to the Previous Command

Menu bar: Edit > Undo

You can reverse the effect of the previous command by choosing **Edit > Undo** from the menu bar. Alternatively, you can undo the previous command by pressing CTRL+Z keys. Also, you can specify the number of undos in the **Miscellaneous** tab of the **General Preferences** dialog box. The **General Preferences** dialog box has been discussed earlier in Chapter 1.

Re-applying the Previous Command

Menu bar: Edit > Redo

If you undo the previous command by mistake, you can re-apply the previous command. To do so, choose **Edit > Redo** from the menu bar.

Reinvoking the Last Command

Menu bar: Edit > Reinvoke Last

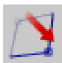
You can repeat the last command by choosing **Edit > Reinvoke Last** from the menu bar. Alternatively, press ALT+1 keys to repeat the last command. For example, if the last command executed was **Cut**, choose **Edit > Reinvoke Last** to repeat the **Cut** command.

EDITING KEYPOINT CURVES

In Chapter 2, you have created keypoint curves. You can move, reshape, or edit the attributes of these keypoint curves. These editing operations are discussed next.

Moving the Keypoints

Palette: Curves > Keypoint Curve Toolbox > Drag keypoints



To move keypoints, choose the **Drag keypoints** tool from the **Keypoint Curve Toolbox**; you will be prompted to use the mouse to drag the keypoint or enter the new position of the keypoint. Select the keypoint; the keypoint will be highlighted in green, as shown in Figure 3-32. Next, drag the cursor in the required direction; the keypoint will be moved, as shown in Figure 3-33. You can move a keypoint in the horizontal and vertical directions by dragging it with the middle and right mouse buttons, respectively.

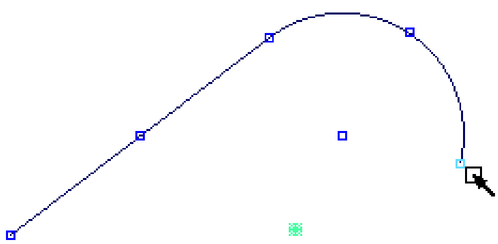


Figure 3-32 *Keypoint selected*

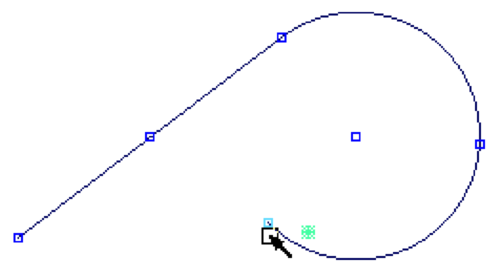


Figure 3-33 *New position of the keypoint*

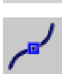
Breaking the Keypoint Curves

Palette: Curves > Keypoint Curve Toolbox > Break Curve at Keypoint

You can detach keypoint curve at keypoints. To do so, choose the **Break Curve at Keypoint** tool from the **Keypoint Curve Toolbox**; you will be prompted to select keypoints to break curve at. Select the keypoint where you want to break the curve; the curve will be broken at that point. The broken curve will act as a separate object.

Joining the Keypoint Curves

Palette: Curves > Keypoint Curve Toolbox > Break Curve at Keypoint > Join Curves



You can attach different keypoint curves to form a single curve by using the **Join Curves** tool. This tool can also be used to attach regular curves by joining their edit points. To attach curves, choose the **Join Curves** tool from the **Keypoint Curve Toolbox**; you will be prompted to select the keypoints or edit points to join at. Select keypoints or edit points; the curves will join to form a single curve. Note that the keypoints of two curves to be joined need to be coincident. The joined curves will act as a single object.

Modifying the Attributes of a Keypoint Curve

Menu bar: Windows > Information > Information Window

You can edit the attributes of a keypoint curve such as name, length, radius, sweep angle, and so on. To do so, select the keypoint curve from the active window and then choose **Windows > Information > Information Window** from the menu bar; the **Information Window** dialog box will be displayed, as shown in Figure 3-34. Alternatively, select the keypoint curve and then press CTRL+5 keys to display the **Information Window** dialog box. To change the name of the curve, enter a new name in the **Name** edit box. You can select the **Bounding Box** check box to display the bounding box of the curve. Select the **Invisible** check box to hide the curve in the active window. To change the attributes of the curve, click in the **Attributes** area; different edit boxes, depending upon the type of the keypoint curve, will be displayed. You can change the length, radius, and sweep angle of the keypoint curve by entering new values in these edit boxes. If the keypoint curve is an arc, you can even change this arc to its complement by choosing the **Arc Complement** tool in the **Attributes** area.

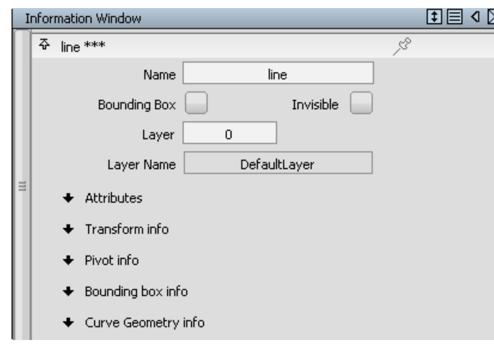


***Figure 3-34** The **Information Window** dialog box*

Tip: *The **Information Window** dialog box can also be used to view the pivot point, bounding box, layer, and surface geometry information.*

Note

*Another way to invoke the **Information Window** is by using the **Marking** menu. Press SHIFT+CTRL and right-click; a **Marking** menu is displayed. Choose **Information Window** from it.*

CONSTRUCTION OBJECTS

Construction objects act as a reference for creating features of a model. The construction objects used in Alias Design are point, vector, plane, and grid. The creation of these objects is discussed next.

Placing a Point

Palette: Construction > Point

You can place reference points in the view windows by using the **Point** tool. The reference points act as an input to other tools, and are also used as snapping targets and place-holders. To create a reference point, choose the **Point** tool from the **Construction** tab in the **Palette**; you will be prompted to select the object or enter the position of the point. If you select a curve as a reference for positioning the point, the point will be defined by three parameters, N1, N2, and du, as shown in Figure 3-35. If you select the boundary edge of the surface as a reference for positioning the point, the point will be defined by three parameters, N, du, and dv, as shown in Figure 3-36. You can also specify the position of the point by entering coordinates in the promptline or by clicking in the active window.

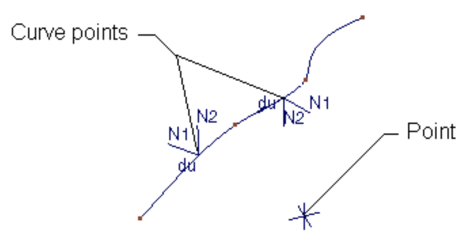


***Figure 3-35** Points on a curve*

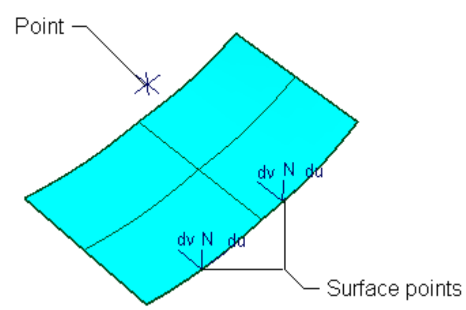


***Figure 3-36** Points on a surface*

To place a point with its name in the view windows, double-click on the **Point** tool; the **Construction Point Options** dialog box will be displayed, as shown in Figure 3-37. Select the **Show Name** check box to display the name of the point in the view windows.

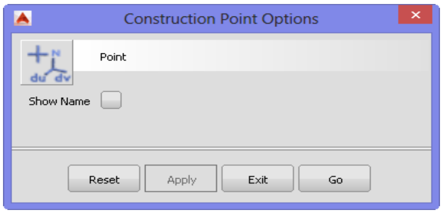


***Figure 3-37** The **Construction Point Options** dialog box*

Creating a Vector

Palette:	Construction > Vector

You can create a reference vector by using the **Vector** tool. Reference vector is used as an input for tools that require starting point and directions such as **Project**, **Multi-surface draft**, and **Draft/Flange**. To create a vector, choose the **Vector** tool from the **Construction** tab in the **Palette**; you will be prompted to pick a point or enter coordinates of the vector. Click in the active window or enter coordinates in the promptline; the manipulator will be displayed and you will be prompted to adjust the manipulator or enter the end position of the vector. Also, the **Next Vector** button will be displayed at the lower right corner of the active window. Choose the **Next Vector** button; the vector with the default setting will be created. You can change the position and length of the vector by dragging the arrow head manipulator to the required position before choosing the **Next Vector** button. If you select an existing object from the window to specify the vector's origin; the vector will be set in geometry space, as shown in Figure 3-38. Also, the **XYZ** and **Next Vector** buttons will be displayed at the lower right corner of the active window. If you move the origin of the vector along the geometry, its orientation will get changed with respect to the change in the geometry, as shown in Figure 3-39. Choose the **XYZ** tool to set the vector in world space, as shown in Figure 3-40. If you move the origin of the vector along the geometry, the vector will not change its orientation with respect to the change in the geometry, as shown in Figure 3-41. You can switch back to the geometry space by choosing the **GEOM** tool.

To create a vector with its name in the view windows, double-click on the **Vector** tool; the **Construction Vector Options** dialog box will be displayed, as shown in Figure 3-42. Select the **Show Name** check box to display the name of the vector in the view windows.

