

# Chapter 13

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## Surface Evaluation and Painting

### Learning Objectives

**After completing this chapter, you will be able to:**

- *Evaluate curve and surface continuity.*
- *Create parting lines.*
- *Evaluate minimum and maximum curvatures.*
- *Check models for data transfer.*
- *Evaluate deviations.*
- *Create canvases and draw sketches in Alias Design.*
- *Understand layers and color schemes.*
- *Create, duplicate, and merge layers.*
- *Import and export images.*



## SURFACE EVALUATION

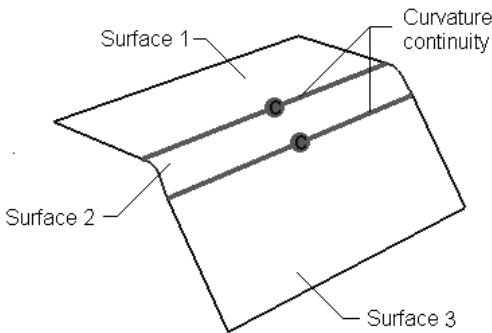
After creating the model, you need to evaluate different properties of the model such as continuity, curvature, contours, and so on. Surface evaluation helps you check all these properties to ensure that the model is fit for data transfer. In other words, it helps you complete the data transfer. Surface evaluation is done by using different tools. These tools are discussed next.

### Evaluating the Continuity of Surfaces

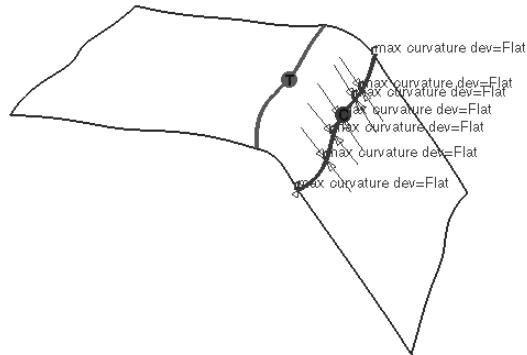
**Palette:** Evaluate > Surface continuity



You can evaluate the continuity of surfaces to check whether the specified continuity has been achieved by the surfaces or not. You can specify the continuity by selecting the required radio button in the **Surface Continuity Evaluation Options** dialog box. To evaluate the continuity between surfaces, choose the **Surface continuity** button from the **Evaluate** tab in the **Palette** and select the common edge between two surfaces; the specified continuity will be displayed, as shown in Figure 13-1. If the surface has achieved the specified continuity, it will be displayed at the common edge between surfaces, refer to Figure 13-1. Otherwise, the deviation between the two surfaces will be displayed at the common edge, as shown in Figure 13-2.



**Figure 13-1** Curvature continuities between surfaces



**Figure 13-2** Deviations between surfaces

You can use different mouse buttons to view the deviation comb, adjust its sampling, or view information about the continuity such as gap between surfaces, radius of curvature, angle between normals, and so on. To view the deviation comb, click on the continuity with the middle mouse button; the deviation comb will be displayed, as shown in Figure 13-3. To hide the curvature comb, select it again using the middle mouse button. To scale the deviation comb, drag it using the left mouse button. To change the sampling density, drag the middle mouse button. Click on the continuity achieved using the right mouse button; the information window will be displayed, as shown in Figure 13-4.

To set the parameters of the **Surface continuity** tool, double-click on the **Surface continuity** button; the **Surface Continuity Options** dialog box will be displayed, as shown in Figure 13-5.

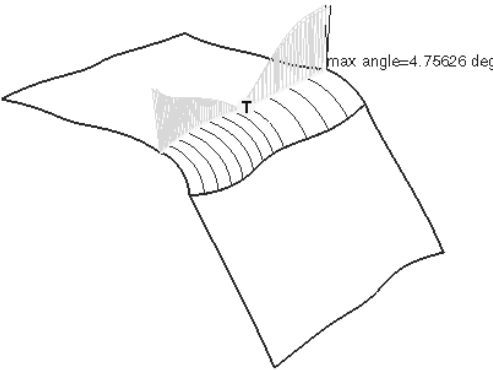


Figure 13-3 Deviation comb on the edge

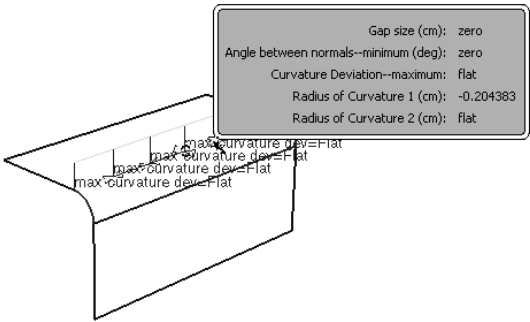


Figure 13-4 Information window of the achieved continuity

The options in this dialog box are discussed next.

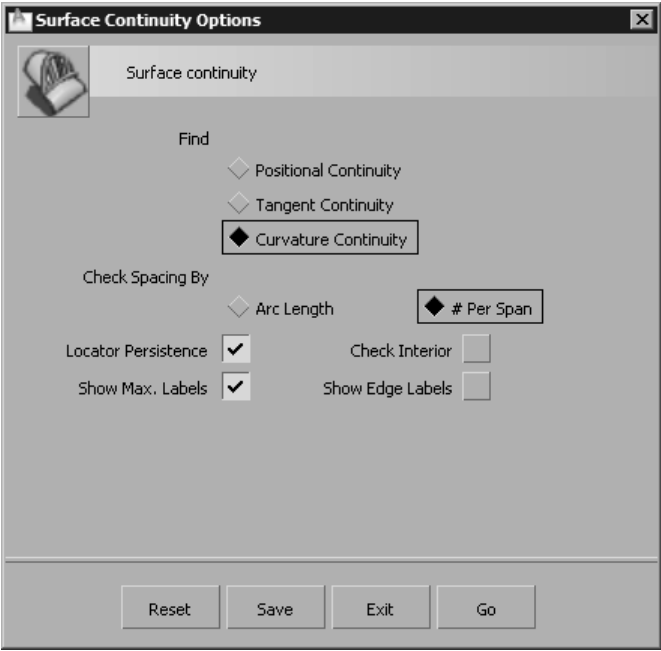


Figure 13-5 The Surface Continuity Options dialog box

## Find

The **Find** area is used to specify the type of continuity to be checked. The radio buttons in this area are discussed next.

### Positional Continuity

Select this radio button to check the gap between the surfaces having positional continuity. The positional continuity is represented by the letter P.

### Tangent Continuity

Select this radio button to check the gap between the surfaces having tangential continuity. The tangential continuity is represented by the letter T.

### Curvature Continuity

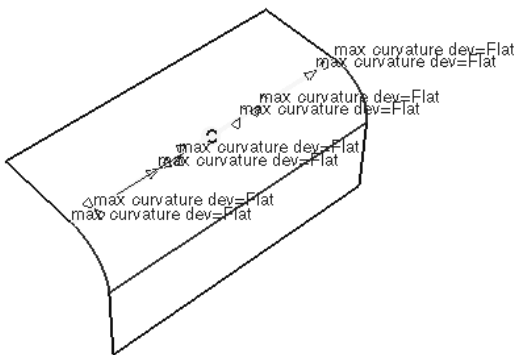
This radio button is selected by default and is used to check the gap between the surfaces having curvature continuity. The curvature continuity is represented by the letter C.

## Check Spacing By

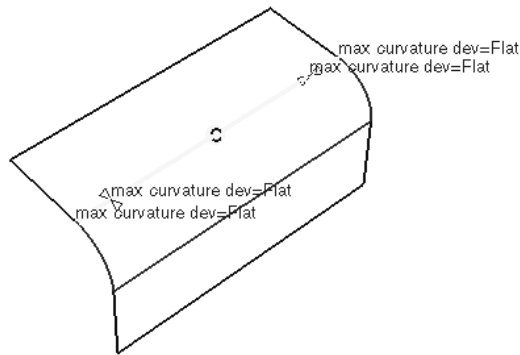
Continuity is evaluated at different points along the surface. The **Check Spacing By** area is used to specify how these points are spaced along the surface. The radio buttons in this area are discussed next.

### Arc Length

Select this radio button to check or evaluate the continuity at equally spaced points along the surface. The spacing between these equally spaced points is specified in the **Distance Between Checks** edit box. Figures 13-6 and 13-7 show the continuity evaluated with the lower and higher spacing values, respectively.



**Figure 13-6** Continuity evaluated with lower spacing value 0.7



**Figure 13-7** Continuity evaluated with higher spacing value 2

### # Per Span

This radio button is selected by default and is used to check or evaluate the continuity in each span at certain points. These points are spaced based on the value specified in the **Curve Fit Checkpoints** edit box of the **Construction Options** dialog box. This edit box will be displayed when you choose **Tolerances > Fitting** from the **Construction Options** dialog box.

### Locator Persistence

This check box is selected by default and is used to keep the locator persistent (permanent) when you exit the **Surface continuity** tool. The effect of the **Locator Persistence** check box can be viewed only when you select the surface edges explicitly. If you select whole model by dragging a pick box around it and then choose the **Surface continuity** tool, the locators will not be persistent.

### Show Max. Labels

This check box is selected by default and is used to display the points that have maximum positional, tangential, or curvature deviation in the model, if any. These deviations occur due to the discontinuities (gaps or breaks) present at the common edge boundaries/edge of the surfaces.

### Check Interior

Select this check box to evaluate and display the continuity along the multiple-knot isoparametric curves in the interior of the surfaces.

### Show Edge Labels

Select this check box to display the symbols (P, C, and T) along the edges to indicate discontinuities along the edges. The blue symbols indicate the regions having minimum discontinuities; the red symbols indicate the regions with maximum discontinuities; and the green symbols indicate the regions with average discontinuities. If you evaluate surfaces with this check box cleared, only continuity indicator will be displayed on the edge.

### Show Comb

This check box will be available only when you select the **Show Edge Labels** check box. Select the **Show Comb** check box to display the comb lines for discontinuities such as gaps or tangent and curvature breaks. On selecting this check box, the **Auto Scale** check box will be displayed. By default, the **Auto Scale** check box is selected. As a result, the deviation comb is scaled automatically in proportion to the size of the object.

### Scale

The **Scale** edit boxes will be displayed only when you clear the **Auto Scale** check box. These edit boxes are used to manually specify the scale of the deviation comb.

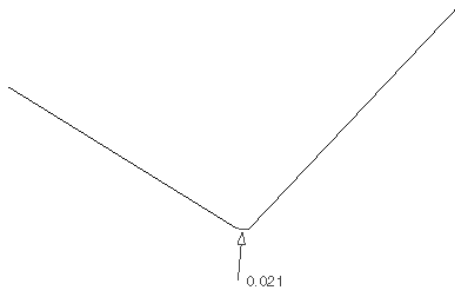
## Evaluating the Continuity of Curves

**Palette:** Evaluate > Surface continuity > Curve continuity

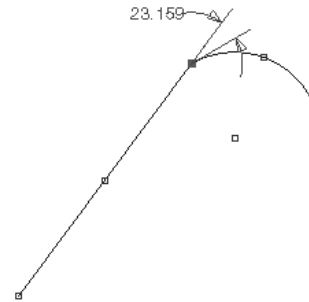


You can check the continuity between two curves by using the **Curve continuity** tool. To check the type of continuity between the curves, choose the **Curve continuity** button from the **Evaluate** tab in the **Palette**; you will be prompted to select the intersection point between the curves. Select the common endpoint of any two or more lines; AliasStudio will evaluate the continuity in the form of lines. If the distance between the endpoints of the two lines is greater than the value specified in the **Maximum Gap Distance** edit box of the **Continuity** area in the **Construction Options** dialog box, a line will be drawn between the two endpoints with the distance displayed on it, as shown in Figure 13-8. If the curves are not

tangent continuous, then tangent lines will be drawn for each curve and the angle between them will also be displayed, as shown in Figure 13-9.

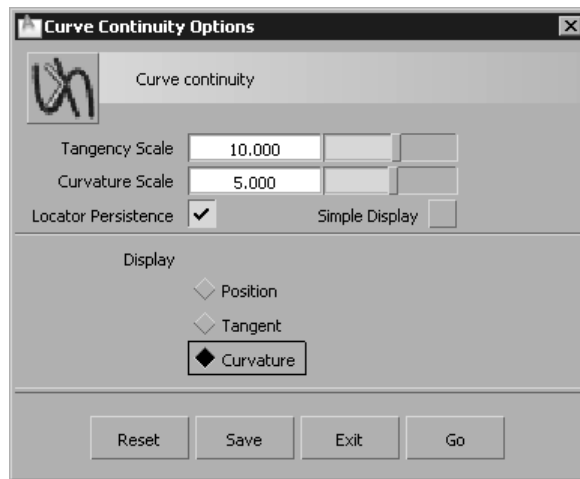


**Figure 13-8** Distance between the endpoints



**Figure 13-9** Angle between the two tangents of curves

To set the parameters of the **Curve continuity** tool, double-click on the **Curve continuity** button; the **Curve Continuity Options** dialog box will be displayed, as shown in Figure 13-10.



**Figure 13-10** The **Curve Continuity Options** dialog box

The options in this dialog box are discussed next.

## Tangency Scale

This edit box is used to specify the scale of tangents of the curves. By default, 10 is displayed in this edit box. You can also specify this value by using the slider bar given on the right of this edit box. Alternatively, press the SHIFT key and drag the left mouse button to change the scale of tangents.

## Curvature Scale

This edit box is used to specify the scale of curvature lines of curves. By default, 5 is displayed in this edit box. You can also specify the scale of curvature lines by using the slider bar given on the right of this edit box. Alternatively, press the SHIFT key and then drag the right mouse button to change the curvature scale of the curves. Curvature lines are indicated by pink arrows pointing toward the intersection points of curves.



### Note

*The actual length of tangent/curvature lines is proportional to the product of the angle and the tangent/curvature scale values.*

## Locator Persistence

This check box is selected by default and enables the locator to be persistent (permanent). This implies that the locator will be displayed even after exiting the **Curve continuity** tool.

## Simple Display

Select this check box to display a circle as the locator for continuity status. If curves are continuous, a green circle will be displayed as the locator for continuity. Otherwise, a red circle will be displayed as the locator for continuity. Figure 13-11 shows the tangent continuous curves with the default curve continuity locator and the simple display curve continuity locator.

## Display

This area is used to specify the type of continuity to be evaluated. The radio buttons in this area are discussed next.

### Position

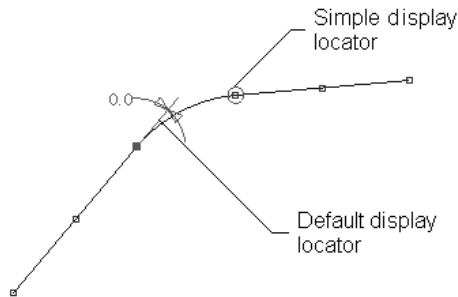
Select this radio button to evaluate positional continuity between curves. If positional continuity is not achieved, a line connecting endpoints will be displayed along with the distance mentioned on it.

### Tangent

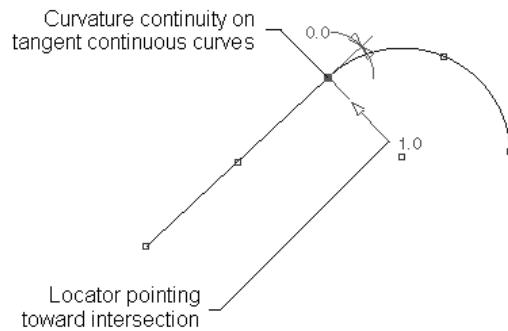
Select this radio button to evaluate tangential continuity between curves. If tangential continuity is not achieved, tangent lines will be drawn on the curves and the angle between them will also be mentioned.

### Curvature

This radio button is selected by default and is used to evaluate curvature continuity between curves. If the tangent continuous curves are selected for evaluating curvature continuity, an extra locator with the deviation value will be displayed. This locator will be pointing toward the intersection point of curves, as shown in Figure 13-12.



**Figure 13-11** Default display and simple display locators displayed on tangent continuous curves



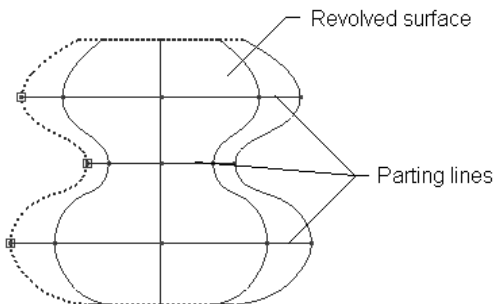
**Figure 13-12** Extra locator displayed at the intersection of curves

## Creating the Parting Lines

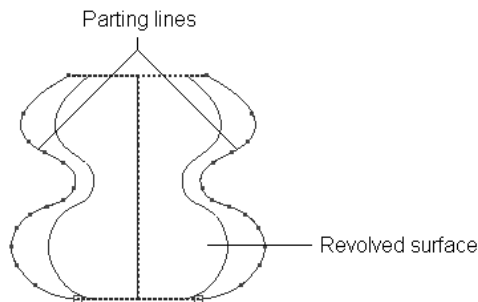
**Palette:** Evaluate > Parting line



While manufacturing a component using injection molding, sometimes the final shape of the object is obstructed. This happens because of two reasons: under-cutting and out-of-draft. Under cutting occurs when the prepared cavity does not allow the core to be taken out. In other words, the cavity locks or retains the core inside it. Out-of-draft occurs when the angle on a part of surface is less than the draft angle. For these reasons, you may not be able to manufacture a component of required specifications by using injection molding. Therefore, you need to create parting lines on the boundaries of these undercut or out-of-draft components. To do so, choose the **Parting line** button from the **Evaluate** tab in the **Palette**; a manipulator will be displayed in the view windows and you will be prompted to select the surface(s) to evaluate. Select the surface(s) from the window and then choose the **Go** button that will be displayed at the lower right corner of the active window; parting lines will be created, as shown in Figure 13-13. You can change the pull direction of the mold by using the manipulator. On changing the pull direction of the manipulator, the curves-on-surface will get updated, as shown in Figure 13-14.



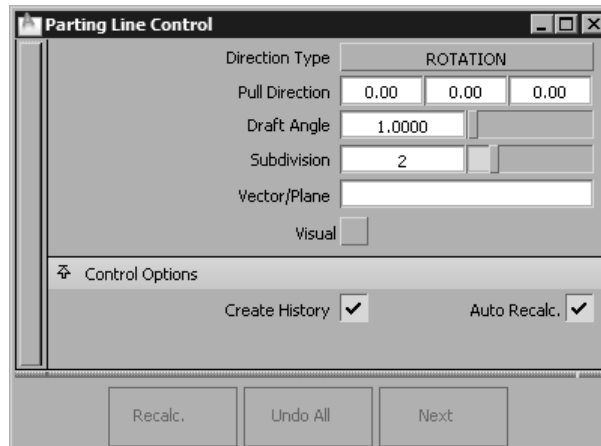
**Figure 13-13** Parting lines created on the revolved surface



**Figure 13-14** Updated parting lines



To set the parameters of the **Parting line** tool, double-click on the **Parting line** button; the **Parting Line Control** dialog box will be displayed, as shown in Figure 13-15.



*Figure 13-15 The Parting Line Control dialog box*

The options in this dialog box are discussed next.

### Direction Type

This area is used to specify the type of direction in which the mold is pulled away. The buttons in this area are discussed next.

#### ROTATION

This button is chosen by default and is used to specify the pull direction by specifying the angles along the three axes.

#### VECTOR

Choose this button to specify the pull direction by selecting a vector from the window or by specifying the position of vector.

### Pull Direction

These edit boxes are used to specify the 3D coordinates that define the direction for pulling the object from its mold. These edit boxes are used to specify the directions in both the direction types, rotation and vector.

### Draft Angle

This edit box is used to specify the draft angle for the object to be pulled out from the mold. You can also specify the draft angle by using the slider bar given on the right of this edit box.

## Subdivision

This edit box is used to increase or decrease the quality of the curve-on-surface that is projected on the surface. The range of the **Subdivision** edit box is 1 to 6. A higher value yields precise results, whereas the lower value yields poor results.

## Vector/Plane

This field is used to enter the name of the vector or plane to which the manipulator will be aligned for specifying the pull direction. You can also select the vector or plane with which the manipulator will be aligned. Even before selecting surfaces, you can select the vector or plane.

## Visual

By default, this check box is cleared and is used to create a curve-on-surface as parting line. Select this check box to create polylines instead of curves-on-surface. These polylines can be used only for display purposes. You can pick these polylines, but you cannot create geometry on them.

## Control Options

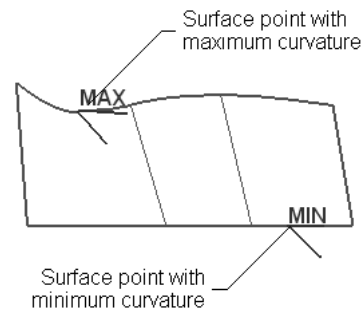
The options in this area have already been discussed in the earlier chapters.

## Evaluating the Min/Max Curvature

**Palette:** Evaluate > Min/max curvature



You can locate the points of maximum and minimum curvature on a surface or a group of surfaces. To do so, choose the **Min/max curvature** button from the **Evaluate** tab in the **Palette**; the points of maximum and minimum curvature will be displayed on the surface, as shown in Figure 13-16. Also, the **Min/Max Curvature** information box will be displayed, as shown in Figure 13-17. This information box displays the detailed information about curvature, radius, and type of surface.



To set the parameters of the **Min/max curvature** tool, double-click on the **Min/max curvature** button; the **Min/Max Curvature Options** dialog box will be displayed, as shown in Figure 13-18.

**Figure 13-16** Points of maximum and minimum curvature

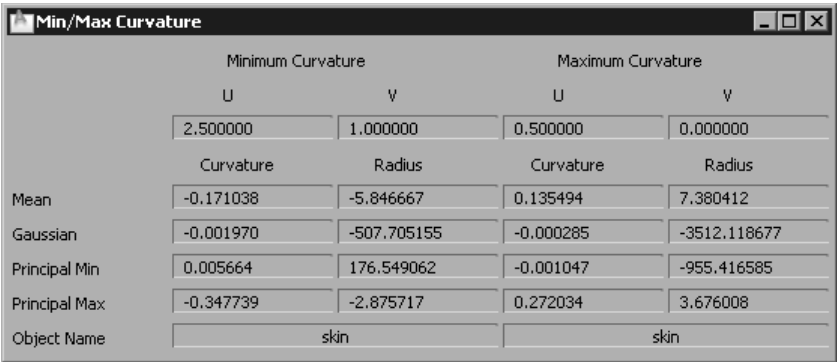


Figure 13-17 The Min/Max Curvature information box

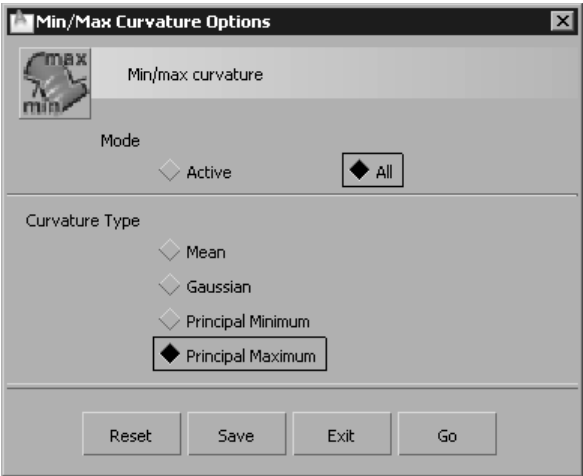


Figure 13-18 The Min/Max Curvature Options dialog box

The options in the **Min/Max Curvature Options** dialog box are discussed next.

**Mode**

This area is used to specify whether curvatures will be evaluated on all objects or active objects only. The radio buttons in this area are discussed next.

**Active**

Select this radio button to evaluate the curvature on the picked/selected objects only.

**All**

This radio button is selected by default and is used to evaluate the minimum and maximum curvatures of all surfaces.

## Curvature Type

This area is used to specify the type of curvature to be evaluated. The radio buttons in this area are discussed next.

### Mean

Select this radio button to evaluate the mean of two principal curvatures at each point.

### Guassian

Select this radio button to evaluate the curvature that will be equal to the product of the two principal curvatures.

### Principal Minimum

Select this radio button to evaluate minimum curvature (curvature on the smoothest curves on surface).

### Principal Maximum

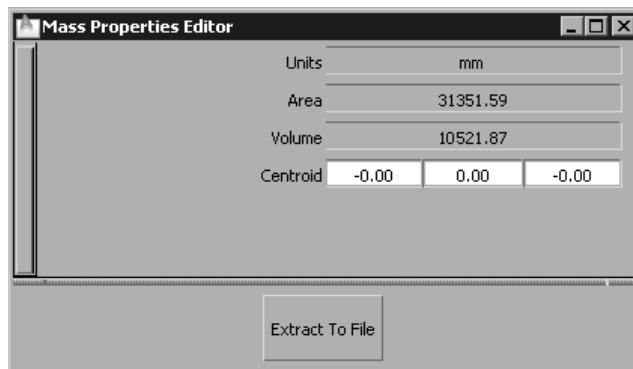
This radio button is selected by default and is used to evaluate maximum curvature (curvature on the steepest curves on surface).

## Evaluating Mass Properties

**Palette:** Evaluate > Mass Properties

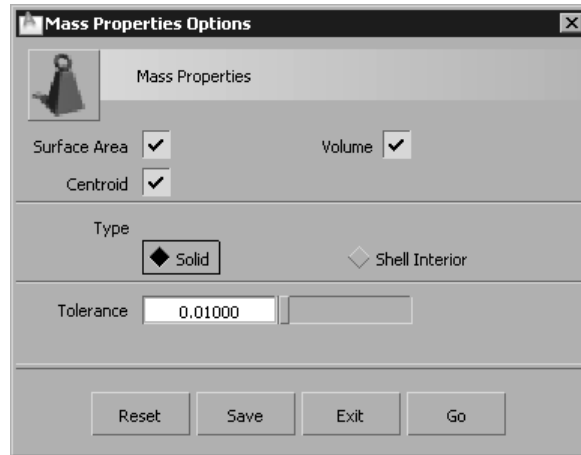


In Alias Design, you can evaluate mass properties such as volume, surface area, and centroid of object (surfaces, shells, or meshes) and then display their values. To evaluate the mass properties of an object, select the object and then choose the **Mass Properties** button from the **Evaluate** tab in the **Palette**; the **Mass Properties Editor** will be displayed. This editor displays the mass properties of the object. Figure 13-19 shows the **Mass Properties Editor** of a sphere located at the origin. Choose the **Extract To File** button given at the bottom of the **Mass Properties Editor** to save these mass properties in a text file.



*Figure 13-19 The Mass Properties Editor*

To set the parameters of the **Mass Properties** tool, double-click on the **Mass Properties** button; the **Mass Properties Options** dialog box will be displayed, as shown in Figure 13-20.



*Figure 13-20 The Mass Properties Options dialog box*

The options in this dialog box are discussed next.

### Surface Area

This check box is selected by default and is used to display the surface area of an object in the **Mass Properties Editor**. If you clear this check box, the surface area of the object will not be displayed.

### Volume

This check box is selected by default and is used to display the volume of the object in the **Mass Properties Editor**. If you clear this check box, the volume of the object will not be displayed.

### Centroid

This check box is selected by default and is used to display the centroid of the object in the **Mass Properties Editor**. If you clear this check box, the centroid of the object will not be displayed.

### Type

The **Type** area is used to describe how the selected surfaces or faces will define the object. The radio buttons in this area are discussed next.

#### Solid

This radio button is selected by default and assumes the picked objects as closed boundary or solid objects. In other words, the mass properties will be evaluated for solid object.

### Shell Interior

Select this radio button to represent the picked object as the thin shell object. The surface that you select will act as the exterior of the shell enclosing the interior hollow space. The thickness of the shell can be specified in the **Thickness** edit box of the **Mass Properties Options** dialog box.

### Tolerance

This edit box is used to specify the maximum distance allowed between the adjacent surfaces to form a closed volume or boundary. By default, this edit box displays 0.01. You can also change this value by using the slider given on the right of this edit box.