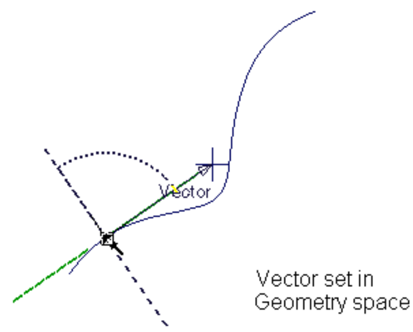


Figure 3-38 *Vector set in geometry space*

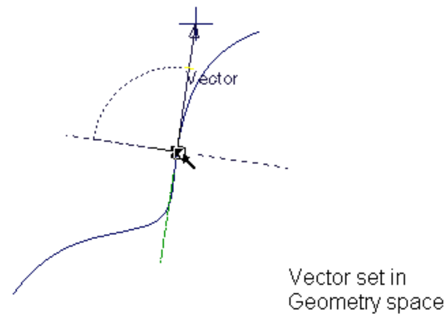


Figure 3-39 *Changed orientation of the vector*

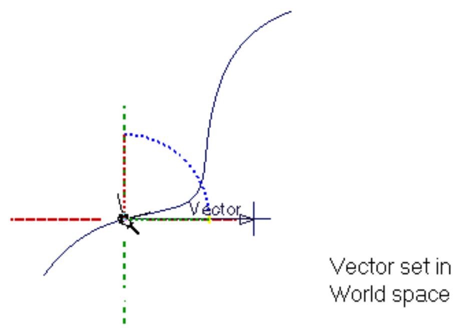


Figure 3-40 *Vector set in world space*

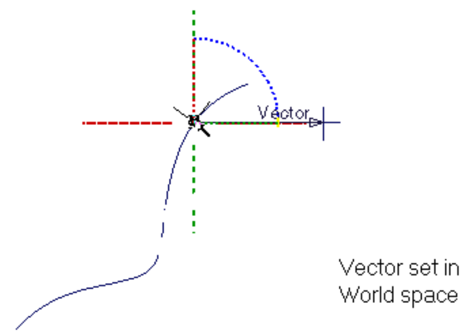


Figure 3-41 *Unchanged orientation of the vector*

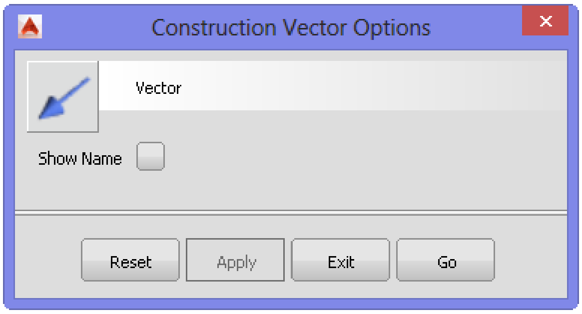
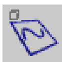


Figure 3-42 *The* ***Construction Vector Options*** *dialog box*

Creating a Reference Plane

Palette: Construction > Plane



A construction plane is used as a reference for creating advanced surfaces. The construction plane is also used as an input for other tools such as **Curve Planarize**, **Curve Section**, and so on. You can create a reference/construction plane by using the **Plane** tool. A reference plane that is used to create an object or a feature is known as construction plane. To create a reference plane, choose the **Plane** tool from the **Construction** tab in the **Palette**; you will be prompted to select the plane construction method. Also, five buttons, **View**, **Slice**, **3 Pt**, **Geom**, and **World** will be displayed at the lower right corner of the active window. These buttons are discussed next.

View

Choose this button to create a plane by specifying its center point. The Z-axis of the plane will be parallel to the view vector. When you choose this button, you will be prompted to specify the center point or the geometry point. Specify the position of the center point in the promptline or click in the active window; the plane with the manipulators will be displayed in the active window, as shown in Figure 3-43. Also, the **Next Plane** and **Set Construction Plane** buttons will be displayed in the active window. Next, choose the **Next Plane** button to create the construction plane, as shown in Figure 3-44. If you choose the **Set Construction Plane** button, the reference plane will be set as the construction plane. This construction plane can be set to an arbitrary coordinate system that can be oriented with respect to the world coordinate system. You can also modify the size, angle, or position of the plane by using different manipulator handles that will be discussed later in this chapter.

Slice

Choose this button to create a plane by specifying two points. When you choose this button, you will be prompted to specify the center point or the geometry point of the plane. Specify the position in the promptline or click in the active window at the required point; the plane will be created in the active window and you will be prompted to specify the second point in the plane. Specify the second point; the plane passing through the center point and second point will be created. This plane will be perpendicular to the view window. Figure 3-45 shows two points specified for creating the plane and Figure 3-46 shows the plane passing through these points.

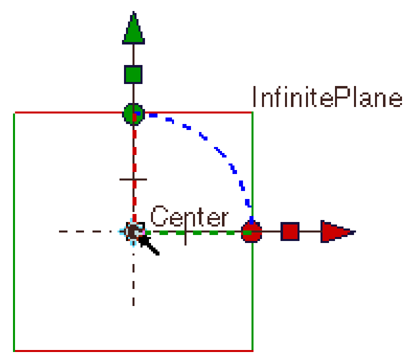


Figure 3-43 *Plane with manipulators*

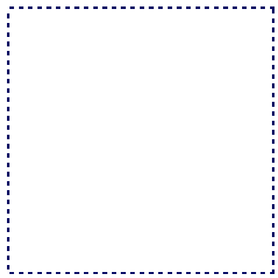


Figure 3-44 *Reference plane created*

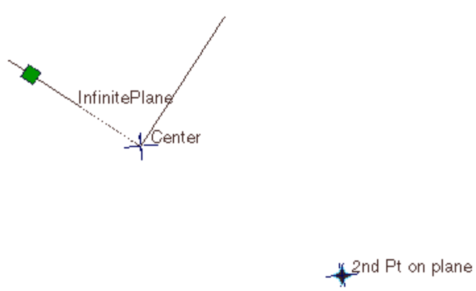


Figure 3-45 *Two points specified for creating the plane*

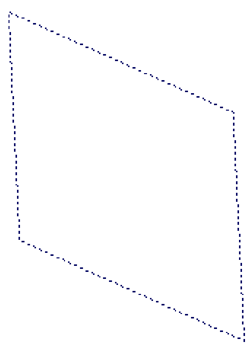


Figure 3-46 *Plane passing through two points*

3 Pt

Choose this button to create a plane by specifying three points. On choosing this button, you will be prompted to specify the center point or the geometry point of the plane. Specify the position in the promptline or click in the active window at the required point; the plane will be created in the active window and you will be prompted to specify the second point in the plane. Specify the second point by clicking in the active window or entering coordinates in the promptline; you will be prompted to specify the third point in the plane. Specify the third point; a plane passing through the specified points will be created. Figure 3-47 shows three points specified for creating the plane and Figure 3-48 shows the plane passing through these points.

Geom

Choose this button to create a plane on a geometry such that its Z-axis is oriented along the surface normal or the curve tangent. On choosing this button, you will be prompted to specify the center point or the geometry point of the plane. Click on the curve or surface at the required position; the plane will get snapped to the clicked object with the Z-axis oriented

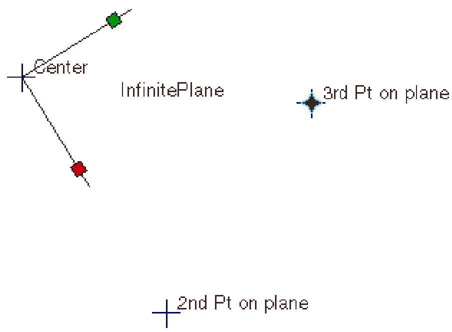


Figure 3-47 *Three points specified for creating the plane*

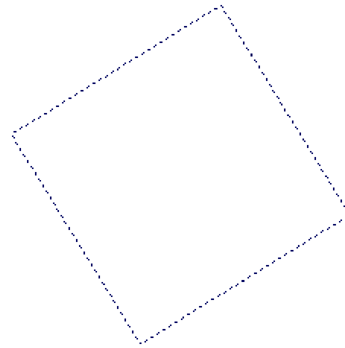


Figure 3-48 *Plane passing through three points*

along the surface normal or the curve tangent. To view the changing orientation of the plane, move the plane along the curve or across the surface by using the manipulator. Figure 3-49 shows the plane snapped to a curve and Figure 3-50 shows the changed orientation of the plane after moving it to the other location along the curve.

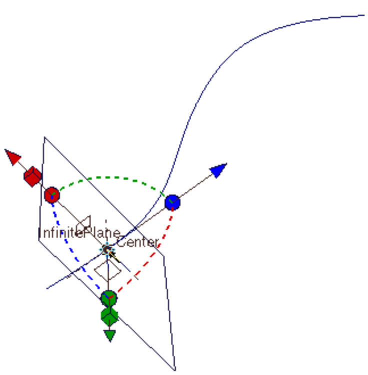


Figure 3-49 *Plane snapped to a curve*

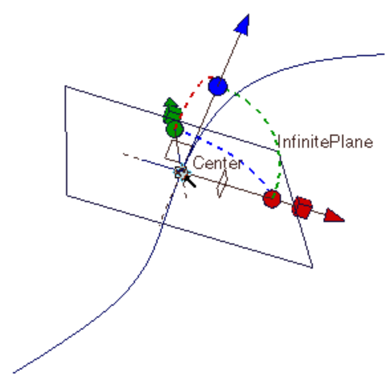


Figure 3-50 *Changed orientation of the plane*

World

Choose this button to create a plane which is oriented along the world axes, as shown in Figure 3-51. On choosing this button, you will be prompted to specify the center point or the geometry point of the plane. Specify the center point or the geometry point by clicking in the active window or by entering coordinates in the promptline; the plane with its axes oriented along the world axes will be created in the active window as shown in Figure 3-52.

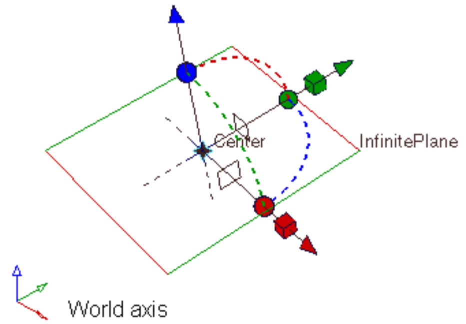


Figure 3-51 *Plane oriented along the world axes*

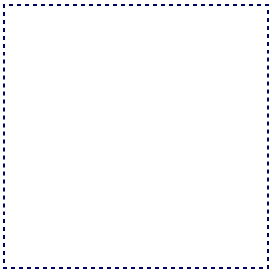


Figure 3-52 *Construction plane*

To create a construction plane with its name displayed in the view windows, double-click on the **Plane** tool; the **Construction Plane Options** dialog box will be displayed, as shown in Figure 3-53. Select the **Show Name** check box to display the name of the construction plane in the view windows.

You can edit a plane with the help of a plane manipulator. Different handles of a plane manipulator are shown in Figure 3-54. The significance of these handles is discussed next.

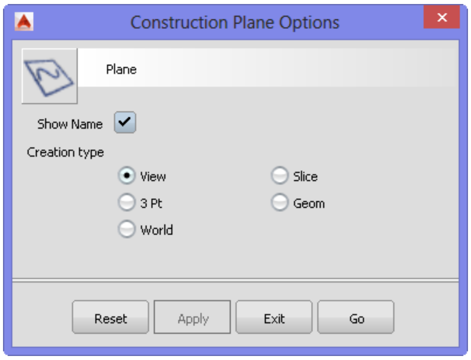


Figure 3-53 *The **Construction Plane Options** dialog box*

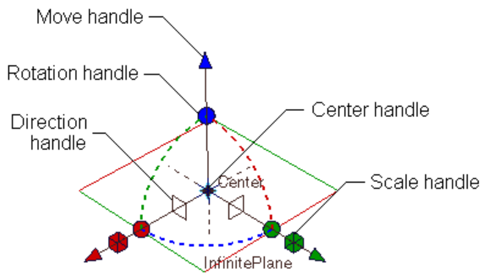


Figure 3-54 *Different handles of a plane manipulator*

Move handle

The Move handles (arrows) are visible on all three axes. Click and drag these handles to move the plane along their respective axes. You can also enter the translation amount in the promptline.