### Thickness

The **Thickness** edit box will be available only when you select the **Shell Interior** radio button. This edit box is used to specify the thickness of shell. As a result, the surface area calculated will be the sum of the interior and exterior surface areas of the shell and the volume calculated will be equal to the volume of the shell, instead of the space enclosed by the shell. By default, the value in this edit box is 5.0 and you can change this value by using the slider given on the right of this edit box.



#### Note

*If the volume displayed in the **Mass Properties Editor** is negative, the normals of the surfaces may be pointing inward. In such a case, you need to reverse the orientation of these surfaces by using the **Reverse surface orientation** tool from the **Surface Edit** tab of the **Palette**.*

*Also, the surface whose mass properties need to be calculated must form a closed volume or match the tolerance values set in the **Mass Properties Options** dialog box.*

## Checking Models for Data Transfer

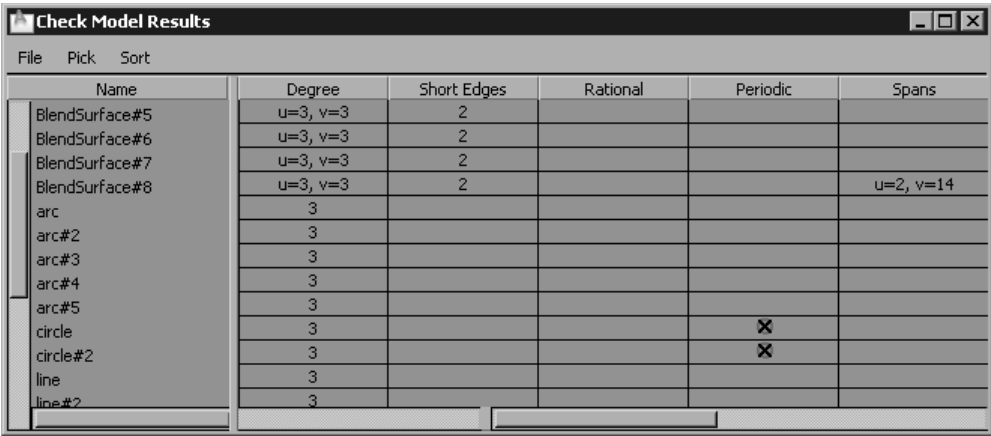
**Palette:** Evaluate > Check model



While importing or exporting models, there may be some data loss. This data loss occurs due to the problems such as discontinuity, multiple-knots, irrational geometries, and so on. These problems prevent the transfer of data from/to other software packages.

To check the model to address these problems, double-click on the **Check model** button of the **Evaluate** tab in the **Palette**; the **Check Model Options** dialog box will be displayed. Set the options for checking the model and then choose the **Check** button given at the bottom of this dialog box; the **Check Model Results** report window will be displayed, as shown in Figure 13-21.

In this report window, the first column shows the names of objects, and the rest of the columns show the problems to be checked in the model. The display of columns depends on the options set in the **Check Model Options** dialog box. If the model fails any given check, a cross mark enclosed in a red circle will be displayed in the corresponding columns of the report window. To highlight a particular checked surface or curve, select it from any of the columns in the **Check Model Results** report window.

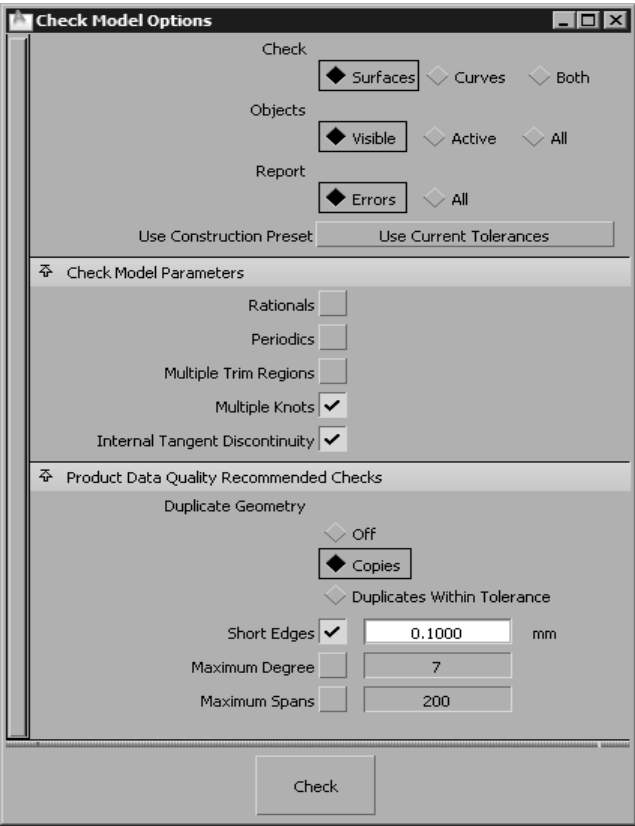


The image shows a software window titled "Check Model Results". It contains a table with columns: Name, Degree, Short Edges, Rational, Periodic, and Spans. The table lists various model components and their properties. The "Name" column includes BlendSurface#5 through BlendSurface#8, arc, arc#2 through arc#5, circle, circle#2, line, and line#2. The "Degree" column shows values like u=3, v=3 or 3. The "Short Edges" column shows values like 2 or 3. The "Rational" and "Periodic" columns are mostly empty, with "X" marks in the "Periodic" column for "circle" and "circle#2". The "Spans" column shows values like u=2, v=14 for "BlendSurface#8".

Name	Degree	Short Edges	Rational	Periodic	Spans
BlendSurface#5	u=3, v=3	2			
BlendSurface#6	u=3, v=3	2			
BlendSurface#7	u=3, v=3	2			
BlendSurface#8	u=3, v=3	2			u=2, v=14
arc	3				
arc#2	3				
arc#3	3				
arc#4	3				
arc#5	3				
circle	3			X	
circle#2	3			X	
line	3				
line#2	3				

Figure 13-21 The Check Model Results report window

To set the parameters of the **Check model** tool, double-click on the **Check model** button; the **Check Model Options** dialog box will be displayed, as shown in Figure 13-22. The model will be checked based on the parameters set in this dialog box.



The image shows a software dialog box titled "Check Model Options". It contains several sections for configuring the check process. The "Check" section has radio buttons for Surfaces, Curves, and Both. The "Objects" section has radio buttons for Visible, Active, and All. The "Report" section has radio buttons for Errors and All. There are checkboxes for "Use Construction Preset" and "Use Current Tolerances". The "Check Model Parameters" section has checkboxes for Rationals, Periodics, Multiple Trim Regions, Multiple Knots, and Internal Tangent Discontinuity. The "Product Data Quality Recommended Checks" section has a "Duplicate Geometry" section with radio buttons for Off, Copies, and Duplicates Within Tolerance. Below this are input fields for Short Edges (0.1000 mm), Maximum Degree (7), and Maximum Spans (200). A "Check" button is at the bottom.

Check

☒ Surfaces ☐ Curves ☐ Both

Objects

☒ Visible ☐ Active ☐ All

Report

☒ Errors ☐ All

Use Construction Preset ☐ Use Current Tolerances ☐

Check Model Parameters

Rationals ☐

Periodics ☐

Multiple Trim Regions ☐

Multiple Knots ☒

Internal Tangent Discontinuity ☒

Product Data Quality Recommended Checks

Duplicate Geometry

☐ Off ☒ Copies ☐ Duplicates Within Tolerance

Short Edges ☒ 0.1000 mm

Maximum Degree ☐ 7

Maximum Spans ☐ 200

Check

Figure 13-22 The Check Model Options dialog box

The options in this dialog box are discussed next.

## Check

This area is used to specify the type of geometry to be checked. The specified geometry is displayed in the **Name** column of the **Check Model Results** report window. The radio buttons in this area are discussed next.

### Surfaces

This radio button is selected by default and is used to check surfaces for the specified parameters.

### Curves

Select this radio button to check curves for the specified parameters.

### Both

Select this radio button to check both surfaces and curves for the specified parameters.

## Objects

This area is used to specify the type of object to be checked. The specified objects are displayed in the **Name** column of the **Check Model Results** report window. The radio buttons in this area are discussed next.

### Visible

This radio button is selected by default and is used to check objects for the specified parameters visible in the window.

### Active

Select this radio button to check the active objects for the specified parameters.

### All

Select this radio button to check all components of the model for the specified parameters.

## Report

This area is used to specify the type of report to be checked and displayed. The radio buttons in this area are discussed next.

### Errors

This radio button is selected by default and is used to display only those entities that have errors.

### All

When you select this radio button and then choose the **Check** button, all entities will be checked for errors and a report will be displayed. The report shows all entities regardless of whether they possess any error or not.



## Use Construction Preset

This area is used to specify the construction preset to be used while checking the model. The construction presets are significant for specifying the tolerances, units, and so on. By default, the **Use Current Tolerances** button is chosen in this area. As a result, the current settings of the **Construction Options** window will be used for checking the model. Press and hold the left mouse button on the **Use Current Tolerances** button; a flyout will be displayed. This flyout will display all other presets available in the **Construction Options** window. Choose the required construction preset from this flyout to check the model. You can use presets that corresponds to the software such as Inventor, CATIA, Pro/ENGINEER, and so on.

## Check Model Parameters

This area is used to specify the model parameters to be checked. The model parameters are displayed as column headings in the **Check Model Results** report window. The options in this area are discussed next.

### Rationals

Select this check box to check any rational geometry present in the model.

### Periodics

Select this check box to check any periodic or closed geometry present in the model.

### Maximum Spans

Select this check box to check if the model has spans higher than the value specified in the edit box given on the right of this check box. By default, 200 is displayed in this edit box, which means Alias Design checks the objects that have number of spans greater than 200. You can specify new degree in this edit box after activating it by selecting the **Maximum Spans** check box.

### Multiple Trim Regions

After trimming a surface, the surface may appear as a separated surface. This is not desirable in other CAD software packages and may confuse the user. Select the **Multiple Trim Regions** check box to check the model for these multiple trim regions. You can delete these undesirable surfaces.

### Multiple Knots

This check box is selected by default and is used to check if there are multiple knots in the model. Multiple knots cause problems such as sharp corners, discontinuities, and so on in objects.

### Internal Tangent Discontinuity

This check box is selected by default and is used to check the model for internal tangent discontinuities that occur because of multiple-knots present in the object.

### Non-planar curves

This check box will be available only when you select the **Curves** or **Both** radio button from the **Check** area. Select this check box to check the model for non-planar curves.

## Product Data Quality Recommended Checks

This area is used to specify the checks recommended for improving the quality of the product. model parameters to be performed. The model parameters are displayed as column headings in the **Check Model Results** report window. The options in this area are discussed next.

### Duplicate Geometry

This area is used to check objects for duplication. The different radio buttons in this area are discussed next.

#### Off

Select this radio button to skip the checking of the model for duplicate geometry.

#### Copies

This radio button is selected by default and is used to check model for duplicate copies of curves or surfaces. If the model contains the duplicate copy of an object and you have selected the **All** radio button in the **Report** area, the original object will be displayed with the comment 'Original' in the corresponding row and the duplicate copy will be represented by a red circle with the cross mark inside it.

#### Duplicates Within Tolerance

Select this radio button to check the model for duplicate copies or the embedded objects that lie within the specified tolerance. This tolerance is specified in the **Duplicate Tolerance** edit box.

### Maximum Degree

Select this check box to check whether the object to be checked has degree higher than the degree specified in the edit box given on the right of this check box. By default, 7 is displayed in this edit box. As a result, Alias Design will check the objects having a degree higher than 7. You can change the degree in this edit box after activating it by selecting the **Maximum Degree** check box.

### Short Edges

This check box is selected by default and is used to check if the object has edges shorter than the value specified in the edit box given on the right of this check box. By default, 0.1 is displayed in this edit box, which means Alias Design will check objects for the edges shorter than 0.1 unit. You can specify new distance in this edit box.

### Maximum Spans

Select this check box to check if the model has spans higher than the value specified in the edit box given on the right of this check box. By default, 200 is displayed in this edit box, which means Alias Design checks the objects that have number of spans greater than 200. You can specify new degree in this edit box after activating it by selecting the **Maximum Spans** check box.

## Check

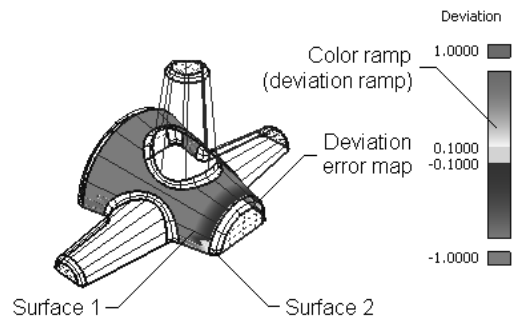
After setting the parameters in the **Check Model Options** area, you need to check the model for the parameters set. To do so, choose the **Check** button given at the bottom of this dialog box; the **Check Model Results** report window will be displayed. This report window displays the result of checks performed on the model.

## Evaluating the Deviations

**Palette:** Evaluate > Deviation map



In a model, there may be some deviation between meshes and NURBS surfaces, between surfaces, or between meshes. In Alias Design, you can evaluate these deviations. To do so, choose the **Deviation map** button from the **Evaluate** tab in the **Palette**; the buttons, **Meshes**, **Surfaces**, and **Accept** will be displayed at the lower right corner of the active window. Also, you will be prompted to click Meshes or select surfaces. Select the first surface or a set of the surfaces or meshes from the active window; only the **Accept** button will be displayed at the lower right corner of the active window. Choose the **Accept** button; the three buttons, **Meshes**, **Surfaces**, and **Go** will be displayed at the lower right corner of the active window. Also, you will be prompted to click Surfaces or select meshes. Choose the **Surfaces** button and then select the second set of surfaces; the **Go** button will get activated. Choose the **Go** button; the deviation error map will be displayed on the selected surfaces. Also, a vertical color ramp (deviation ramp) will be displayed on the right of the active window. Figure 13-23 shows a deviation error map and a color ramp (deviation ramp) of a model.