Scale handle

The Scale handles (cubes) are visible on the two axes that lie on the plane. Click and drag one of the handles to scale the plane along it. You can also enter the scale factors in the promptline. Figure 3-55 shows the construction plane scaled along the X-axis.

Rotation handle

The Rotation handles (spheres) are visible on all the three axes. Click and drag these handles on one of the axes to rotate the plane about it. You can also enter the rotation angles in the promptline to rotate the plane. Figure 3-56 shows the construction plane rotated about X-axis.

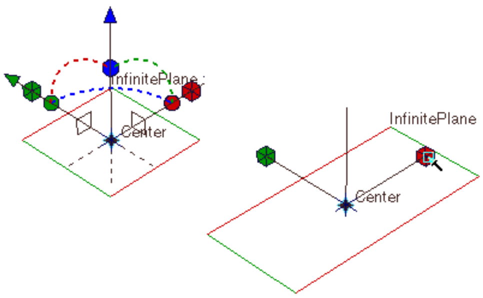


Figure 3-55 Construction plane scaled along the X-axis

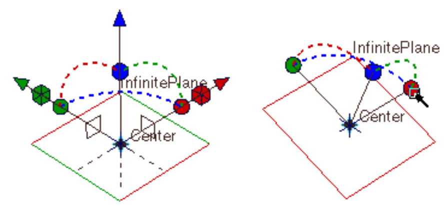


Figure 3-56 Construction plane rotated about the X-axis

Direction handle

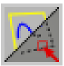
The Direction handles (rectangular boxes) are visible on two axes that lie on the plane. Click one of the handles to flip the direction of the plane. Click on the dotted line that lies opposite to the axis to reflect the plane.

Center handle

The Center handle is used as the pivot point for moving, rotating, scaling, and flipping the plane. It also acts as the origin of the construction plane. You can drag this handle to change the position of the plane.

Setting the Construction Plane

Palette:	Construction > Set Construction Plane



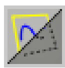
The **Set Construction Plane** tool is used to set the reference plane as the construction plane. To do so, choose the **Set Construction Plane** tool from the **Construction** tab in the **Palette**; you will be prompted to select a construction plane. Select a plane to set it as the construction plane. At a time, only one plane can be set as the construction plane; the rest of the planes will act as the reference planes. You can set any of the reference planes as the construction plane by using this tool. Note that when you set a reference plane as the construction plane, the axis triad changes accordingly. Also, the name of the construction plane will be displayed at the lower left corner of all view windows in the interface.

Note

*The **Plane** tool allows you to set the reference plane as the construction plane without using the **Set Construction Plane** tool. To do so, choose the **Set Construction Plane** tool that is displayed when you specify the center point or the geometry position of the plane while using the **Plane** tool.*

Toggling between the Planes

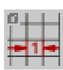
Palette: Construction > Toggle Construction Plane



You can toggle between the reference plane that is set as the construction plane and the plane defined by world space (XYZ) axes by using the **Toggle Construction Plane** tool. You need to set the reference plane as the construction plane before using this tool. Toggling between the construction planes changes the axis triad accordingly.

Presetting the Grid

Palette: Construction > Grid Preset



Grid is a network of uniformly spaced lines, superimposed on the screen. It is used as a reference for sketching, placing, snapping objects, and so on. You can turn the grid display on or off by choosing **WindowDisplay > Toggles > Grid** from the menu bar. Alternatively, press SHIFT+CTRL and then right-click; a marking menu will be displayed. Choose **Toggle Grid** from it to turn on/off the grid display. The grid lines are spaced horizontally and vertically with some spacing between them. You can change this spacing by using the **Grid Preset** tool.

To set the parameters of the **Grid Preset** tool, double-click on the **Grid Preset** tool; the **Preset Grid Options** dialog box will be displayed, as shown in Figure 3-57. The options in this dialog box are discussed next.

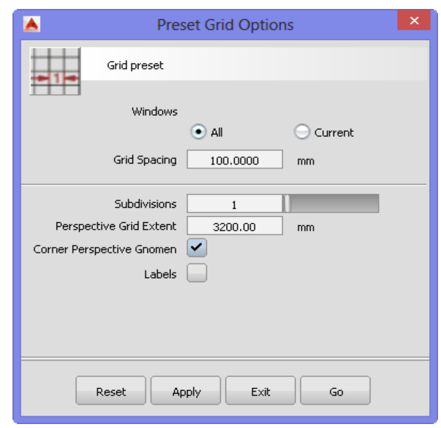


*Figure 3-57 The **Preset Grid Options** dialog box*

Windows

The **Windows** area is used to specify the window in which the grid settings will be changed. The radio buttons in this area are discussed next.

All

This radio button is selected by default and is used to change the grid settings in all windows of the interface screen.

Current

Select this radio button to change the grid settings in the current or active window.

Grid Spacing

This edit box is used to specify the spacing or distance between grid lines in the current linear units. By default, the unit of grid spacing is millimeter. To change the unit spacing of the grid, choose **Preferences > Construction Options** from the menu bar; the **Construction Options** dialog box will be displayed. Next, choose **Units > Linear** from the dialog box to display the options under it. Click on the **mm** button given on the right of the **Main Units**; a drop-down list showing different units will be displayed. Choose the required unit from the drop-down list and then close the **Construction Options** dialog box.

Subdivisions

This edit box is used to specify the number of subdivision lines between the two main grid lines. The subdivision lines appear light and dotted unlike the main grid lines that appear continuous and dark. The subdivision lines are also uniformly spaced with respect to each other. You can also specify the subdivisions by using the slider bar given on the right of the **Subdivisions** edit box. Figure 3-58 shows the main grid lines and subdivision grid lines.

Perspective Grid Extent

The **Perspective Grid Extent** edit box is used to specify the size of the grid in the **Perspective** window in linear units. By default, the grid size of 3200 mm is displayed in the **Perspective Grid Extent** edit box. You can change this value by entering a new value in this edit box. Figure 3-59 shows the **Perspective** window with the perspective grid extent of 1000 units.

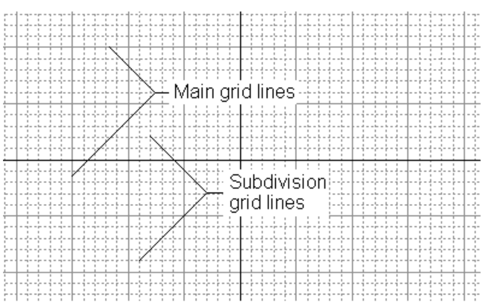


Figure 3-58 *Main grid lines and subdivision grid lines*

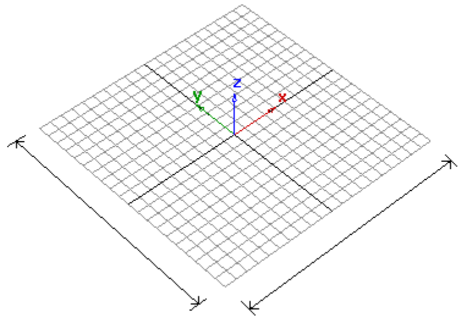


Figure 3-59 *The **Perspective** window with the perspective grid extent of 1000 units*

Note

*When you change the units using the **Construction Options** dialog box, the default values of the respective units also change. If the unit is mm and the default value of the **Perspective Grid Extent** edit box is 3200, then after changing the units to cm, the default value will be 320.*

Corner Perspective Gnomen

Gnomen is an indicator that is placed at the lower left corner of the view window. This is significant as it displays the orientation of three mutually perpendicular colored axes. The **Corner Perspective Gnomen** check box is selected by default and displays the gnomen in the **Perspective** window. Clear this check box to hide the gnomen from the **Perspective** window.

Labels

Select this check box to display the labels on main and subdivision grid lines with their corresponding unit values. These labels appear only in the orthographic windows.

Label Font Properties

This area will be available only when you select the **Labels** check box. The options in this drop-down list is used to specify the size of the font of label. By default, the **Default** option is chosen from this drop-down list. As a result, the labels with the default font properties are displayed, as shown in Figure 3-60. However, you can change the default settings as well. To do so, click on the **Default** option; a drop-down list will be displayed. You can choose the **Custom** option from this drop-down list to change the font size.

Label Font Size

This area will be available only when you choose the **Custom** option from the **Label Font Properties** drop-down list. By default, the **10** option is chosen from this area and is used to display the labels with the font size of 10. Click on the **10** option to display the drop-down list and choose the required label font size from this drop-down list; the label with the chosen label font size will be displayed in the orthographic windows. Figure 3-61 shows the grid label with label font size of 18.

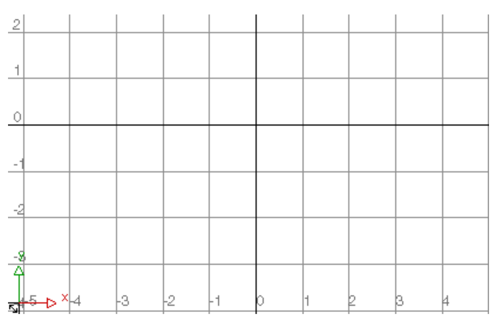


Figure 3-60 Grid label with default label font size

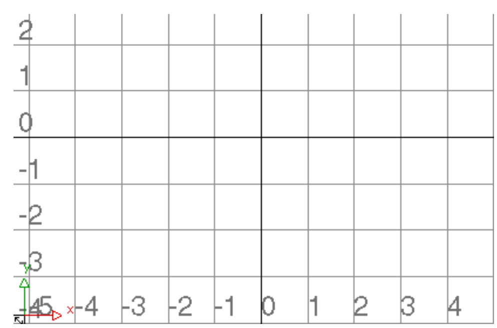


Figure 3-61 Grid label with label font size of 18

WORKING WITH LAYERS

Like other software packages, Alias Design allows you to organize objects. By organizing objects, you can control the selection, display, symmetry, and so on of the objects. These actions can be performed by using the layers that are displayed in the **Layers** bar. By default, a layer named **DefaultLayer** will be displayed in the **Layers** bar. To create a new layer, choose **Layers > New** from the menu bar; a new layer L1 will be displayed in the **Layers** bar. You can rename the layer by double-clicking on the layer and then entering a new name in it. Different operations that can be performed on objects by using layers are discussed next.

Assigning the Objects to Layers

You can assign objects to layers. To do so, select the required objects and keep the left mouse button pressed on the layer in the **Layers** bar; a flyout will be displayed, as shown in Figure 3-62. Choose the **Assign** option from this flyout; the objects will be assigned to the layer.

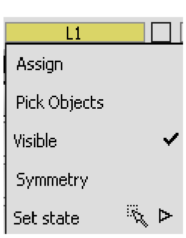


Figure 3-62 The layer flyout

Selecting the Objects

To select objects assigned to a layer, keep the left mouse button pressed on the layer in the **Layers** bar to invoke the flyout associated with the layer.

Next, choose the **Pick Objects** option from the flyout; the objects assigned to the layer will be picked. You can also control the selection of objects in the selected layer by using the options in the **Layers** menu. To select objects in the selected layer, choose **Layers > Select > Objects on Selected Layers** from the menu bar. To pick layers with the selected object assigned to it, choose **Layers > Select > Layers by Picked Objects** from the menu bar. To select all layers in the **Layers** bar, choose **Layers > Select > All Layers** from the menu bar. To select the layer within a range, choose **Layers > Select > Layer Range** from the menu bar and then enter the range in the promptline.

Controlling the Visibility of Objects

You can control the display of objects in the layers. By default, objects assigned to a layer will be visible. To turn off the visibility of objects in a layer, press and hold the left mouse button on the layer; a flyout will be displayed. Choose the **Visible** option from the flyout; the visibility of objects in the layer will be turned off. You can also control the visibility of objects in the selected layer by using the options in the **Layers** menu. To turn on the visibility of objects assigned to a selected layer, choose **Layers > Visibility > Visible** from the menu bar. Similarly, to turn off the visibility of objects assigned to a selected layer, choose **Layers > Visibility > Invisible** from the menu bar. You can also toggle between the visibility states of objects in a layer by clicking the box given on the right of the layer in the **Layers** bar.

Setting the Symmetry of Objects

You can set the symmetry of objects in the layer. By setting the symmetry of objects in the layer, you can display the symmetric (mirror) copy of objects in the view window. By default, the symmetry of objects will be turned off. To set the symmetry of objects in a layer, press and hold the left mouse button on the layer; a flyout will be displayed. Choose the **Symmetry** option from the flyout; the symmetry of objects will be set. You can also set the symmetry of objects in the selected layers with the **Layers** menu. To do so, choose **Layers > Symmetry > On** from the menu bar. To turn off the symmetry of objects in the selected layers, choose **Layers > Symmetry > Off** from the menu bar. To convert the symmetric objects to real geometry, choose **Layers > Symmetry > Create Geometry** from the menu bar.

Deleting the Layers

To delete the selected layers, choose **Layers > Delete > Selected Layers** from the menu bar. To delete the unused layers, choose **Layers > Delete > Unused Layers** from the menu bar. Note that the **Delete** command will delete only the layer, not objects.

Controlling the State of Objects

You can control the state of objects in the selected layers. To set the state of the selected layer to pickable, choose **Layers > Set state > Pickable** from the menu bar. Alternatively, keep the left mouse button pressed on the layer in the **Layers** bar; a flyout will be displayed. Choose **Set state > Pickable** from the flyout. The pickable layer and objects assigned to this layer will be displayed in grey. You can pick an object assigned to the pickable layer. To set the state of the selected layer to reference, choose **Layers > Set state > Reference** from the menu bar. Alternatively, choose **Set state > Reference** from the flyout that is displayed when you keep the left mouse button pressed on the layer in the **Layers** bar. The reference layer and objects assigned to this layer will be displayed in light brown. You can snap to objects assigned to the reference layer without picking them up. To set the state of the selected layer to inactive, choose **Layers > Set state > Inactive** from the menu bar. Alternatively, choose **Set state > Inactive** from the flyout that is displayed when you keep the left mouse button pressed on the layer in the **Layers** bar. The inactive layer and objects assigned to this layer will be displayed in light blue and also objects assigned to the inactive layer will be visible. However, you cannot pick or snap to objects assigned to the inactive layer.

Applying the Colors to Layers

You can apply colors to objects assigned to the selected layers. To do so, press and hold the left mouse button on the square box on the right of the layer; the color chooser flyout with different color swatches will be displayed, as shown in Figure 3-63. Select the required color swatch to apply color to the object. To edit the color of the objects, choose the **Edit** button from this flyout; the **Layer Color** editor will be displayed. Select the required color from this editor to assign the color to the object.

Figure 3-63 *The color chooser flyout*

Toggling between the Visibility States of Layers

You can toggle between the visibility states of layers to turn on/off the visibility state of the entities assigned to them. By default, the visibility state of layers is turned on. To turn the visibility state of layers off, choose **Layers > Toggle Layers** from the menu bar; all layers will be disabled. Also, the visibility of layers will be turned off. To turn the visibility of Layer bar off, choose **Layers > Toggle Layer Bar** from the menu bar; the visibility of all layers will be turned off. However, you can access layers by using the **Object Lister** window that is displayed on choosing **Windows > Object Lister** from the menu bar. You can also toggle between the visibility states of unused layers by choosing **Layers > Toggle Unused Layers** from the menu bar.

CONTROLLING THE DISPLAY OF OBJECTS

You can control the display of control vertices, edit points, hulls, and so on of all or active objects. To do so, choose the **ObjectDisplay** option from the menu bar; a menu will be displayed. Click on the box given on the right of the **Control** option; the **DisplayControl** options box will be displayed, as shown in Figure 3-64. The options in the **DisplayControl** options box are discussed next.

Scope

The options in this drop-down list are used to specify the objects whose display will be affected by using the **DisplayControl** options box. You can control the display of active objects, entire model, new curves, and so on by choosing the respective button from this drop-down list.

Type

This drop-down list will be displayed only when you choose the **New crv** tool from the **Scope** drop-down list. The options in this drop-down list are used to specify the type of curve to be affected by using the **DisplayControl** option box. You can control the display of a free curve, blend curve, or keypoint curve by choosing the corresponding tool.

All

The **All** area is used to automatically turn on or off the check boxes in this area. By default, all check boxes are selected, thereby ensuring that the display of all components of an object is turned on in the view window. Choose the **OFF** button from this area to clear all check boxes automatically such that the display of the corresponding options in the view windows is turned off. You can turn the display of features on or off by selecting or clearing the corresponding check boxes manually.

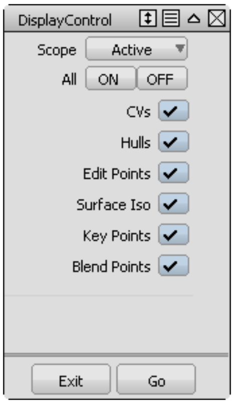


*Figure 3-64 The **DisplayControl** options box*

Exit

Choose this button to close the **DisplayControl** options box.

Go

Choose this button to update changes in the display of objects in the view windows.

CONTROLLING THE VISIBILITY OF OBJECTS

You can turn the visibility off or on of objects in the view windows. The methods to control the visibility of objects are discussed next.

Turning off the Visibility of Objects

To turn off the visibility of objects, select the objects from the view window; the selected objects will be highlighted. Next, choose **ObjectDisplay > Invisible** from the menu bar; the visibility of the selected objects will be turned off. In other words, the objects will be invisible.

Turning on the Visibility of Objects

To turn on the visibility of hidden objects, choose **ObjectDisplay > Visible** from the menu bar; the hidden or invisible objects will be displayed in the view window. You can control the visibility of various features associated with the object. To do so, click on the box on the right of the **Visible** option; the **Visible Options** dialog box will be displayed, as shown in Figure 3-65. By default, the **All** radio button is selected from the **Scope** area of the **Visible Options** dialog box and is used to display all hidden objects in the view window. If you select the **Pick** radio button from the **Scope** area, the visibility of hidden objects selected from the **SBD** (Scene Block Diagram) window will be turned on. This radio button is also used to turn on the visibility of the objects whose name is entered in the promptline.

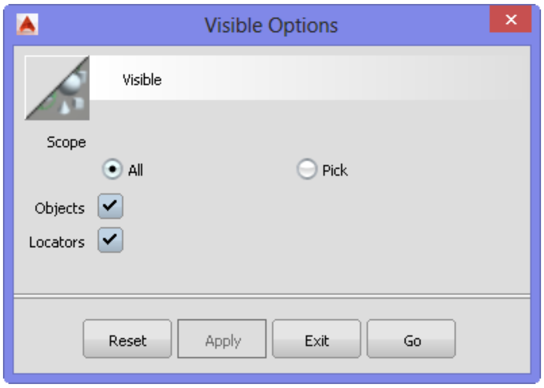


*Figure 3-65 The **Visible Options** dialog box*

Turning Objects into Templates

You can turn an object into template when you do not want them to be disturbed or affected while modifying other objects in the view window. Templates are also used as the reference objects or construction objects. To turn objects into templates, select the required objects from the window; the selected objects will be highlighted. Next, choose **ObjectDisplay > Template** from the menu bar; the objects will be turned into templates. The templates in the inactive state will be displayed in grey color, whereas the selected templates are displayed in pink color.

Changing the Appearance of Data

You can change the appearance of surfaces, curves, and section data. To do so, choose the **ObjectDisplay** option from the menu bar; a menu will be displayed. Click on the box on the right of the **Draw Style** option in the flyout; the **DrawStyle** options box will be displayed, as shown in Figure 3-66. The areas in this option box are discussed next.

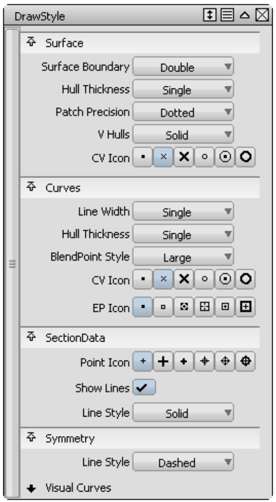


***Figure 3-66** The **DrawStyle** options box*

Surface

The options in this area is used to modify the appearance of features related to a surface. You can change a single surface to appear as double surface and vice versa. You can also change the icons of control vertices of the surface by selecting the corresponding option from the **CV Icon** area.

Curves

The options in this area is used to modify the appearance of features related to a curve. You can change the line width and blend point style of the curve. Also, you can change the icons of control vertices and edit points of the curve by selecting the required options from the corresponding area.

SectionData

The options in this area is used to modify the appearance of the features related to section curves. You can change the line style, section point icon, and so on by selecting the required options from the corresponding areas.

Symmetry

The options in this area is used to specify the appearance of objects that are set to symmetric. To do so, choose **Layers > Symmetry > On** from the menu bar. You can change the symmetric object to dashed or solid object by selecting the corresponding options from the **Line Style** area.