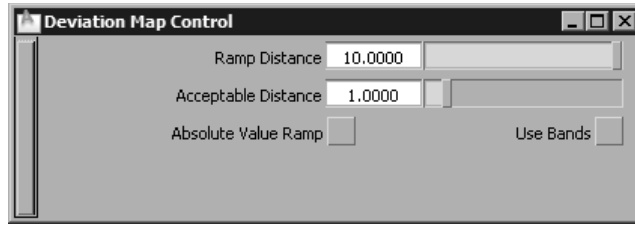


**Figure 13-23** Deviation error map and color ramp of a model

As discussed earlier, the **Deviation map** tool shows the deviation (distance) between a set of surfaces and a set of meshes. To evaluate the deviation between a set of surfaces and a set of meshes, select the required surfaces first and then switch over to meshes by choosing the **Meshes** button that will be displayed after accepting the first set of surfaces. Alternatively, select meshes and then switch over to surfaces by choosing the **Surfaces** button that will be displayed after accepting the first set of meshes. To evaluate the deviation between two sets of surfaces, select the set of surfaces and then choose the **Surfaces** button that will be displayed after accepting the first set of surfaces. Similarly, select the set of meshes and then choose the **Meshes** button that will be displayed after accepting the first set of meshes. Also, this tool evaluate the deviation between two sets of surfaces or two sets of meshes.

To set the parameters of the **Deviation map** tool, double-click on the **Deviation map** button; the **Deviation Map Control** dialog box will be displayed, as shown in Figure 13-24.

The options in this dialog box are discussed next.



*Figure 13-24 The Deviation Map Control dialog box*

## Ramp Distance

This edit box is used to specify the maximum deviation between meshes or/and surfaces, which is also displayed on the color ramp or the deviation ramp. The region on the surfaces of the model with the deviation value greater than the specified value will be displayed in red or in purple.

## Acceptable Distance

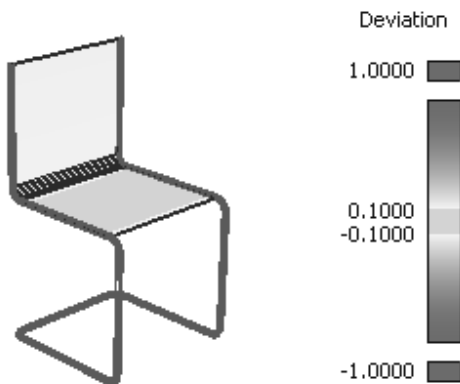
This edit box is used to specify the upper limit for acceptable deviation between meshes or/and surfaces. By default, 0.1 is displayed in this edit box. The region on the surfaces of the model with the deviation value smaller than the specified value will be displayed in green.

## Absolute Value Ramp

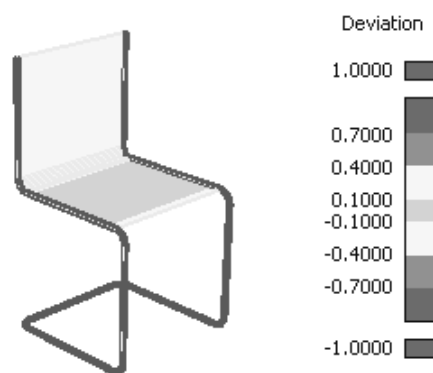
Select this check box to display deviation, irrespective of its direction on the color ramp or the deviation ramp. On selecting this check box, you can view absolute deviation values, as shown in Figure 13-25.

## Use Bands

Select this check box to display the bands of colors instead of slowly varying colors for displaying the deviation in the ramp, as shown in Figure 13-26.



*Figure 13-25 Absolute deviation values*



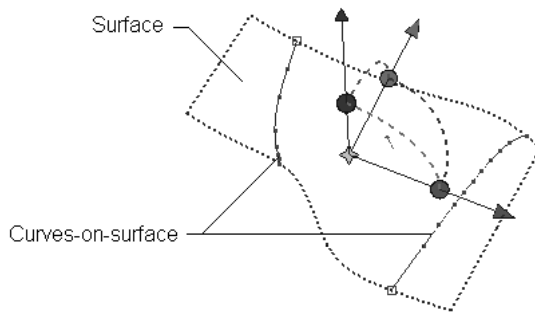
*Figure 13-26 Bands showing deviation values*

## Creating Parting Lines by Horizon

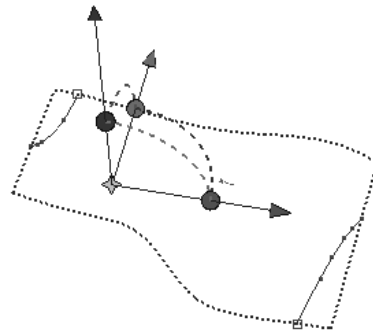
**Palette:** Evaluate > Horizon



You can create curves-on-surface by using the **Horizon** tool. Horizon acts as a point in space or denotes a direction. To create curves-on-surface using this tool, choose the **Horizon** button from the **Evaluate** tab in the **Palette**; a manipulator will be displayed in the view windows and you will be prompted to select the surface(s) to evaluate. Select the surface(s) to be evaluated in the active window; the **Go** button will be displayed at the lower right corner of the active window. Choose the **Go** button; the curves-on-surface will be created, as shown in Figure 13-27. You can change the origin of horizon by using manipulator. You can even rotate the horizon. Note that curves-on-surface get updated when you change the origin of the horizon, as shown in Figure 13-28.

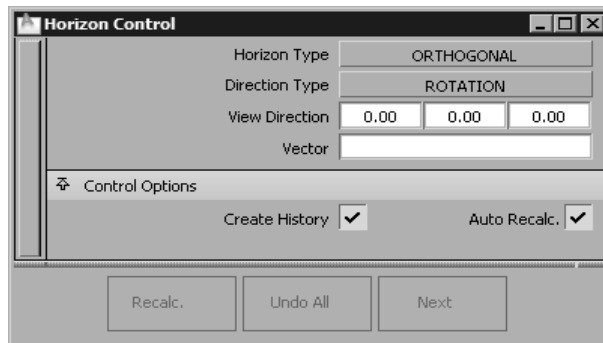


**Figure 13-27** Curves-on-surface created on a surface



**Figure 13-28** Modified curves-on-surface

To set the parameters of the **Horizon** tool, double-click on the **Horizon** button; the **Horizon Control** dialog box will be displayed, as shown in Figure 13-29.



**Figure 13-29** The **Horizon Control** dialog box

The options in this dialog box are discussed next.

## Horizon Type

This area is used to specify how the horizon lines will be projected on the surface to create curves-on-surface. The options in this area are discussed next.

### PERSPECTIVE

This button is chosen by default. As a result, the horizon as seen from a certain point in the space is used to create curves-on-surface on the surface.

### ORTHOGONAL

When you choose this button, the horizon as seen from a certain direction is used to create curves-on-surface on the surface.

## View Point

These edit boxes will be available only when the **PERSPECTIVE** button is chosen in the **Horizon Type** area. These edit boxes are used to specify a point in the space to look at the picked surface. You can also specify the position of the point by using manipulator.

### Point

This field is used to specify the name of the point to be positioned or aligned with the horizon manipulator. This point acts as a view point for creating curves-on-surface. Alternatively, select the point to align the manipulator with; the name of the selected point will be displayed in this field. You can even select the point and surface before invoking the **Horizon** tool.

## Direction Type

This area will be available only when you choose the **ORTHOGONAL** button from the **Horizon Type** area. This area is used to specify the direction along which the picked surface will be looked at. The buttons in this area are discussed next.

### ROTATION

This button is chosen by default and is used to define the view direction by specifying angles along three axes.

### VECTOR

Choose this button to define the view direction by selecting a vector from the window or by specifying its position.

## View Direction

These edit boxes will be available only when you choose the **ORTHOGONAL** button from the **Horizon Type** area. These edit boxes are used to specify the direction along which the picked surface will be looked at.

### Vector

This field is used to specify the name of the vector with which the manipulator will be aligned for specifying the view direction. Alternatively, select the required vector to align the manipulator with; the name of the selected vector will be displayed in this field. You can even select the vector and surface before invoking the **Horizon** tool.

## Control Options

The options in this area have been discussed in earlier chapters.

## SKETCHING/PAINTING IN Alias Design

In addition to modeling, Alias Design allows you to create 2D concept design sketches. These 2D sketches are created in the sketching/painting environment of Alias Design and are used to create 3D models. Creating sketches first and then creating 3D models on them helps you conceptualize the model iteratively. Also, you can annotate 3D models or cloud data to indicate problematic region for future use.

The sketching tools vary depending upon the product of Alias Design being used. For example, the sketching tools available in Alias Design may be different from the sketching tools used in Alias Surface and Alias Automotive. Throughout this textbook, we have used the Alias Design product and therefore, only the tools available in this product have been used. The different sketching features available in Alias Design are pencils, markers, airbrushes, solidbrushes, erasers, sharpenbrushes, blurbrushes, smearbrushes, clonebrushes, and so on. These sketching features will be discussed in detail in the next chapter.

## WORKING WITH SKETCHING/PAINTING WINDOW

You can use different sketching/painting tools and features in the sketching/painting environment of Alias Design. To invoke the sketching/painting environment, you need to customize the Alias Design interface. To do so, choose **Preferences > Workflows > Paint** from the menu bar. Also, the sketcher or paint tools get added in the **Paint** tab of the **Palette** and **Shelves** windows. Alternatively, press CTRL+2 to invoke the sketching environment.

After switching over to **Paint** workflow, you need to start a new file to sketch on. To do so, choose **File > New** from the menu bar; the **confirm** message box will be displayed. Choose the **Yes** button from the **confirm** message box; the **New canvas** dialog box will be displayed. Choose the **OK** button from this dialog box; the **Paint** window will be displayed, as shown in Figure 13-30. You can change the layout of the window by choosing the corresponding button in the **Layouts** option of the menu bar.

## Components of Sketching/Painting Window

There are different components in the **Paint** window that are used for sketching or painting. These components are discussed next.

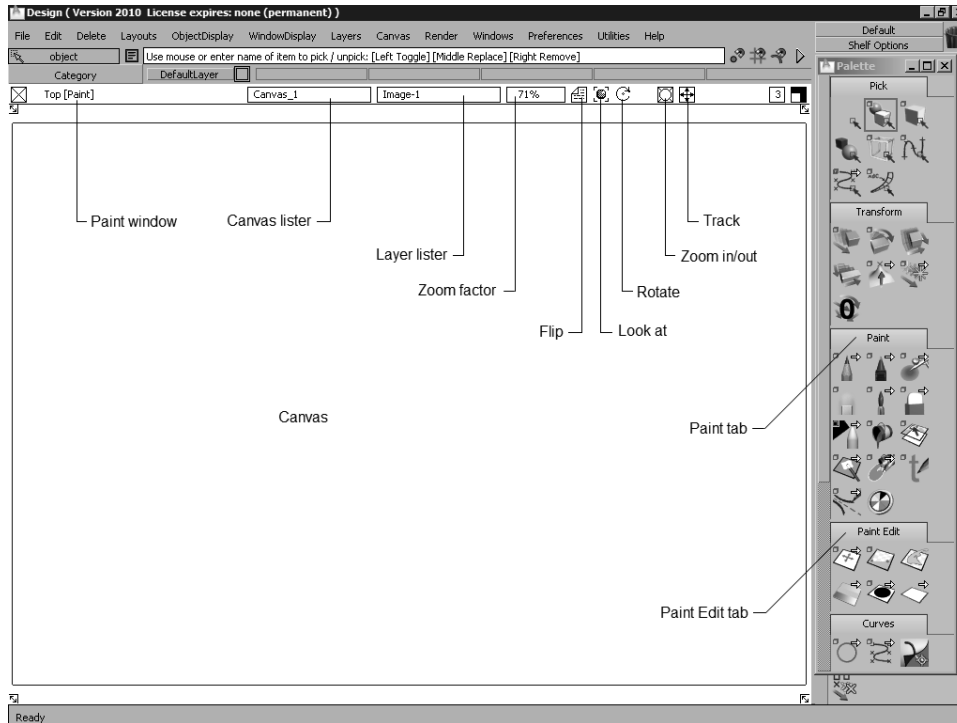
### Canvas

The Canvas or Canvas plane is used for drawing sketches. You can create a canvas by choosing **File > New** from the menu bar of the **Paint** window. The creation of the canvas will be discussed later in this chapter.



#### Note

*You can create multiple canvases in an existing file by choosing **Canvas > New canvas** from the menu bar.*



*Figure 13-30 The **Paint** window and its components*

## Canvas lister

The Canvas lister is used to toggle between different canvases that are displayed in the **Paint** window. Press and hold the left mouse button on the Canvas lister to display a menu. Select the required canvas from this menu.

## Layer lister

The Layer lister is used to select the layer to be assigned to the current canvas. Press and hold the left mouse button on the Layer lister to display a menu, and then select the required layer from this menu. The layer assigned to the canvas will be the active layer and is represented by the layer with the \* symbol attached as the superscript.

## Zoom factor

The Zoom factor is used to select the zoom factor to zoom in or zoom out the canvas. By default, the Zoom factor corresponding to the best fit view will be chosen. You can specify any other Zoom factor by selecting it from the menu that will be displayed when you press and hold the left mouse button on the Zoom factor.

## Flip

Choose on the **Flip** button to toggle between canvases. You can view the canvas that lies behind the current or active canvas.



**Look at**

Choose this button to reorient and re-center the canvas in such a way that it fits best in the window. This fitting involves automatic application of zooming, tracking, or rotation of the canvas.

**Rotate**

Press and hold the left mouse button on the **Rotate** button and then drag the cursor to rotate the canvas clockwise or counter-clockwise about its center in the **Paint** window.

**Zoom in/out**

Press and hold the left mouse button on the **Zoom in/out** button and then drag the cursor outward to zoom in the canvas. To zoom out, drag the cursor toward the center of the window.

**Track**

Press and hold the left mouse button on the **Track** button and then drag the cursor up, down, left, or right to move the canvas accordingly.

**The Paint Tab**

The **Paint** tab in the **Palette** displays all sketching/painting tools used in Alias Design. These tools include various types of brushes, pencils, erasers, and so on.