Visual Curves

The options in this area is used to specify the appearance of visual curves that include the curves created by evaluation tools, cross-sections, and so on. These curves do not include geometry curves.

TUTORIALS

Tutorial 1

In this tutorial, you will create the model shown in Figure 3-67. After creating the model, you will shade it to give it a realistic look. **(Expected time: 45 min)**

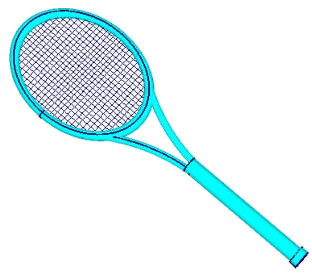


Figure 3-67 *Model for Tutorial 1*

The following steps are required to complete this tutorial:

a. Start Alias and then start a new wire file.
b. Create the base feature of the model by using the **Torus** tool.
c. Scale the base feature non uniformly by using the **Non proportional scale** tool.
d. Create the profile and path curves for the extrude feature by using the **Circle** and **Arc (two point)** tools.
e. Create the extrude feature by using the **Extrude** tool.
f. Copy and rotate the extrude feature by using the **Edit** menu option and the **Rotate** tool, respectively.
g. Create the handle of the model by using the **Extrude** tool.
h. Create the cap of the handle by using the **Cylinder** tool.
i. Create the net by using the **Line** tool.
j. Turn off the display of extrude curves.
k. Shade the model by using **Diagnostic Shading**.
l. Save the model and exit.

Starting a New Wire File

1. Start Autodesk Alias Design 2015 by double-clicking on its icon on the desktop of your system. You need to start a new wire file for creating the model.

2. Choose **File > New** from the menu bar; a new Alias Design file gets started and the **Perspective** window is displayed on the screen.

Creating the Base Feature

The base feature is created by using the **Torus** tool. Before placing a torus in the active window, you need to set the parameters of the torus by using the **New Torus Options** dialog box.

1. Double-click on the **Torus** tool from the **Surfaces** tab in the **Palette**; the **New Torus Options** dialog box is displayed.

2. Enter **2** and **0.15** in the **Major radius** and **Minor radius** edit boxes, respectively and choose the **Go** button; you are prompted to specify the position of the torus.

3. Enter **0** in the promptline; the base feature is created, as shown in Figure 3-68.

Scaling the Base Feature

As the base feature that you have created is not of the required shape and size, you need to scale it by using the transform tools.

1. Choose the **Non-p Scale** tool from the **Transform** tab in the **Palette**; you are prompted to enter the scale factors along the X, Y, and Z-axes.

2. Enter **100, 75, 100** in the promptline and press ENTER; the base surface is scaled, as shown in Figure 3-69. Alternatively, drag the left mouse button downward to scale the base surface non uniformly. In this case, you can scale it arbitrarily.

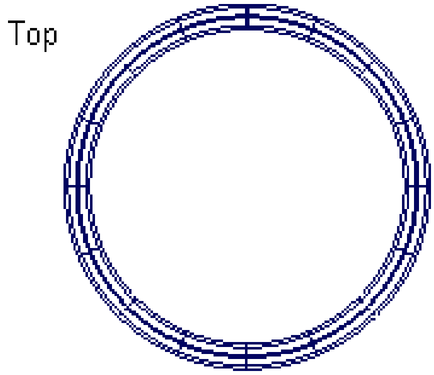


***Figure 3-68** Base feature*

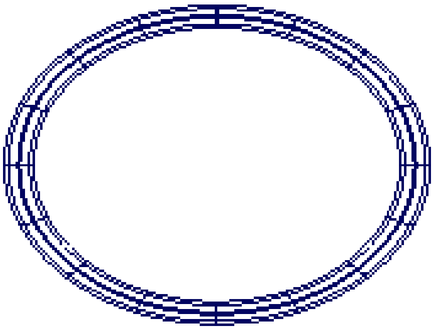
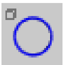


***Figure 3-69** Base feature after scaling non-uniformly*

Creating the Profile and Path Curves for the Extrude Feature

Next, you need to create the profile curve as well as the path curve for the extrude feature at top of the base feature by using the **Circle** and **Arc (two point)** tools.

1. Choose **Layouts > Top** from the menu bar; the **Top** window is expanded.



2. Choose the **Circle** tool from the **Curves** tab in the **Palette**; you are prompted to specify the position of the circle.

3. If the grid display is off, turn on the display of grid by choosing **WindowDisplay > Toggles > Grid** from the menu bar. Alternatively, press SHIFT+CTRL and right-click; a marking menu is displayed. Choose **Toggle Grid** from the marking menu or choose the **Show** button displayed on the title bar of the window; a flyout is displayed. Choose **Grid** from the flyout to toggle the display on or off.

4. Press the ALT key and click at the **Grid**; a circle is created on the plane on which the base feature is placed, as shown in Figure 3-70.

5. Next, choose the **Move** tool from the **Transform** tab in the **Palette**; you are prompted to specify the new position of the circle. Alternatively, you can use the red and green manipulator arrows displayed on the circle to move the circle.

6. Drag the cursor to move the circle to the desired position on the base feature, as shown in Figure 3-71.

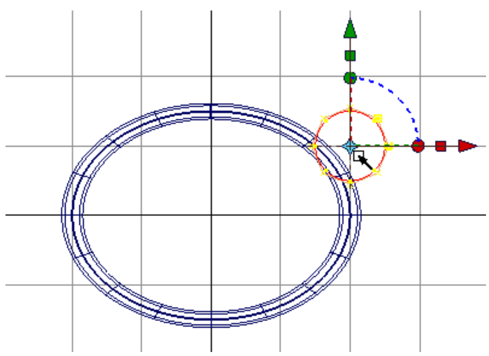


Figure 3-70 Circle created as a generation curve

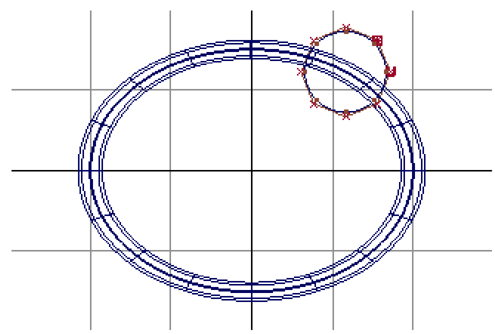


Figure 3-71 Circle moved on the base feature

7. Choose the **Rotate** tool from the **Transform** tab in the **Palette**; you are prompted to enter the rotation angles about the X, Y, and Z axes. Alternatively, click on the red and green manipulator circles displayed on the circle and then rotate it to the desired position.

8. Enter **90, 90, 60** in the promptline and press ENTER; the circle is rotated as specified about the X, Y, and Z axes, as shown in Figure 3-72.

9. Choose the **Scale** tool from the **Transform** tab in the **Palette**; you are prompted to enter the scale factor.

10. Enter **20** in the promptline and press ENTER; the circle is scaled uniformly along the X, Y, and Z axes.

11. Choose **WindowDisplay > Toggles > Grid** from the menu bar; the grid display is turned off. The scaled circle after turning off the grid display is shown in Figure 3-73.

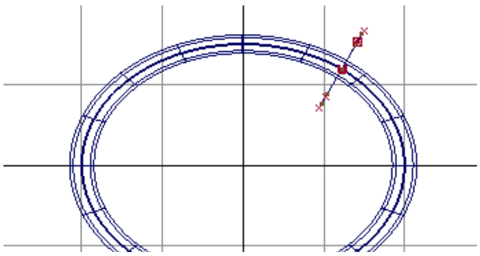


Figure 3-72 Circle rotated

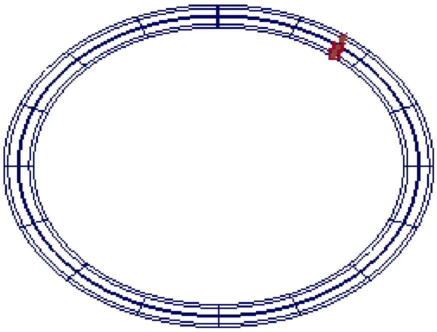


Figure 3-73 Scaled circle after turning off the grid display

12. Next, draw the arc by using the **Arc (two point)** tool from the **Curves** tab in the **Palette**, as shown in Figure 3-74.

Creating the Extrude Feature

The extrude feature can be created by using the circle and the arc as the profile curve and the path curve, respectively.

1. Move the cursor to the currently available Swept Surfaces tool and then press and hold the left mouse button; the Swept Surfaces flyout is displayed.

2. Choose the **Extrude** tool from the flyout; you are prompted to select the curves to extrude.

3. Select the circle from the window; you are prompted to select or deselect curves to undo the selection of the first curve. Also, the **Go** button is displayed at the lower right corner of the window.

4. Choose the **Go** button; you are prompted to select the path curve.

5. Select the arc from the window; the extrude feature is created, as shown in Figure 3-75.

Copying and Rotating the Extrude Feature

Next, you need to copy the extrude feature and then rotate it to place it exactly opposite to the original extrude feature at the bottom of the base surface.

1. Select the extrude feature and then choose **Edit > Copy** from the menu bar to copy the extrude feature.

2. Next, choose **Edit > Paste** from the menu bar; the extrude feature is pasted exactly on the original feature in the window.

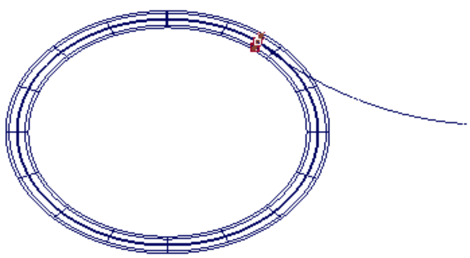


Figure 3-74 *Arc created by using the* ***Arc (two point)*** *tool*

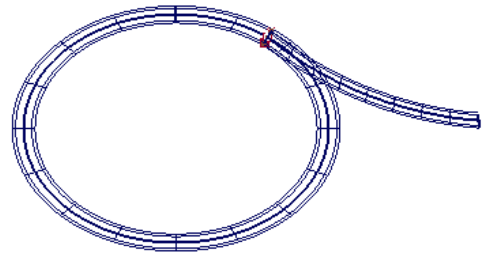


Figure 3-75 *The extrude feature*

3. Choose the **Rotate** tool from the **Transform** tab in the **Palette**; you are prompted to enter the rotation angles about the X, Y, and Z-axes.

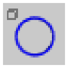
4. Enter **180, 0, 0** in the promptline and press ENTER; the copied feature is rotated about the X, Y, and Z axes, as shown in Figure 3-76.

Creating the Handle of the Model

In this section, you need to create the handle of the model by using the **Extrude** tool.

1. Choose **Layouts > Left** from the menu bar or press the F6 key; the **Left** window is expanded to fill the entire interface screen. Alternatively, choose the **Left** hotspot from the ViewCube.

2. Next, choose the **Circle** tool from the **Curves** tab in the **Palette**; you are prompted to specify the position of the circle.



3. Click near the end of the two extrude surface features at the point where the two extruded surfaces appear to meet; the circle is placed on the specified position, as shown in Figure 3-77.

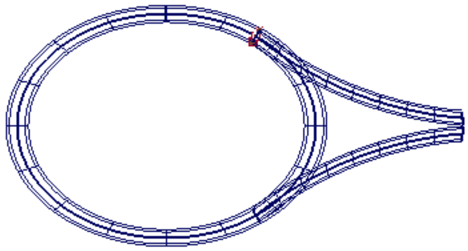


Figure 3-76 *The copied feature after rotation*

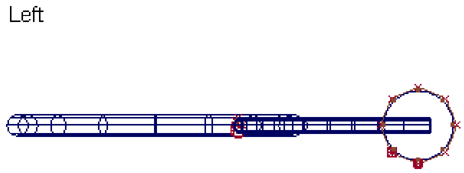


Figure 3-77 *Circle created near the end of the extrude surface features*

4. Choose the **Scale** tool from the **Transform** tab in the **Palette**; you are prompted to enter the scale factor.

5. Enter **40** in the promptline and press ENTER; the sphere is scaled uniformly along the X, Y, and Z axes, as shown in Figure 3-78.

6. Choose the **Rotate** tool from the **Transform** tab in the **Palette**; you are prompted to enter the rotation angles about the X, Y, and Z axes.

7. Enter **0, 0, 90** in the promptline and press ENTER; the circle is rotated about the X, Y, and Z axes accordingly, as shown in Figure 3-79.

8. Choose the **Pick nothing** tool from the **Pick** tab in the **Palette** to exit the **Rotate** tool.

9. Next, choose the **Line** tool from the **Keypoint Curve Toolbox** and create the line, refer to Figure 3-79.

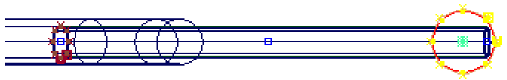


Figure 3-78 *Circle after scaling uniformly*

Figure 3-79 *The rotated circle and the line*

10. Double-click on the **Extrude** tool from the **Surfaces** tab in the **Palette**; the **Extrude Options** dialog box is displayed.

11. Select the **Cap Both** radio button from the **Create Caps** area in the dialog box and then choose the **Go** button; you are prompted to select the curve(s) to extrude.

12. Select the circle from the window; the **Go** button is displayed again at the lower right corner of the active window.

13. Choose the **Go** button; you are prompted to select the extrude path.

14. Select the line; the handle is created, as shown in Figure 3-80.

Creating the Cap of the Handle

The cap of the handle can be created by using the **Cylinder** tool. You can also scale the cap to the required size by using the **Non-p Scale** tool.

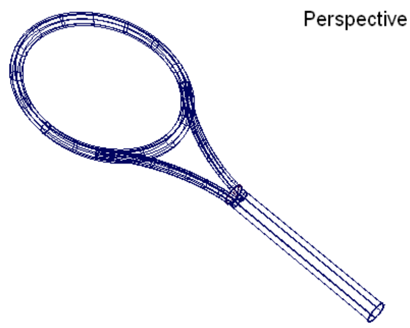
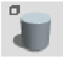


Figure 3-80 *Handle created by extrusion*

1. Choose the **Cylinder** tool from the **Surfaces** tab in the **Palette**; you are prompted to specify the position of the cylinder. 

2. Click at the end of the handle in the **Left** window; a cylinder is created.

3. Choose the **Rotate** tool from the **Transform** tab in the **Palette** and rotate the cylinder along the Z-axis, as shown in Figure 3-81.

4. Choose the **Non proportional scale** tool from the **Transform** tab in the **Palette** and scale the cylinder non-uniformly along the X, Y, and Z axes, as shown in Figure 3-82. 

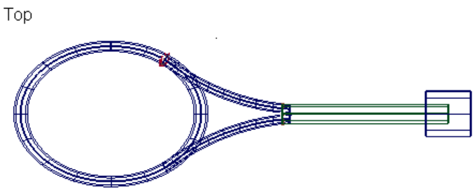


Figure 3-81 *Cylinder created for the cap of the handle*

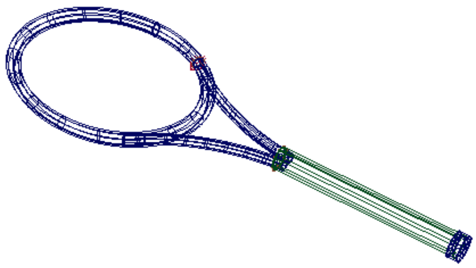
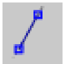


Figure 3-82 *Cap created after scaling the cylinder non-uniformly*

Creating the Net of the Model

Next, you need to create the net of the model by using the **Line** tool. For the creation of the net, you need to create a set of horizontal and vertical lines.

1. Choose **Layouts > Top** from the menu bar; the **Top** window is expanded to fill the entire drawing area.

2. Choose the **Line** tool from the **Keypoint Curve Toolbox** and click on the torus to specify the start point and endpoint of the line, as shown in Figure 3-83. 

3. Choose the **Pick Nothing** tool from the **Pick** tab in the **Palette** to display the line created in the previous step, as shown in Figure 3-84.

4. Create the rest of horizontal lines by pressing the middle mouse button while the **Line** tool is still active.

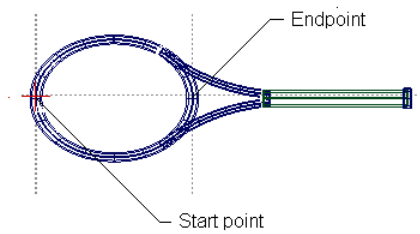


Figure 3-83 *Start point and endpoint of the line*

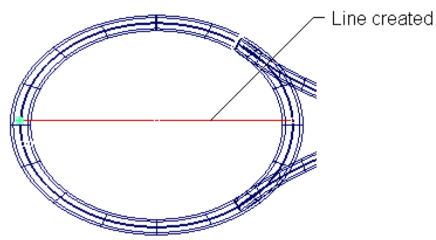


Figure 3-84 *One horizontal line created*

5. Similarly, create vertical lines by pressing the right mouse button while the **Line** tool is still active. The model after creating the net is shown in Figure 3-85.

Note

When you draw lines with the ***Line*** *tool, keypoints are also displayed. You need to turn off the display of these keypoints to suit the background color. The procedure to change the color related to the interface has been discussed in Chapter 1.*

Turning off the Display of Curves Used in the Extrude Feature

For clear display of the model, you need to turn off the display of the curves used in the extrude feature. You can do so by using layers.

1. Choose **Layers > New** from the menu bar; a new layer, L1 is displayed in the **Layers** bar.

2. Double-click on the layer L1; the layer text edit box is displayed.

3. Enter **Extrude Curves** in the layer text edit box and press ENTER; the layer L1 is renamed as **Extrude Curves**.

4. Next, select the profile curve and the extrude path used in the extrude feature; the selected curves get highlighted.

5. Press and hold the left mouse button on the **Extrude Curve** layer; a flyout is displayed.

6. Choose the **Assign** option from the flyout; curves are assigned to the **Extrude Curves** layer.

7. Press and hold the left mouse button to display the flyout again.

8. Choose the **Visible** option from the flyout; the visibility of the curves assigned to the **Extrude Curves** layer is turned off.

Applying the Diagnostic Shading to the Model

The model that you have created is in the wireframe mode. For a better view, you need to shade the model.

1. Choose **ObjectDisplay > Diagnostic Shading** from the menu bar; the **Diagnostic Shade** dialog box is displayed.

2. Choose the **User Defined Texture Diagnotic Shader** tool from the **Diagnostic Shade** dialog box; the model gets shaded, as shown in Figure 3-86. 

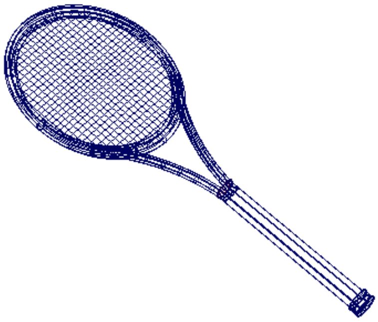


Figure 3-85 *Model after creating the net*

Figure 3-86 *Model after diagnostic shading*

Saving the File

To save the above model, you need to create a new project directory, *c03_tutorials*. The new directory helps you store all files efficiently.

1. Choose **File > Save** from the menu bar; the **Save As** dialog box is displayed. You can also invoke this dialog box by pressing the ALT+S keys.

2. Choose the down arrow next to the **Go To** field and select the **Current Home** option from the drop-down list; the *aliasdesign_2015* directory is displayed.

3. Choose the **New Project** button; a folder will be created with the name **new_project**. Rename it to *c03_tutorials.*

4. Next, select the *c03_tutorials* folder and choose **Set Current.**

5. Enter *c03_tut01* in the **File name** edit box of the **Save As** dialog box.

6. Choose the **Save** button; the file is saved as *c03_tut01.wire*.

The location of this file is given below:

/aliasdesign_2015\c03_tutorials\wire\c03_tut01.wire

7. Choose **File > Exit** from the menu bar; the **confirm** message box is displayed.

8. Choose the **Don't Save** button to exit the application.

Tutorial 2

In this tutorial, you will create the model shown in Figure 3-87. Figure 3-88 shows the model in the **Left** window. After creating the model, you will shade it to give it a realistic look.

(Expected time: 1 hr 30 min)

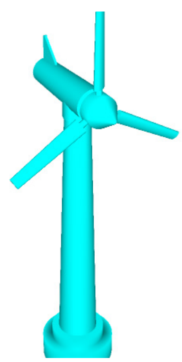


Figure 3-87 *Model for Tutorial 2*

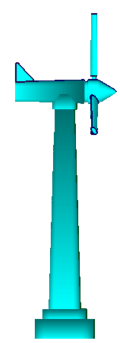


Figure 3-88 *View of the model in the* ***Left*** *window*

The following steps are required to complete this tutorial:

a. Start a new wire file.
b. Create the base feature of the model by using the **Revolve** tool.
c. Create the central part of the model by using the **Skin** tool.
d. Turn off the visibility of the curves used in the base feature and central part.
e. Create the blade joint by using the **Cylinder** tool.
f. Create the blade of the model by using the **Skin Surface** tool.
g. Close the ends of the blade by using the **Set Planar** tool.
h. Group the blade joint with the closed-end blade by using the **Edit** menu.
i. Copy and rotate the above grouped parts by using the **Edit** menu and the **Rotate** tool, respectively.
j. Create the tail piece by using the **Skin** tool.
k. Close the ends of the tail piece by using the **Set Planar** tool.
l. Shade the model by using the **Diagnostic Shading**.
m. Save the model and exit.