**The Paint Edit Tab**

The **Paint Edit** tab in the **Palette** displays the tools used for editing the sketched objects. These editing tools are used to transform images, control the brightness and contrast of images, deform or warp the sketched images, and so on.

**CREATING A NEW CANVAS/PAINT WINDOW**

To create a new canvas, choose **File > New** from the menu bar; the **confirm** message box will be displayed. Choose the **Yes** button from the **confirm** message box; the **New canvas** dialog box will be displayed, as shown in Figure 13-31. Choose the **OK** button from this dialog box; the paint window will be displayed. Alternatively, choose **Canvas > New canvas** from the menu bar to create a new canvas.

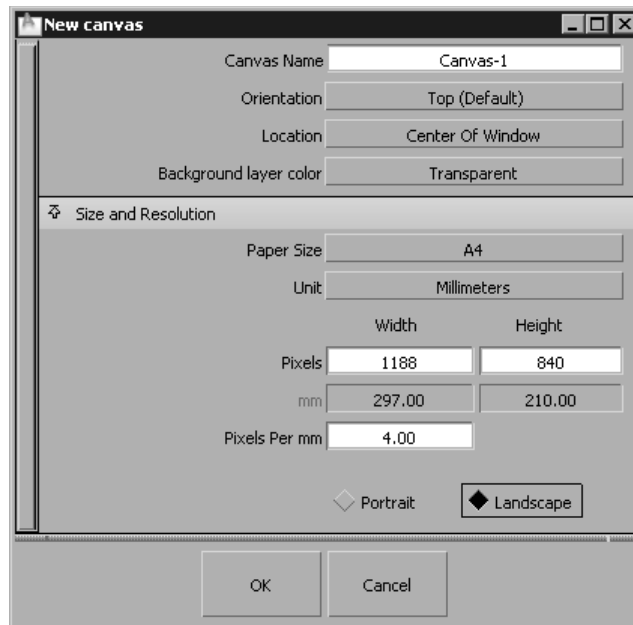
Various areas in this dialog box are discussed next.

**Canvas Name**

This field is used to specify the name of the canvas. By default, Canvas-1 is displayed in this field. You can enter a new name in this field.

**Orientation**

This area is used to specify the orientation of the canvas in 3D space or XYZ space. By default, the **Top (Default)** button is chosen in this area. When you choose the **OK** button from the **New canvas** dialog box, the **Top** window will be displayed as the new canvas plane. You can choose



*Figure 13-31 The New canvas dialog box*

the **Left**, **Front**, **Back**, **Top**, **Left**, **Back** or **Top**, **Left**, **Front** button to display the corresponding canvas planes.

## Location

This area is used to specify the location of the new canvas. By default, the **Center Of Window** button is chosen in this area. As a result, the canvas will be located at the center of the window. Choose the **Origin** button from this area to position the canvas at the origin.

## Background layer color

This area is used to specify the background color of the canvas plane. By default, the **Transparent** button is chosen in this area. Choose the **Black**, **White**, or **Current Brush Color** button to assign the corresponding color to the background of the canvas plane.

## Paper Size

This area is used to specify the paper size of the canvas plane. By default, the **A4** button is chosen in this area. You can create a canvas of other size by choosing the respective button from the flyout that will be displayed when you press and hold the left mouse button on the **A4** button. You can also specify a paper size of your own by choosing the **Custom** button from this area.

## Unit

You can specify the unit for canvas size either in inches or in millimeters by choosing the corresponding button in the **Units** area. By default, the **Millimeters** button is chosen in this area.

## Pixels

The **Width** and **Height** fields of the **Pixels** area are used to specify the width and height of the canvas in pixels.

## mm/in

The **Width** and **Height** fields of the **mm/in** area are used to specify the width and height of the canvas in millimeters/inches. The **mm/in** area will be active only when you choose the **Custom** button in the **Paper Size** area.

## Pixels Per mm/in

This edit box is used to specify the resolution for the canvas. With this edit box, you can specify the number of pixels per millimeter or inch.

## Portrait

Select this radio button to select the vertical (portrait) orientation of the canvas.

## Landscape

This radio button is selected by default and displays the horizontal (landscape) orientation of the canvas.

# INTRODUCTION TO CANVAS LAYERS

A canvas may contain one or more layers. These layers act as transparent sheets arranged one over the other. These layers contain information about various sketches, images, shapes, and so on of the canvas. Creation of layers allows you to sketch different elements on different layers so that you can edit these layers individually without affecting other layers. Layers can be image layers, mask layers, or shape layers. The types of layer are discussed next.

## Image Layers

The image layers are used to sketch different parts of an object. For example, the canvas image of a car may have different image layers such as body, headlights, tyres, text displaying the registration number, and so on. You can change the background color of image layer, duplicate image layers, merge image layers, and so on. These features on the image layers will be discussed in the next chapter.

## Mask Layers

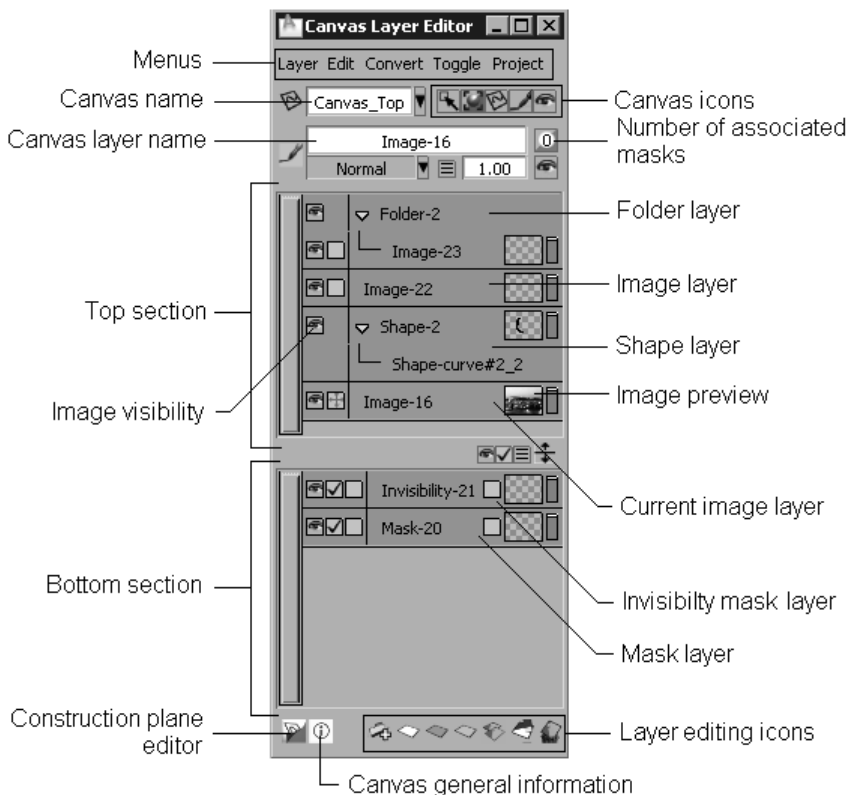
Alias Design allows you to protect the image layer from painting/sketching, erasing, and so on by creating a mask layer on it. A mask protects an image from clearing, blurring, dodging, and so on. The masked regions are displayed in red. The color difference between the masked and unmasked regions can be viewed only on image layers, but the effect of the mask can be viewed both on images and masked layers. A mask layer may contain paint or shapes. The mask layer containing paint is similar to an image layer, whereas a mask layer containing a shape is similar to a shape layer. You can create masks by using the magicwand or marquees, which will be discussed in the next chapter.

## Shape Layers

You can create precise images with the help of shapes. You can create a shape by using simple curves, curves-on-surface, surface edges, or a set of any of these curves. You can modify these shapes easily. When you modify curves, the shape gets updated automatically. If you use curves to create model, modifying the curves update the model as well as its sketch. A layer containing shapes is known as shape layer. When you create a shape, a shape layer is created automatically. You cannot apply paint brushes on a shape layers. If a shape layer contains more than one shape, you can view these shapes by expanding the shape layer in the **Canvas Layer Editor** window that will be discussed in next topic. You can duplicate, edit, delete, mirror, and fill a shape. The creation of shape layers will be discussed in the next chapter.

## ORGANIZING CANVAS LAYERS

After creating different layers, you can organize or rearrange them by using the **Canvas Layer Editor** window. To invoke this window, choose **Windows > Editors > Canvas Layer Editor** from the menu bar. Alternatively, click on the Layer lister to display a flyout and then choose the **Canvas Layer Editor** button from this flyout; the **Canvas Layer Editor** window will be displayed, as shown in Figure 13-32.



**Figure 13-32** The **Canvas Layer Editor** window and its components

Different components of the **Canvas Layer Editor** window are discussed next.

## Layer

Press and hold the left mouse button on the **Layer** menu to display a flyout. The options in this flyout are used for creating a new image layer, mask layer, shape layer, duplicate a layer, and merge layers.

## Edit

Press and hold the left mouse button on the **Edit** menu to display a flyout. The options in this flyout are used to edit layers such as deleting a layer, inverting or flipping a layer, inverting the marquee, and selecting shape layer.

## Convert

Press and hold the left mouse button on the **Convert** menu to display a flyout. The options in this flyout are used to convert layers to images, masks and invisibility masks, and also convert the marquee to masks.

## Toggle

Press and hold the left mouse button on the **Toggle** menu to display a flyout. The options in this flyout are used to toggle between the visibility of different layers.

## Project

Press and hold the left mouse button on the **Project** menu to display a flyout. The options in this flyout are used to project the sketch on objects. All visible layers on the canvas can be projected on the object. To view the projected sketch, shade the object.

## Canvas name

This edit box is used to display the name of the active canvas. The icon of the canvas is displayed on the left of this edit box.

## Canvas selector

Click on the **Canvas selector** down-arrow given on the right of the **Canvas name** edit box to display a flyout. This flyout is used to display all canvases. These canvases can be created by choosing **Canvas > New canvas** from the menu bar. You can create as many canvases as you wish with help of the **Canvas** menu.

## Pick canvas

Click on the **Pick canvas** icon to pick the current canvas.

## Lookat canvas

Click on the **Lookat canvas** icon to position the canvas at the center of the active window according to the size of the canvas.

## Set canvas

Click on the **Set canvas** icon to make it an active canvas. You can draw a sketch, import an image, or work with the active canvas.

## Lock canvas

Click on the **Lock canvas** icon to lock canvas. When you lock a canvas, you cannot select any other canvas.

## Canvas visibility

Click on the **Canvas visibility** icon to turn the visibility of the sketch in a canvas on or off. When you click on this icon, the icon gets changed.

## Canvas layer name

This edit box is used to display the name of the active image layer. The icon of the image layer is displayed on the left of this edit box.

## Number of associated masks

The **Number of associated masks** icon on the right of the **Canvas layer name** edit box lists the number of masks/invisibility mask layers associated with the image layer. The **Canvas Layer Editor** window allows you to display all or the current image layer, change opacity of the canvas layer, or turn the visibility of canvas layers on or off.

In addition to these components, the **Canvas Layer Editor** window provides you with two other sections. These sections help you arrange and organize different layers. These sections are discussed next.

## Top Section

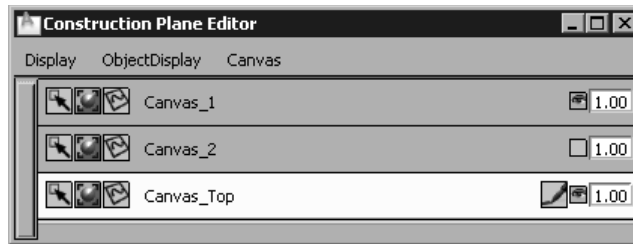
The top section of the **Canvas Layer Editor** window comprises of image layers, folders of image layers, and shapes. In this section, you can expand folders to view image layers, expand the shape layer to view different shapes, and turn the visibility of the selected image layer on or off. You can also rename the selected image layer by double-clicking on it and then entering a new name in the image name field. The preview of the image layer is also displayed on the right of the image layer.

## Bottom Section

The bottom section of the **Canvas Layer Editor** window comprises of mask layers, invisible mask layers, folders of mask or invisibility mask layers. Along with these layers, this section has the same options as in the top section.

## Construction plane editor

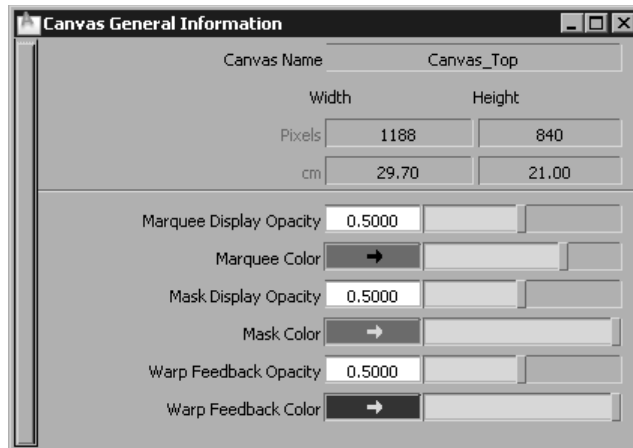
The **Construction plane editor** icon is located below the bottom section of the **Canvas Layer Editor** window. Click on this icon; the **Construction Plane Editor** window will be displayed, as shown in Figure 13-33. This window is used to manage canvases and construction planes. The options in this window are the same as those discussed in the **Canvas Layer Editor** window.



*Figure 13-33 The Construction Plane Editor window*

## Canvas general information

The **Canvas general information** icon is located below the bottom section of the **Canvas Layer Editor** window. When you click on this icon, the **Canvas General Information** window will be displayed, as shown in Figure 13-34. This window is used to control the mask or marquee, warp feedback colors, and change the opacity of these features. The **Canvas General Information** window also displays the name and size of the canvas.



*Figure 13-34 The Canvas General Information window*

The other icons located below the bottom section of the **Canvas Layer Editor** window are used to create new image layers, mask layers, invisibility mask layers, delete layers, and so on.

## WORKING ON LAYERS

Alias Design allows you to create image layers, mask layers, invisibility mask layers, and so on. To create, duplicate, or merge layers, choose the **Canvas Layer Editor** button from the Layers lister flyout; the **Canvas Layer Editor** window will be displayed. Choose the required option from this flyout to get the corresponding result. Alternatively, you can create, duplicate, or merge layers by invoking the respective tool in the **Paint Edit** tab of the **Palette**. These tools are discussed next.

## Creating a New Image Layer

**Palette:** Paint Edit > New image layer



You can create a new image layer and make it active. To do so, choose the **New image layer** button from the **Paint Edit** tab in the **Palette**; a new image layer will be created.

You will notice that the new image layer is listed in the Layer lister of the **Paint** window. To view all image layers, click on the Layer lister; all image layers will be listed in the flyout. You can activate any of the newly created image layers by choosing it from this flyout. Alternatively, you can view all image layers in the **Canvas Layer Editor** window that will be displayed when you choose the **Canvas Layer Editor** button from the Layer lister flyout. By default, the new image layers will be named as Image-1, Image-2, Image-3, and so on. To rename an image layer, double-click on the image name in the **Canvas Layer Editor** window and then enter a new name in it.

## Creating a New Mask Layer

**Palette:** Paint Edit > New image layer > New mask layer



You can create a new mask layer and make it active. To do so, choose the **New mask layer** button from the **Paint Edit** tab in the **Palette**; a new mask layer will be created.

You will notice that the new mask layer is listed in the Layer lister of the **Paint** window. The new mask layer will be displayed in the bottom section of the **Canvas Layer Editor** window and can also be renamed.

## Creating a New Invisibility Mask Layer

**Palette:** Paint Edit > New image layer > Canvas invisibility mask layer



You can create a new invisibility mask layer and make it active. To do so, choose the **Canvas invisibility mask layer** button from the **Paint Edit** tab in the **Palette**; a new invisibility mask layer will be created. You can notice that the new invisibility mask layer is listed in the Layer lister of the **Paint** window. The new invisibility mask layer will be displayed in the bottom section of the **Canvas Layer Editor** window and can also be renamed.

## Creating a New Canvas Folder

**Palette:** Paint Edit > New image layer > New layer folder



You can create a new canvas folder to contain canvas layers in it. All new canvas layers will be placed inside this folder. To do so, choose the **New layer folder** button from the **Paint Edit** tab in the **Palette**; a canvas layer folder will be created. You can notice that the new canvas layer folder is listed in the Layer lister of the **Paint** window. The canvas layer folder will be displayed on the top or bottom section of the **Canvas Layer Editor** window depending on the type of canvas layer it has. You can expand the canvas layer folder to view the list of canvas layers contained in it. You can also rename the canvas layer folder as well as the image layers in it.



## Duplicating a Layer

**Palette:** Paint Edit > New image layer > Duplicate layer



You can create a duplicate copy of the currently selected image layer, shape layer, or mask layer. To do so, choose the **Duplicate layer** button from the **Paint Edit** tab in the **Palette**; the duplicate copy of the current layer will be created over it. You can notice that the new duplicate layer with suffixes 1, 2, 3, and so on is listed in the Layer lister of the **Paint** window. The duplicate layer will be displayed in the top or bottom section of the **Canvas Layer Editor** window, depending on the type of the canvas layer in it. You can also rename the duplicate layer.

## Merging Layers

**Palette:** Paint Edit > New image layer > Merge below



You can merge the current canvas layer with the canvas layer beneath it. To do so, choose the **Merge below** button from the **Paint Edit** tab in the **Palette**; the current active canvas layer will be merged with the canvas layer beneath it and the merged layer will take the name of the layer with which the active layer is merged. The merged layer will be displayed in the top or bottom section of the **Canvas Layer Editor** window depending on the type of the canvas layer in it. You can also rename the merged layer.

## Merging the Visible Layers

**Palette:** Paint Edit > New image layer > Merge visible layers



You can merge all visible paint layers. To do so, choose the **Merge visible layers** button from the **Paint Edit** tab in the **Palette**; the current paint layer will be merged with all other visible paint layers. The merged layer will take the name of the first visible paint layer and will be displayed in the top section of the **Canvas Layer Editor** window. You can also rename the merged layer. To prevent a paint layer from merging with other layers, turn its visibility off before merging the layers by using the **Merge visible layers** tool. To turn the visibility of a layer off, click on its eye icon in the **Canvas Layer Editor** window.

## Merging all Layers

**Palette:** Paint Edit > New image layer > Merge all layers



You can merge all image layers even if you have turned the visibility of some of the layers off. To do so, choose the **Merge all layers** button from the **Paint Edit** tab in the **Palette**; all image layers will be merged. The merged layer will be displayed in the top or bottom section of the **Canvas Layer Editor** window. You can also rename the merged layer.

## COLOR SCHEMES

In Alias Design, sketching is done by using brushes, pencils, markers, and so on. These sketching tools are invoked by choosing the respective buttons from the **Paint** tab in the **Palette**. These sketching tools will be discussed in the next chapter. If you double-click on a sketching tool,

the **Brush Color** area in the **Brush Options** dialog box will enable you to select the color for the selected brush. Alias Design allows you to select a color in different ways, which will be discussed in the next chapter. Different color schemes that are used to color a model are discussed next.

## RGB (Red, Green, Blue)

Red, blue, and green are additive primary colors. You can produce a wide range of colors by adding these additive primary colors in various proportions. The RGB color scheme describes how red, green, and blue colors are mixed with different intensities to produce colors. When you mix these three primary colors with their full intensity, they produce white color. When you mix these three primary colors at their lowest intensity, they produce black color. The range of additive primary colors is 0 to 255. You can adjust the RGB colors by using the **Red**, **Green**, and **Blue** sliders.

## CMY (Cyan, Magenta, Yellow)

Cyan, magenta, and yellow are subtractive primary colors. These colors are the complements of additive primary colors that are red, green, and blue, respectively. The CMY color scheme describes how cyan, magenta, and yellow colors are subtracted with different intensities to produce different colors. The range of subtractive primary colors is 0 to 255. You can adjust the CMY colors by using the **Cyan**, **Magenta**, and **Yellow** sliders, respectively.

## HSL and HSV (Hue, Saturation, Lightness, Value)

Hue is the ability that enables you to distinguish one color from the other. Saturation enables you to distinguish a strong color from a weak color. Lightness enables you to distinguish between the light and dark colors. Value specifies the brightness value that distinguishes a light color from a dark color. You can adjust the HSL or HSV by using the **Hue**, **Saturation**, and **Lightness (Luminance)**, or **Value** slider, respectively.

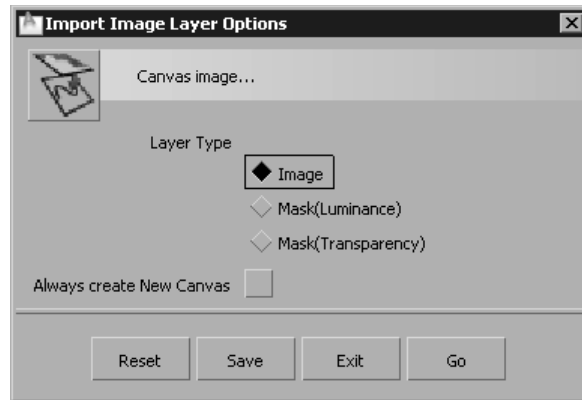
The adjustment of various colors to produce different colors from different color schemes such as RGB, CMY, HSL, and HSV will be discussed in the Chapter 14.

## IMPORTING IMAGES

**Menu bar:** File > Import > Canvas Image

You can import an image (in jpg, tiff, or bmp format) into an existing or new canvas as a new image layer or a mask layer. To do so, choose **File > Import > Canvas Image** from the menu bar; the **Import Image** dialog box will be displayed. Select the required image and then choose the **Select** button from this dialog box; the image will be imported as a new canvas/image layer. You can import the selected image as an image or a mask depending on the radio button selected in the **Import Image Options** area of the **Import Image** dialog box.

To change the parameters of the **Canvas Image** option, click on the box icon on the right of the **Canvas Image** option; the **Import Image Layer Options** dialog box will be displayed, as shown in Figure 13-35.



*Figure 13-35 The **Import Image Layer Options** dialog box*

The options in this dialog box are discussed next.

## **Layer Type**

This area is used to specify the type of layer to be imported. The radio buttons in this area are discussed next.

### **Image**

This radio button is selected by default and is used to import the selected image as an image layer.

### **Mask(Luminance)**

Select this radio button to import the image as a mask. On selecting this radio button, the luminance value of the image will be used as mask.

### **Mask(Transparency)**

Select this radio button to import the image as a mask such that its transparency value is used as mask.

### **Always create New Canvas**

This check box is used to specify whether the image will be imported as a new canvas or will be assigned to an existing canvas. By default, this check box is cleared and enables you to import an image in three different ways. If there is more than one canvas and you select one of them, the image will be imported into the selected canvas. If none of the canvases is selected, the image will be imported into the active canvas. If there is no active canvas in the active window, the image will be imported into a new canvas that is created automatically in the active window. If you select the **Always create New Canvas** check box, the image will be imported as a new canvas in the active window.

## EXPORTING IMAGES

**Menu bar:** File > Export > Canvas Image/Mask Layer

You can export an image or a mask layer as an image. To do so choose **File > Export > Canvas Image/Mask Layer** from the menu bar; the **Export Image Layer** dialog box will be displayed. Specify the name and location of the image/mask layer to be exported and then choose the **Save** button; the image/mask layer will be exported to the specified location.

To change the parameters of the **Canvas Image/Mask Layer** option, click on the box icon given on the right of the **Canvas Image/Mask layer** option; the **Export Image Layer Options** dialog box will be displayed, as shown in Figure 13-36.



*Figure 13-36 The **Export Image Layer Options** dialog box*

The options in this dialog box are discussed next.

### File Type

This area is used to specify the format in which the exported image/mask layer will be saved. You can export images in different formats such as jpeg, tiff, and bmp.

### Limit Image Size

Select this check box to specify the size of the image. On selecting this check box, two edit boxes will be displayed, which are discussed next.

### Horizontal Size

This edit box is used to specify the size of the image in horizontal direction.

### Vertical Size

This edit box is used to specify the size of the image in vertical direction.

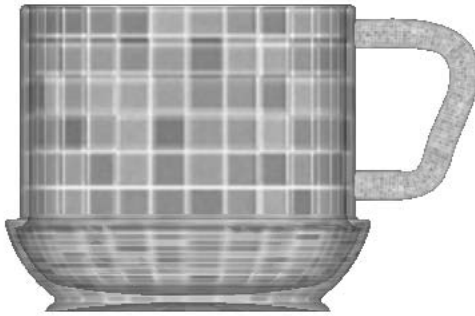
## Quality Level

This area will be available only when you select the **jpeg** radio button from the **File Type** area. The **Quality Level** area is used to specify the quality of the exported image. You can choose the **Low**, **High**, **Medium**, or **Maximum** button to specify the quality of the exported image. Alternatively, you can specify the quality of the exported image by using the edit box or the slider bar displayed below the **Quality Level** area.

## TUTORIALS

### Tutorial 1

In this tutorial, you will import the image, as shown in Figure 13-37, and then create the model of a cup by using this image, as shown in Figure 13-38. Calculate the mass properties of the cup. Also, check the model for the problems that can affect its successful data transfer to other CAD packages. **(Expected time: 30 min)**



*Figure 13-37 Image of the model*



*Figure 13-38 Model for Tutorial 1*

The following steps are required to complete this tutorial:

- Start Alias Design and invoke the **Paint** mode.
- Import the image.
- Create the cup using the **Revolve surface** tool.
- Create the handle using the **Tube Surface** tool.
- Intersect the cup with the handle by using the **Intersect** tool.
- Trim the unwanted surfaces from the model by using the **Trim** tool.
- Evaluate the mass properties of the model by using the **Mass Properties** tool and then save these properties in a text file.
- Check the model by using the **Check model** tool.
- Save the file.

### Starting Alias Design in the Paint Mode

- Double-click on the Alias 2010 icon on your desktop; the **Design** window is displayed.

2. Choose **Preferences > Workflows > Paint** from the menu bar; the **Paint** mode is invoked. Alternatively, choose press CTRL+2 to invoke the **Paint** mode.
3. Choose **File > New** from the menu bar; the **confirm** message box is displayed.
4. Choose the **Yes** button from the **confirm** message box; the **New canvas** dialog box is displayed.
5. Choose the **Left** button from the **Orientation** area and choose the **OK** button from this dialog box; the **Left [Paint]** window expands and covers the entire screen.

## Importing the Image

After starting Alias Design in the **Paint** mode, you need to download the canvas image (*c13\_image\_tut01*) from [www.cadcim.com](http://www.cadcim.com) and import it to current session of Alias Design.

1. Paste the following link in the address bar of the Internet Explorer window and download the *c13\_image\_tut01* file on your computer:

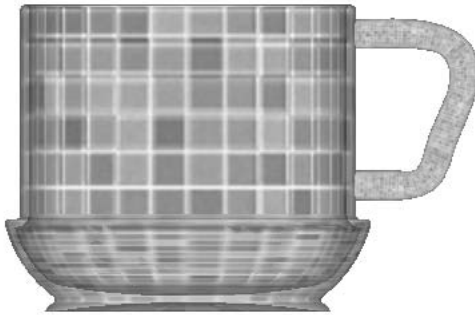
[http://www.cadcim.com/aliasdesign\\_2010/aliasdesign\\_2010.htm](http://www.cadcim.com/aliasdesign_2010/aliasdesign_2010.htm)

2. Extract the contents of the zipped file and save the folder in *aliasdesign\_2010* folder.
3. Choose **File > Import > Canvas Image** from the menu bar; the **Import Image** dialog box is displayed.
4. Browse to the *aliasdesign\_2010* folder in the **Look in** drop-down list.
5. Select *c13\_image\_tut01* file from the list box and then choose the **Select** button from the dialog box; image gets imported into the **Left [Paint]** window. Figure 13-39 shows the imported image of the cup.

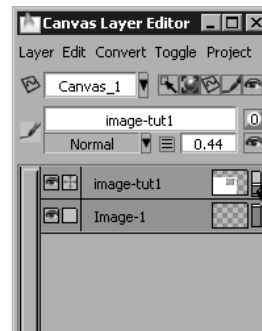
## Creating the Cup

After importing the image, you need to create the sketch that matches the model. The sketch is created in the **Default** mode.