Starting a New Wire File

1. Start Autodesk Alias Design 2015 by double-clicking on its icon on the desktop of your system. You need to start a new wire file for creating the model.

2. Choose **File > New** from the menu bar; a new Alias Design wire file gets started and perspective window is displayed on the screen.

Creating the Base Feature

The base feature of the model is created by using the **Revolve** tool. First, create the sketch of the required profile by using the **Polyline** tool and then revolve the same profile.

1. Choose **Layouts > Left** from the menu bar; the **Left** window expands to fill the entire interface screen.

2. Choose **WindowDisplay > Toggles > Grid** from the menu bar to turn on the grid display, if grids are not displayed already.

3. Press and hold the left mouse button on the **Line** button in the **Keypoint Curve Toolbox**; a flyout is displayed.

4. Choose the **Polyline** tool from the flyout and create the profile, as shown in Figure 3-89. You can use the **Snap to Grid** option to create the profile easily.

5. Double-click on the **Revolve** tool in the **Surfaces** tab of the **Palette**; the **Revolve Control** dialog box is displayed.

6. Select the **Z** radio button and **Global** option of the **Axes** drop-down list from the **Axis Options** area and then select the polyline; the base feature is created, as shown in Figure 3-90.

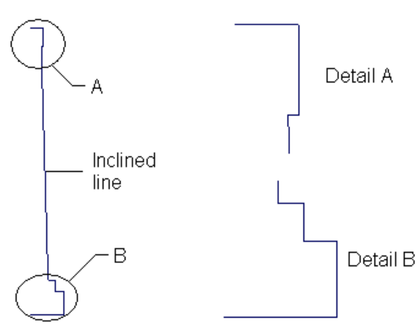


Figure 3-89 *Profile of the base feature*

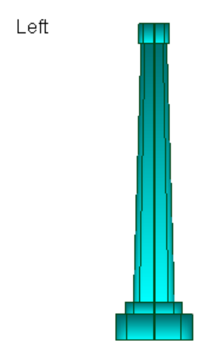


Figure 3-90 *Base feature of the model*

7. Choose the **Next** button to complete the revolved base feature and exit the dialog box.

Note

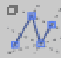
1. The endpoints of profiles need to lie on the Z-axis. Keeping the endpoints of profiles on Z-axis allows you to create the closed revolve feature. Also, the lower endpoint of the profile needs to be at the origin.

2. In Figures 3-89 and 3-90, the grid display has been turned off for clarity of the features.

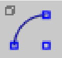
Creating the Central Part

After creating the base feature, you need to create the central part of the model by using the **Revolve** tool.

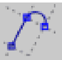
1. Choose the **Polyline** tool from the **Keypoint Curve Toolbox** and create a polyline, as shown in Figure 3-91.



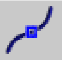
2. Choose the **Arc (two point)** tool from the **Keypoint Curve Toolbox** and create an arc, refer to Figure 3-91. Make sure that the start point of the arc snaps to the endpoint of the polyline.



3. Next, choose the **Line-arc** tool from the **Keypoint Curve Toolbox** and create a linearc, refer to Figure 3-91. Make sure that the start point of the line-arc snaps to the endpoint of the arc.



4. Choose **Break Curve at Keypoint > Join curves** from the **Keypoint Curve Toolbox**; you are prompted to select keypoints.



5. Click at a position in the active window where the keypoints of the polyline and the arc coincide; the curves are attached. Similarly, attach the linearc with the two point arc.

6. Next, choose the **Set Pivot** tool from the **Transform** tab in the **Palette**; you are prompted to specify the new position of the pivot point.

7. Drag the pivot point to the desired location, as shown in Figure 3-91.

8. Double-click on the **Revolve** tool from the **Surfaces** tab in the **Palette**; the **Revolve Control** dialog box is displayed.

9. Select the **X** and **Local** radio buttons from the **Axis Options** area and then select the joined curves; the central part of the model is created, as shown in Figure 3-92.

10. Choose the **Next** button to complete the revolved base feature and exit the dialog box.

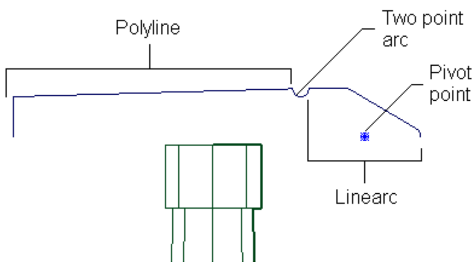


Figure 3-91 *Profile of the central part*

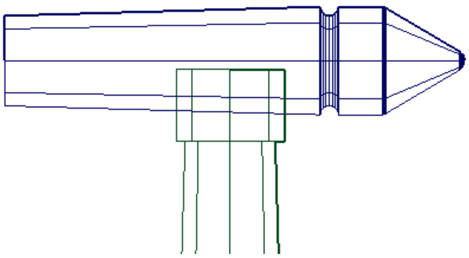


Figure 3-92 *Central part*

Turning the Display of Curves off

For clear display of the model, you need to turn off the display of the curves that were used to create the base feature and the central part. You can do so by using layers.

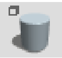
1. Choose **Layers > New** from the menu bar; a new layer L1 is displayed in the **Layers** bar.
2. Double-click on the layer L1; the layer text edit box is displayed.
3. Enter **Base Feature Curve** in the layer text edit box and press ENTER; the layer L1 is renamed to **Base Feature Curve**.
4. Next, select the profile curve used in the base feature; the selected curve is highlighted.
5. Press and hold the left mouse button on the **Base Feature Curve** layer in the **Layers** bar; the layer flyout is displayed.
6. Choose the **Assign** option from the layer flyout; the curve is assigned to the **Base Feature Curve** layer.
7. Press and hold the left mouse button to display the layer flyout again.
8. Choose the **Visible** option from the layer flyout; the visibility of the curve assigned to the **Base Feature Curve** layer is turned off.
9. Similarly, create a new layer and rename it as **Central Part Curve**. Assign the joined curves (polyline, two point arc, and linearc) to this layer and then turn off its visibility.

Creating the Blade Joint

The blade joint is created on top of the central part by using the **Cylinder** tool.

1. Choose **Layouts > Top** from the menu bar; the **Top** window is expanded to fill the entire drawing area.

2. Choose the **Cylinder** tool from the **Surfaces** tab in the **Palette**; you are prompted to specify the position of the cylinder.



3. Click in the **Top** window to specify the position of the cylinder; you will notice that the cylinder is created at the base feature in the **Perspective** window.

4. Use the manipulator in the **Left** window to position the cylinder at the required position.

5. Choose the **Scale** tool from the **Transform** tab in the **Palette**; you are prompted to enter the scale factor.

6. Enter **40** or a suitable value in the promptline and press ENTER; the blade joint is scaled to the specified scale, as shown in Figure 3-93. Figure 3-94 shows the scaled blade joint in the **Perspective** window.

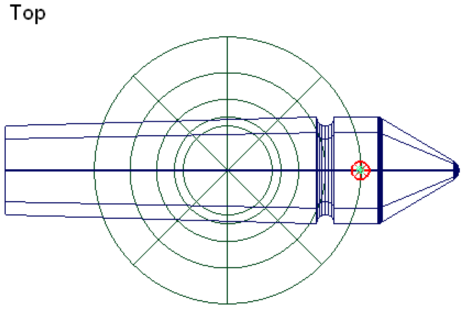


Figure 3-93 *Blade joint after scaling*

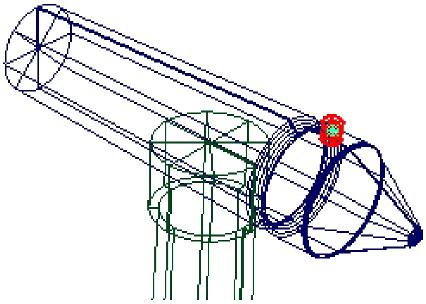


Figure 3-94 *Blade joint displayed in the* ***Perspective*** *window*

Creating the Blade

Blades are created by using the **Skin surface** tool. You need to create two closed curves for the skin surface.

1. Choose the **Ellipse** tool from the **Keypoint Curve Toolbox**; you are prompted to specify the position of the ellipse.

2. Click in the window to specify the position of the first ellipse.

3. Create another ellipse in line with the first ellipse, as shown in Figure 3-95. Figure 3-96 shows two ellipses in the **Top** window.

4. Next, choose the **Skin surface** tool from the **Surfaces** tab in the **Palette**; you are prompted to select the first curve.

5. Select the first ellipse; you are prompted to select the next curve.

6. Select the second ellipse; the skin surface is created, as shown in Figure 3-97.

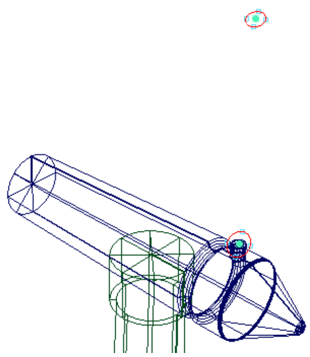


Figure 3-95 Two ellipses created in line with each other

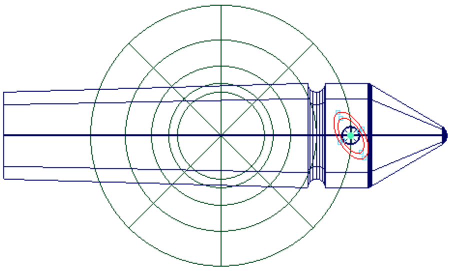


*Figure 3-96 Ellipses displayed in the **Top** window*

Closing the Ends of the Blade

The ends of the blade can be closed by using the **Set planar** tool.

1. Choose the **Set planar** tool from the **Surfaces** tab in the **Palette**; you are prompted to select the curve.

2. Select the top and bottom edges of the skin surface (or two ellipses) and then choose the **Go** button; the planar surfaces are created, as shown in Figure 3-98.

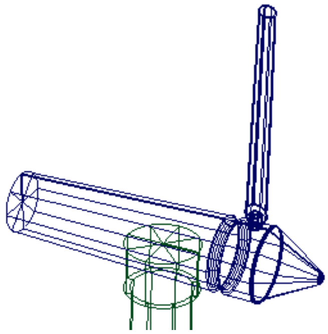


Figure 3-97 Skin surface

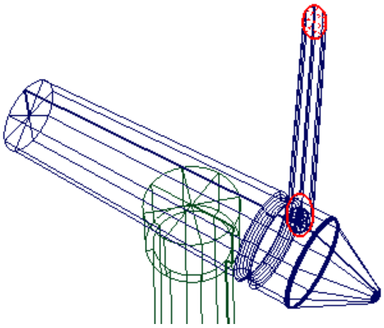


Figure 3-98 Planar surfaces created at the top and bottom of the blade

Grouping the Blade, Blade Joint, and Planar Surfaces

Now, you need to group the blade joint, blade, and its lower and upper planar surfaces.