1. Choose **Preferences > Workflows > Default** from the menu bar to switch from the **Paint** mode to the **Default** mode.
2. Next, choose **Windows > Editors > Canvas Layer Editor** from the menu bar; the **Canvas Layer Editor** window is displayed.
3. Drag the transparency slider located on the right of the imported image (*c13\_image\_tut01*) downward, as shown in Figure 13-40; the transparency of the image is increased.

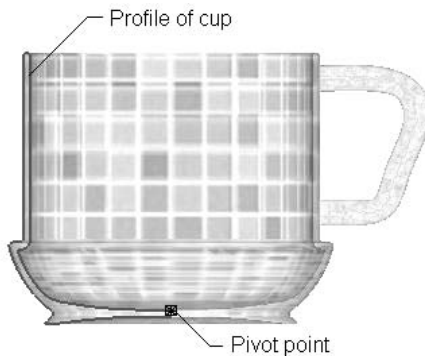


**Figure 13-39** Imported image of the model

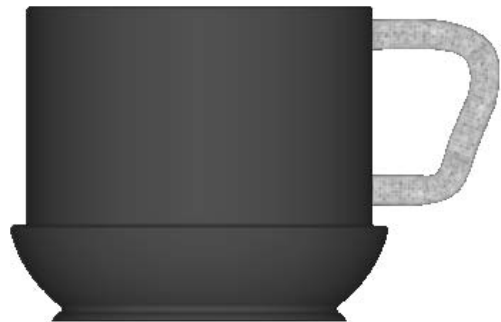


**Figure 13-40** Changing the transparency of the imported image

4. Next, create the profile of the cup by using different curve tools and set the pivot point to the start point or endpoint of the profile, as shown in Figure 13-41.
5. Next, choose the **Revolve surface** button from the **Surfaces** tab in the **Palette** and revolve the profile to create the cup, as shown in Figure 13-42.



**Figure 13-41** Profile of the cup



**Figure 13-42** Cup created by revolving the profile



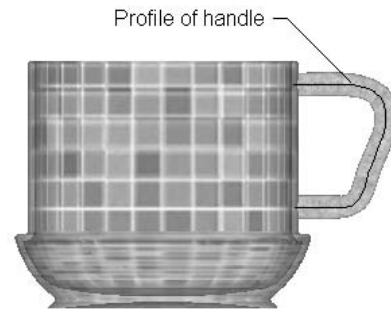
#### Note

If the pivot point is not visible, choose **WindowDisplay > Toggles > Pivots** from the menu bar to make it visible.

### Creating the Handle

The handle of the cup is created by using the **Tube Surface** tool. Before creating the handle, you need to hide the revolved cup.

1. Select the cup from the active window and then choose **ObjectDisplay > Invisible** from the menu bar; the visibility of the cup is turned off.
2. Create the profile of the handle by using different curve tools, as shown in Figure 13-43.
3. Double-click on the **Tube Surface** button of the **Surfaces** tab in the **Palette**; the **Tube Surface Control** dialog box is displayed.
4. Select the profile from the active window and enter the required value in the **Radius** edit box. Note that matches this radius value must match the radius of the handle in the imported image.





**Figure 13-43** Profile of the handle

5. Choose the **Recalc** button; the handle is created.
6. Choose **ObjectDisplay > Visible** from the menu bar; the display of the cup is turned on and the model is displayed, as shown in Figure 13-44.

## Trimming Unwanted Surfaces

The cup and its handle may have some unwanted surface portions left in it. You need to intersect these objects to recognize the unwanted surface portions and then trim them.

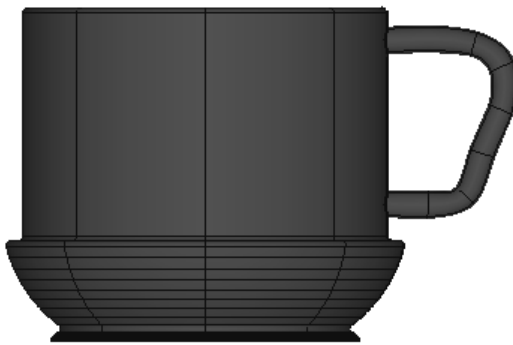
1. Choose **Windows > Editors > Canvas Layer Editor** from the menu bar; the **Canvas Layer Editor** window is displayed. 
2. Choose the **Canvas visibility** icon on left of the **c13\_image\_tut02** layer in the top section of the **Canvas Layer Editor** window; the visibility of the canvas containing the image, **c13\_image\_tut01**, is turned off. 
3. Choose **Project > Intersect** from the **Surface Edit** tab in the **Palette**; you are prompted to select the surface(s) to intersect.
4. Select the cup that you have created; the **Go** button is displayed at the lower right corner of the active window.
5. Choose the **Go** button; you are prompted to select the intersecting surfaces.
6. Select the handle; the cup intersects with the handle, as shown in Figure 13-45.



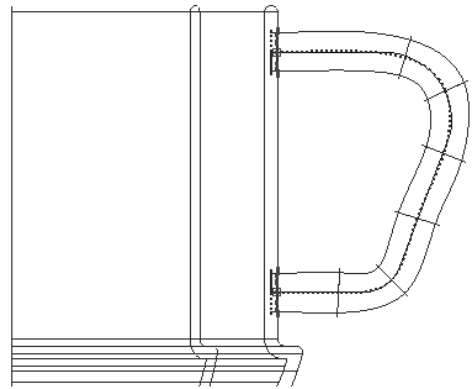
### Note

*Depending on the initial parameters set, the model may be in the shaded or wireframe mode. In case, it is in the shaded mode, you need not turn off its shading.*



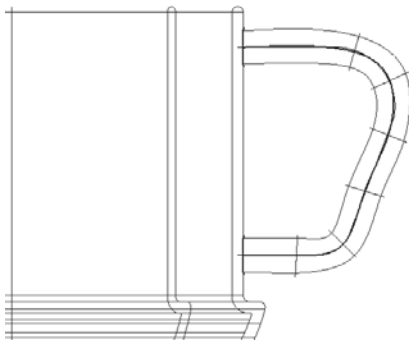


*Figure 13-44 Cup and its handle*

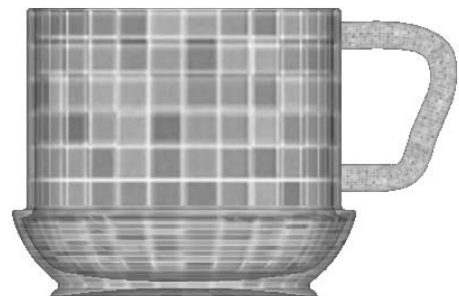


*Figure 13-45 Intersection of cup with its handle*

7. Trim the unwanted surface portions on both the cup and the handle by using the **Trim** tool. Figure 13-46 shows the cup and its handle after trimming the unwanted surfaces. Figure 13-47 shows the complete model.



*Figure 13-46 Cup and handle after trimming*



*Figure 13-47 Complete model*



### Note

The model shown in Figure 13-47 has been rendered. You can display the model simply by using the hardware or diagnostic shading.

## Evaluating Mass Properties

After creating the model, you need to evaluate its mass properties by using the **Mass properties** tool, and then save these properties in a text file.

1. Select entire model and then choose the **Mass properties** button from the **Evaluate** tab in the **Palette**; the **Mass Properties Editor** showing the unit, area, volume, and centroid of the current model is displayed.
2. Choose the **Extract To File** button; the **Save Mass Properties Data** dialog box is displayed.



- 3. Specify the location and name of the text file to be saved.
- 4. Next, choose the **Save** button; the mass properties are saved in the specified text file.

**Checking the Model for Problems**

The model may have some problems that may prevent successful data transfer while being exported to other software. You need to check these problems, if having, by using the **Check model** tool.

- 1. Double-click on the **Check model** button in the **Evaluate** tab of the **Palette**; the **Check Model Options** dialog box is displayed.
- 2. Select the **Both**, **Visible**, and **Errors** radio buttons from the **Check**, **Objects**, and **Report** areas, respectively, in the **Check Model Options** dialog box.
- 3. Choose the **Check** button in this dialog box; the **Check Model Results** window showing possible problems in the model is displayed, as shown in Figure 13-48.



Check Model Results				
File Pick Sort				
Name	Copies	Short Edges	Multiple Knots	Int Tan Discont
profile1			42	✗
profile2			4	✗
revolve			u=42, v=0	✗

Figure 13-48 The **Check Model Results** window for model



**Note**  
The results obtained in the **Check Model Results** window may be different from the results shown in Figure 13-48. This window is given only for your reference.

**Saving the Model**

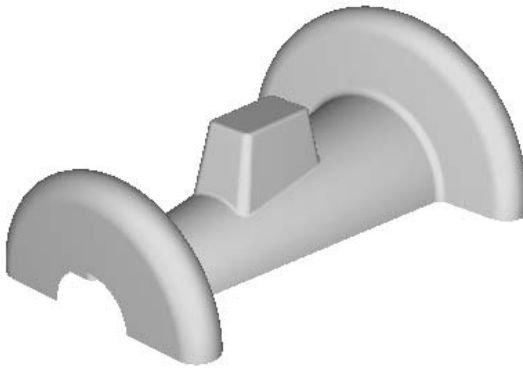
- 1. Save the model with the name and location given below:

`\\aliasdesign_2010\\c13_tutorials\\c13_tut01.wire`

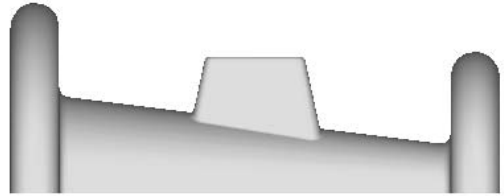
**Tutorial 2**

In this tutorial, you will create the model, as shown in Figure 13-49. The side view of the model is shown in Figure 13-50. After creating the model, you will check its edges for continuity. Also, you will check the maximum and minimum curvature of different surfaces in the model and evaluate errors in the model that can prevent the model from successful data transfer to other software packages.

(Expected time: 45 min)



**Figure 13-49** Model for Tutorial 2



**Figure 13-50** Side view of the model

The following steps are required to complete this tutorial:

- a. Start a new wire file.
- b. Create the base surface by using the **Revolve surface** tool.
- c. Create the protruding surface using the **Skin surface** tool and then close its upper edge by using the **Set planar** tool.
- d. Intersect the base surface with the protruding surface by using the **Intersect** tool.
- e. Trim unwanted surfaces from the model by using the **Trim** tool.
- f. Create round surfaces by using the **Round** tool.
- g. Check surface edges for continuity by using the **Surface continuity** tool.
- h. Evaluate the maximum and minimum curvature on the model by using the **Min/max curvature** tool.
- i. Check the model for errors by using the **Check model** tool.
- j. Stitch the model into one shell by using the **Shell stitch** tool.
- k. Save the file.


### Starting a New Wire File

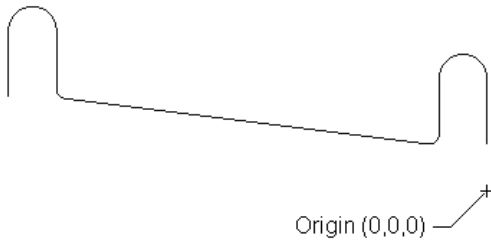
1. Choose **File > New** from the menu bar; a new Design wire file gets started and four windows are displayed on the screen. You can change the window display by first choosing the **Layouts** option from the menu bar first and then selecting the required window from the layer flyout.
2. Choose **Layouts > Left** from the menu bar or press the F6 key; the left window expands and fits the entire screen.

### Creating the Base Surface

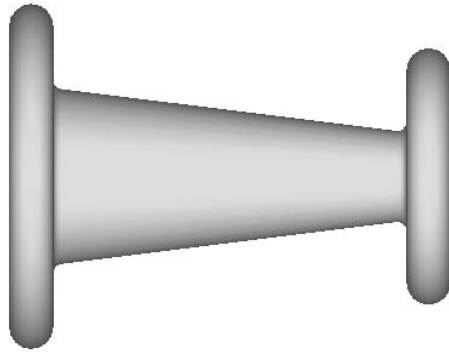
You need to create the profile of the model by using different curve tools and revolve it around the X-axis using the **Revolve surface** tool.

1. Create the profile of the base surface in the **Left** window, as shown in Figure 13-51.

2. Move the pivot point of the profile to the origin of window by using the **Set pivot** tool.
3. Double-click on the **Revolve surface** button in the **Surfaces** tab of the **Palette**; the **Revolve Options** dialog box is displayed. 
4. Select the **X** radio button from the **Revolution Axis** area and enter **180** in the **Sweep Angle** edit box.
5. Choose the **Go** button in the dialog box and then select the profile; the revolved base surface is created, as shown in Figure 13-52.




*Figure 13-51 Profile of the base surface*

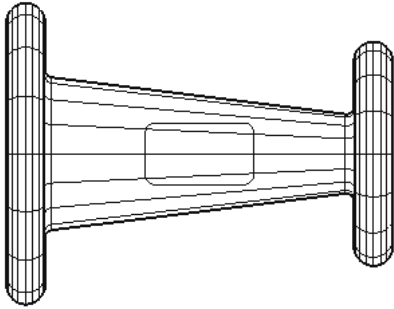


*Figure 13-52 Base surface*

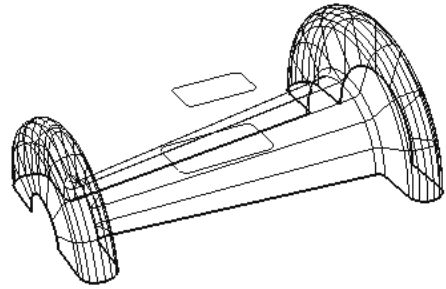
## Creating the Protruding Surface

The protruding surface is created by using the **Skin surface** tool.

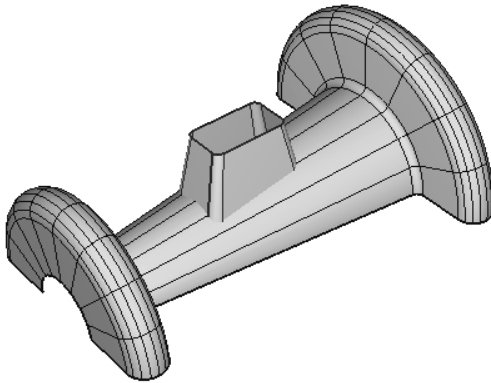
1. Create the profile for the protruding surface, as shown in Figure 13-53.
2. Choose **Layouts > Perspective** from the menu bar or press F8; the **Perspective** window expands and fits the entire screen.
3. Create a duplicate copy of this profile and scale it down. The profile along with its duplicate copy is shown in Figure 13-54.
4. Create the protruding surface between the profile and its duplicate copy by using the **Skin surface** tool, as shown in Figure 13-55.
5. Create the planar surface at the top edge of the skin surface by using the **Set planar** tool. The model after creating the planar surface is displayed, as shown in Figure 13-56. 



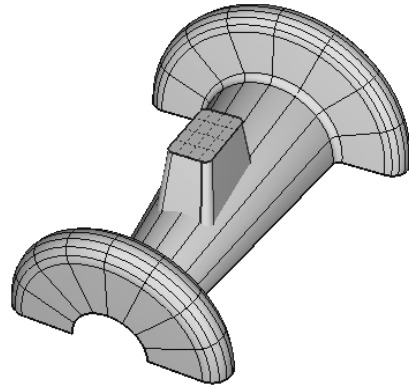
*Figure 13-53* Profile for the protruding surface



*Figure 13-54* Profile and its duplicate copy



*Figure 13-55* Protruding surface



*Figure 13-56* Planar surface

## Intersecting the Surfaces

You need to intersect the base surface with the skin surface by using the **Intersect** tool. The curves-on-surface generated by the intersection of these surfaces are used to trim the unwanted surfaces.

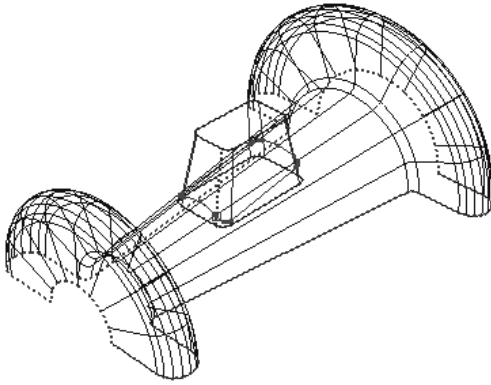
1. Choose **Project > Intersect** from the **Surface Edit** tab in the **Palette** and then select the base surface; the **Go** button is displayed at the lower right corner of the active window.
2. Choose the **Go** button and then select the protruding surface; the surfaces intersect with each other and curves-on-surface are generated, as shown in Figure 13-57.



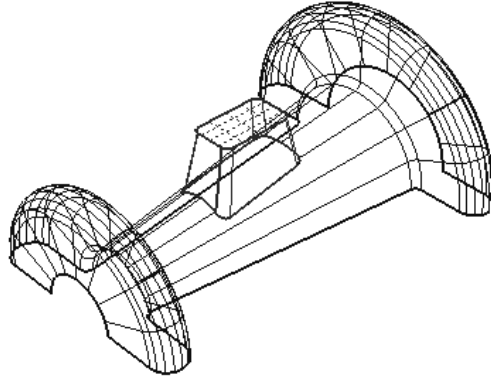
## Trimming the Surfaces

After intersecting the surfaces, you need to trim the unwanted surfaces by using the **Trim** tool.

1. Trim the unwanted surface portions on both the base surface and the protruding surface by using the **Trim** tool. Figure 13-58 shows the model after trimming the unwanted surfaces.



*Figure 13-57 Surfaces after intersection*



*Figure 13-58 Model after trimming the surfaces*

## Creating Rounds

After trimming the surfaces, you need to create rounds at intersection edges by using the **Round** tool. Also, you need to create another round between the protruding surface and planar surface.

1. Choose the **Round** button from the **Surfaces** tab in the **Palette** and then select the intersecting edge; a radius manipulator is displayed at the selected edge. Also, the two buttons, **Build** and **Revert**, are displayed at the lower right corner of the active window.
2. Adjust the radius of the round and then choose the **Build** button; the round is created at the intersection edges.
3. Similarly, create rounds between the protruding surface and the planar surface. The model after creating both rounds is displayed, as shown in Figure 13-59.



### Note

*If all edge segments are not selected at one time, modify the radius value of the selected edge segment. After modifying the radius value, select other edge segments and then choose the **Build** button to create a round.*

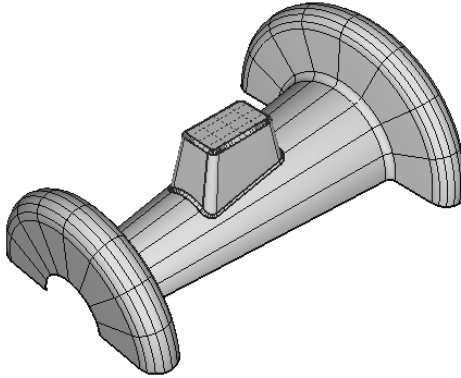
## Checking Edges for Continuities

After creating the model, you need to check whether the model has achieved positional continuity or not. You can do so by using the **Surface continuity** tool. After checking the continuity status of edges, you can delete the continuity locators.

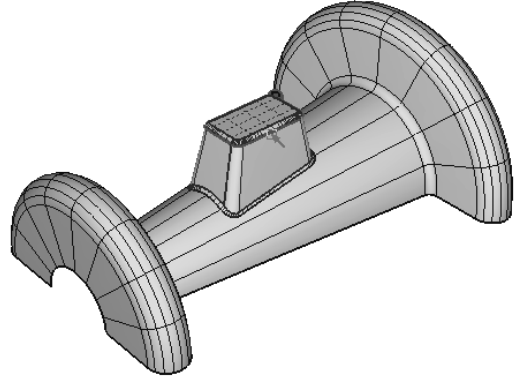
1. Double-click on the **Surface continuity** button in the **Evaluate** tab of the **Palette**; the **Surface Continuity Options** dialog box is displayed.



2. Select the **Positional Continuity** radio button from the **Find** area and then choose the **Go** button in the **Surface Continuity** dialog box.
3. Select the required edge, as shown in Figure 13-60; the continuity locator is displayed on it.



**Figure 13-59** Model after creating rounds




**Figure 13-60** Continuity locator displayed at the selected edge



#### Note

*If surfaces are connected or the gap between them is in the tolerance range, the positional continuity locator is displayed at the selected edge. If surfaces are not connected or the gap between them is not beyond tolerance range, the deviation is evaluated at the selected edge.*

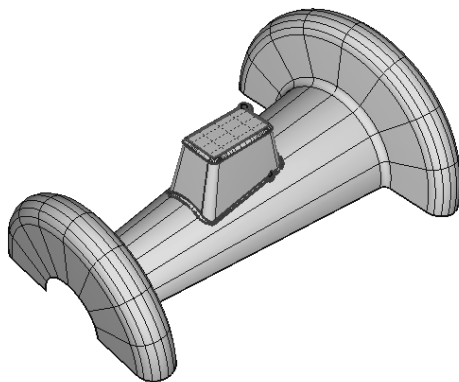
4. Select other edges of the model to check whether positional continuity has been achieved or not. The model displaying positional continuity locators at edges is shown in Figure 13-61.
5. Next, choose the **Pick locator** button from the **Pick** tab in the **Palette** and drag a pick box around the entire model; all continuity locators are highlighted in green. 
6. Press the DELETE key; the **confirm** message box is displayed.
7. Choose the **Yes** button from the **confirm** message box; the locators are deleted from the model.

## Evaluating Minimum and Maximum Curvatures

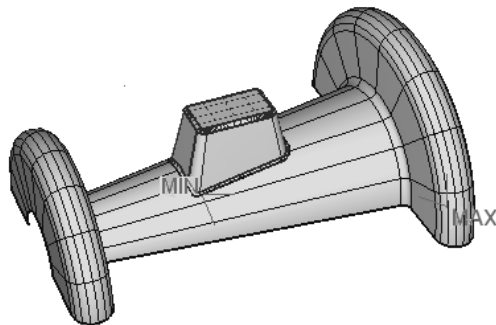
After checking the continuity between edges, you need to evaluate the model for minimum and maximum curvatures.

1. Choose the **Min/max curvature** button in the **Evaluate** tab of the **Palette**; the **MIN** and **MAX** curvature locators are displayed on the model, as shown in Figure 13-62. Also, the **Min/Max Curvature** window is displayed.





**Figure 13-61** Continuity locators displayed at all edges of the model



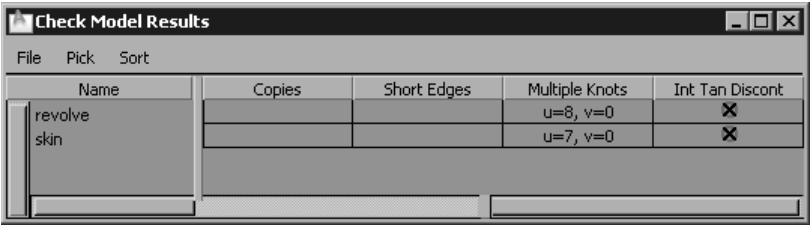
**Figure 13-62** Minimum and maximum curvature locators

2. This window displays details about the minimum and maximum curvatures in the U and V directions of the surface. Close this window after viewing the curvature results.

### Checking the Model for Errors

You can check the model for errors by using the **Check model** tool.

1. Double-click on the **Check model** button in the **Evaluate** tab of the **Palette**; the **Check Model Options** dialog box is displayed.
2. Select the **Surfaces**, **All**, and **Errors** radio buttons from the **Check**, **Objects**, and **Report** areas, respectively, in the **Check Model Options** dialog box.
3. Choose the **Check** button in this dialog box; the **Check Model Results** window showing all possible problems, is displayed, as shown in Figure 13-63.



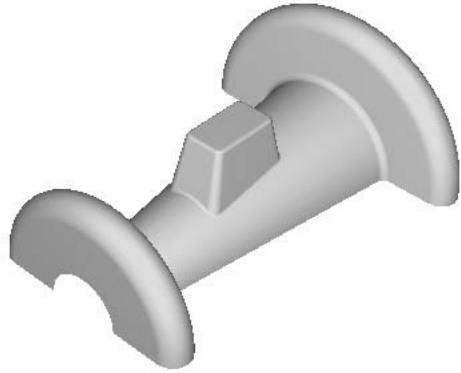
**Figure 13-63** The **Check Model Results** window

### Stitching the Surfaces

After doing all evaluations of the model, you need to stitch the model using the **Shell stitch** tool to ensure that there is no gap anywhere in the model.



1. Double-click on the **Shell stitch** button in the **Surface Edit** tab of the **Palette**; the **Stitch Control** dialog box is displayed. Also, the two buttons, **Stitch** and **Next** in the inactive state are displayed at the lower right corner of the active window.
2. Clear the **Keep originals** check box from the **Stitch Control** dialog box and then select entire model by dragging a pick box around it; the **Stitch** button gets activated.
3. Choose the **Stitch** button; all surfaces of the model get stitched into one shell.
4. Select entire shell and then choose the **Multi Color** button from the **Shading** area of the **Control Panel**, the model is shaded. Next, choose **WindowDisplay > Toggles > Model** from the menu bar; the model is displayed, as shown in Figure 13-64.



**Figure 13-64** Final model after stitching

### Saving the Model

1. Save the model with the name and location given below:

`\aliasdesign_2010\c13_tutorials\c13_tut02.wire`

### Self-Evaluation Test

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

1. Surface evaluation tools enable you to verify whether the created model is fit to be exported to other software packages. (T/F)
2. The **Min/Max Curvature** information box displays a detailed information about the curvature, radius, and type of surface. (T/F)
3. You can save the mass properties of a model in a text file. (T/F)
4. You can create a new canvas in the **Paint** mode by choosing **Canvas > New canvas** from the menu bar. (T/F)
5. You cannot import a bmp image as a new image layer or a mask layer into an existing or a new canvas. (T/F)
6. To view the comb on a continuity locator, click on the continuity with the \_\_\_\_\_ mouse button.

7. The vertical color ramp is also known as \_\_\_\_\_.
8. The canvas plane is a \_\_\_\_\_ dimensional window that is used for drawing, sketching, and painting.
9. You can create masks by using the \_\_\_\_\_ or marquees.
10. A layer that contains shapes is known as \_\_\_\_\_.

## **Review Questions**

**Answer the following questions:**

1. Which of the following is not a mass property?
  - (a) Surface area
  - (b) Volume
  - (c) Centroid
  - (d) Curvature
2. Which of the following layers is displayed in the bottom section of the **Canvas Layer Editor** window?
  - (a) Shape
  - (b) Mask
  - (c) Image
  - (d) None of above
3. Which of the following schemes is known as the additive primary color scheme?
  - (a) RGB
  - (b) CMY
  - (c) HSL
  - (d) HSV
4. Which of the following entities represents the continuity status locator of curves when you select the **Simple Display** check box in the **Curve Continuity Options** dialog box?
  - (a) Circle
  - (b) Rectangle
  - (c) Line
  - (d) Ellipse
5. Which of the following tools is used to create parting lines on a model?
  - (a) **Horizon**
  - (b) **Check model**
  - (c) **Mass properties**
  - (d) **Deviation map**
6. The positional discontinuity in curves is represented by a line with the distance between two curves mentioned on it. (T/F)
7. The **Mass Properties Editor** displays the units and mass properties of an object. (T/F)

8. Data is not lost while importing or exporting a model. (T/F)
9. The \_\_\_\_\_ acts as transparent sheets arranged one over the other.
10. Cyan, magenta, and yellow colors are known as \_\_\_\_\_ primary colors.

## **Exercise**

### **Exercise 1**

In this exercise, you will create the model, shown in Figure 13-65. After creating the model, you will check it for errors. Also, you will evaluate its mass properties and save the results in a text file.  
(Expected time: 30 min)



*Figure 13-65 Model for Exercise 1*

**Answers to Self-Evaluation Test**

**1.** T, **2.** T, **3.** T, **4.** F, **5.** F, **6.** middle, **7.** deviation ramp, **8.** two, **9.** magicwand, **10.** shape layer