1. Select the blade joint, blade, and the lower and upper planar surfaces of the blade; the selected entities are highlighted.

2. Choose **Edit > Group** from the menu bar; the selected entities are grouped.

Note

*If the pivot point of the grouped entities is not located at the center of the central part feature, you need to place it at the center by using the **Set pivot** tool.*

Creating the other Instances of the Grouped Entities

After grouping the above-mentioned entities, you need to create two more instances of grouped entities.

1. Select the group created, if not selected already. Next, choose **Edit > Copy** and then **Edit > Paste** from the menu bar; the grouped entities are copied and placed exactly at the original grouped feature.

2. Next, choose the **Rotate** tool from the **Transform** tab in the **Palette**; you are prompted to enter the rotation angles about the X, Y, and Z axes.

3. Enter **120**, **0**, **0** in the promptline and press ENTER; the grouped entities are rotated, as specified, about the X, Y, and Z axes.

4. Similarly, create the third instance of the grouped entities, as shown in Figure 3-99.

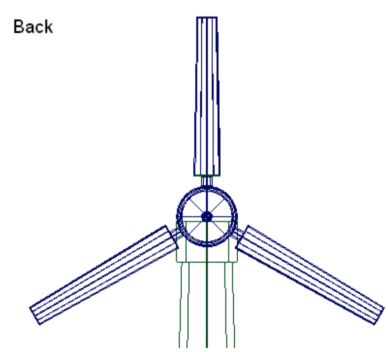


Figure 3-99 *Model after creating all instances of grouped entities*

Creating the Tail Piece

The tail piece is created by using the **Skin surface** tool. You need to create two curves for creating a skin surface.

1. Choose the **Line-arc** tool from the **Keypoint Curve Toolbox** and create the profile. Note that you need to create the profile at an offset of 10 units or a suitable value from the center of the central part of the model, as shown in Figure 3-100. 

2. Choose **Edit > Copy** and then **Edit > Paste** from the menu bar; the linearc profile is copied and placed exactly on the original curve.

3. Next, choose the **Move** tool from the **Transform** tab in the **Palette** and then move the linearc to a new position, as shown in Figure 3-101.

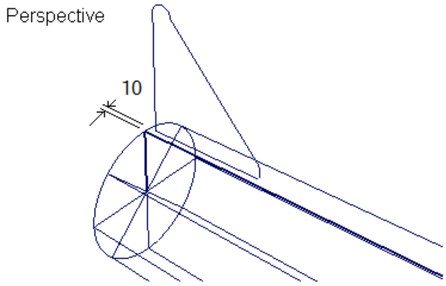


Figure 3-100 Profile of the tail piece

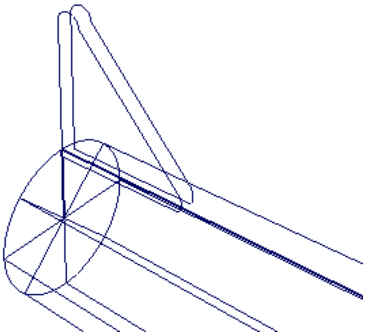


Figure 3-101 Copied profile moved to a new position

4. Choose the **Skin surface** tool from the **Surfaces** tab in the **Palette**; you are prompted to select the first curve.

5. Select the first linearc profile; you are prompted to select the next curve.

6. Select the copied linearc profile; the skin surface is created, as shown in Figure 3-102.

Closing the Front and Back Faces of the Tail Piece

You can close the front and back faces of the tail piece by using the **Set planar** tool.

1. Choose the **Set planar** tool from the **Surfaces** tab in the **Palette**; you are prompted to select the curve.

2. Select both the edges of the skin surface and choose the **Go** button; the two planar surfaces are created, refer to Figure 3-103. Figure 3-104 shows the complete model.

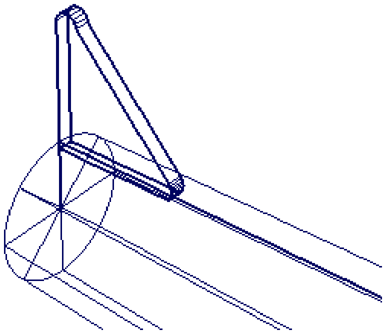


Figure 3-102 Skin surface

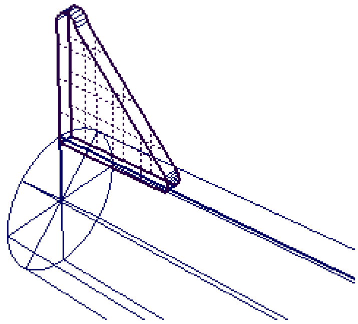


Figure 3-103 Planar surfaces created on the front and back faces

Applying the Diagnostic Shading to the Model

The model that you have created is in the wireframe mode. For a better view, you need to shade the model.

1. Choose **ObjectDisplay > Diagnostic Shading** from the menu bar; the **Diagnostic Shade** dialog box is displayed.

2. Choose the **User Defined Texture Diagnostic Shader** tool from the **Diagnostic Shade** dialog box; the model is shaded, as shown in Figure 3-105. You can choose the rest of the buttons in this area to get other shades.

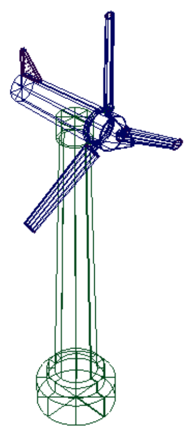


Figure 3-104 *Complete model*

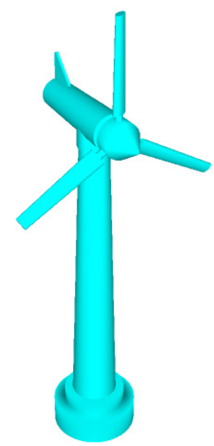


Figure 3-105 *Model after shading*

Note

1. After shading the model, select the complete model from the active window and clear the ***Isoparm U*** *and* ***V*** *check boxes from the* ***Display*** *area of the* ***Control Panel****. It will hide the isoparametric U and V curves, thus giving a more realistic view to the model.*

2. You can turn off the visibility of the curves used for creating blades and tail piece by using layers, as discussed earlier in this tutorial.

Saving the File

You need to save the created model in the *c03_tutorials* folder with the name *c03_tut02*. As you have already created the *c03_tutorials* folder in Tutorial 1 and set it as the current project, you need not create a new folder.

1. Choose **File > Save as** from the menu bar; the **Save As** dialog box is invoked. You can also invoke this dialog box by pressing the ALT+S keys.

2. Enter **c03_tut02** in the **File name** edit box and then choose the **Save** button; the file is saved as *c03_tut02.wire*.

The location of this file is given below:

\aliasdesign_ 2015\c03_tutorials\wire\c03_tut02.wire

3. Choose **File > Exit** from the menu bar; the **confirm** message box is displayed.

4. Choose the **Don't Save** button to exit the application.

Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. In the **Axis Options** area of the **Revolve Control** dialog box, the **X** radio button is selected by default. (T/F)

2. The **Create Caps** area is used with open generation curves. (T/F)

3. For creating a skin surface, you need at least two curves. (T/F)

4. The **Set Planar** tool is used to create a trimmed surface. (T/F)

5. Alias Design allows you to cut, copy, and paste objects. (T/F)

6. Press the __________ keys to copy an object or a component.

7. The __________ command is used to repeat the last executed command.

8. In case of uniform knot spacing, the __________ of the assigned texture appears to fit evenly between the isoparametric curves.

9. Selecting the __________ radio button in the **Layers options** area of the **Paste Options** dialog box allows you to specify the layer where the objects are pasted.

10. While pasting an object using the **duplicate layers** option from the **Paste options** menu, a duplicate layer named __________ will be created, in case the existing layer is named as **Line**.

Review Questions

Answer the following questions:

1. Which of the following degrees is displayed by default in the **Degree** edit box of the **Revolve Control** dialog box?

   (a) **1** (b) **2**
   (c) **5** (d) **7**

2. How many additional isoparametric curves are created on a surface if you enter **3** in the **Number of Spans** edit box in the **Skinning Options** dialog box?

   (a) 1 (b) 2
   (c) 3 (d) 4

3. Which of the following keys is pressed to create a single skin surface from a set of curves?

   (a) SHIFT (b) ALT
   (c) CTRL (d) TAB

4. In the **Revolve Control** dialog box, the **Global** radio button is selected by default in the **Axis Options** area. (T/F)

5. In the **Extrude Options** dialog box, the **Extrude pivot** area is displayed only when the **Tube** radio button is selected from the **Style** area. (T/F)

6. A curve of constant U or constant V parameter is known as isoparametric curve. (T/F)

7. The __________ edit box in the **Preset Grid Options** dialog box is used to specify the number of subdivision lines between two main grid lines.

8. The __________ area is used to specify the condition at the ends of the extruded surface.

9. The **Set planar** tool works only on the profiles that form a __________ loop.

10. You can reverse the effect of the previous command by choosing __________ from the menu bar.

Exercises

Exercise 1

Create the model, as shown in Figure 3-106. After creating the model, you will shade it to give it a realistic look. **(Expected time: 30 min)**

Hint

1. Create the chair padding (legs) by using the **Extrude** tool.
2. Choose the **Circle** tool from the **Curves** tab to create the profile curve.
3. After creating the generation curve, create the path curve by using the **Line-arc** tool.
4. Specify the position of different segments of the linearc by entering coordinates in the promptline.
5. Extrude the circle along the path curve to create the chair padding.
6. Create the seat of the chair by using the **Skin surface** tool.

Exercise 2

Create the model, as shown in Figure 3-107. After creating the model, you will shade it to give it a realistic look. **(Expected time: 45 min)**

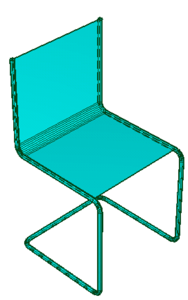


Figure 3-106 *Model for Exercise 1*

Figure 3-107 *Model for Exercise 2*

Answers to Self-Evaluation Test
1. T, **2.** F, **3.** T, **4.** T, **5.** T, **6.** CTRL+C, **7. Reinvoke last**, **8.** stretching, **9. Always ask**, **10.** Line#2