



Advanced  
Manufacturing  
Solutions

# What's New in | PowerSHAPE 2011

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PowerSHAPE 2011

# What's New

| PowerSHAPE

## **PowerSHAPE**

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### **Patent Information**

Emboss functionality is subject to patent number GB 2389764 and patent applications US 10/174524 and GB 2410351.

Morphing functionality is subject to patent application GB 2401213.

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# What's New in PowerSHAPE 2011

The following areas have been updated in PowerSHAPE 2011:

- Using PowerSHAPE 2011 (see page 1).
- Import and Export enhancements. (see page 2)
- User interface (see page 2).
- Surface modelling (see page 14).
- Solid modelling (see page 17).
- Triangle modelling (see page 22).
- Delcam Draft (see page 53).

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## Using PowerSHAPE 2011

The following changes have been made to the general operation of PowerSHAPE

- All models opened in PowerSHAPE 2011 use model version 22. When PowerSHAPE 2011 is installed and run for the first time, the initialisation work will open the latest NEW\_MODEL\_MASTER\_XX you have (where XX <22) and save it as NEW\_MODEL\_MASTER\_22.
- PowerSHAPE now allocates memory for the database dynamically, based on the contents of the model. Previously, a fixed amount of memory was reserved when starting PowerSHAPE. Allocating memory dynamically reduces the amount of memory required, especially for Parasolid-based models.

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# Import and Export enhancements

PowerSHAPE 2011 includes the following import/export enhancements:

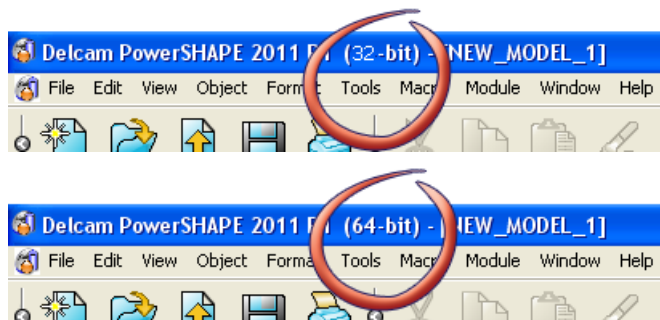
- Parasolid binary formatted files (.x\_b) can now be imported and exported. Previously only Parasolid text files (.x\_t) could be used.
- Colours are a useful way to define machining intent, or pass other useful information between systems. The use of colours when importing and exporting Parasolid files has been updated:
  - The wireframe colour of each face is exported to .dgn and Parasolid formats.
  - Colours defined in other systems are retained when Parasolid files are imported into PowerSHAPE.
- Component names are now preserved when exporting the components as solids, for example when exporting an assembly component as .dgn file.
- Use **Flatten assembly hierarchy** to flatten the assembly hierarchy (see page 7) when exporting or importing Parasolid.

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## User interface

Changes have been made to the interface in PowerSHAPE 2011:

- The PowerSHAPE title bar indicates whether you have installed a 32-bit or 64-bit version.



- Menus (see page 2)
- Toolbars (see page 3)
- Dialogs (see page 7)

## Menus

The following changes have been made to the menus:

- Options have been added to the **Object > Mesh** sub-menu to reflect the changes to the **Mesh** toolbar:

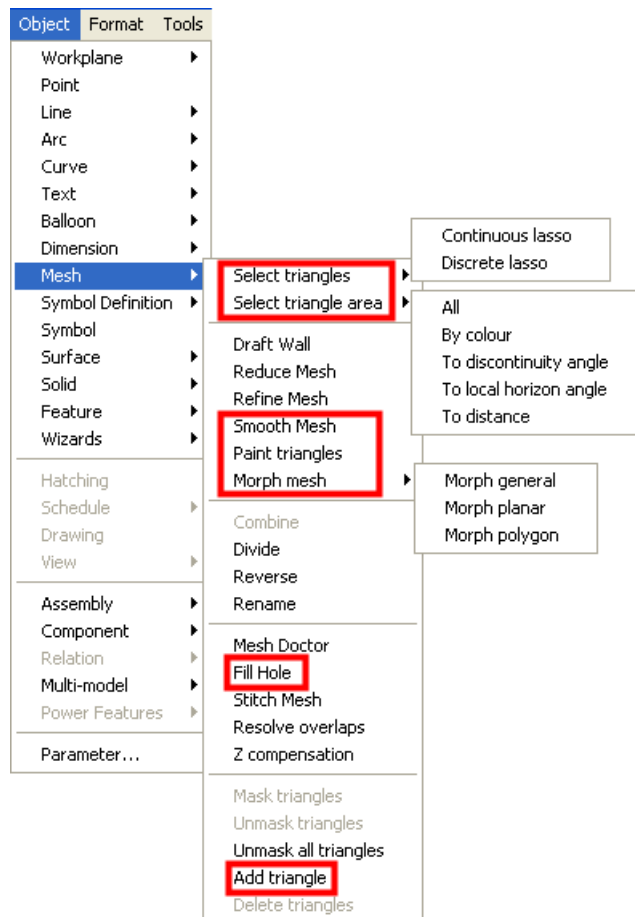
Select triangles (see page 23)

Select triangle area (see page 24)

Smooth mesh (see page 42)

Paint triangles (see page 42)

Morph mesh (see page 28)





## Toolbars

Changes to the toolbars in PowerSHAPE 2011 are described in the following sections.

- Mesh Edit toolbar (see page 4).
- Schedule toolbar (Delcam Draft) (see page 4).
- General Edits toolbar (see page 5).
- As part of the continuing integration of the embedded CopyCAD functionality into PowerSHAPE, a number of buttons have been removed from the embedded **CopyCAD** toolbar. Full details can be found in Triangle Modelling. (see page 22)
- The **Solid Edit** toolbar is now displayed when one or more solids are selected.

### Mesh Edit toolbar

The following changes have been made to the **Mesh Edit** toolbar:

- There are a large number new buttons on the **Mesh Edit** toolbar.

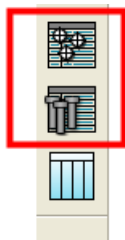


- As well as changes to the functionality, there are some changes to licensing.

Full details of new functionality and licence changes can be found in Triangle Modelling (see page 22).

## Schedule toolbar (Delcam Draft)

The **Schedule** toolbar has been updated.



The previous **Schedule** option has been replaced by two new options:




**Hole schedule** (see page 55)





**Ejector schedule** (see page 55). Use this to produce a schedule for ejector pins, core pins and return pins.

## General Edits toolbar

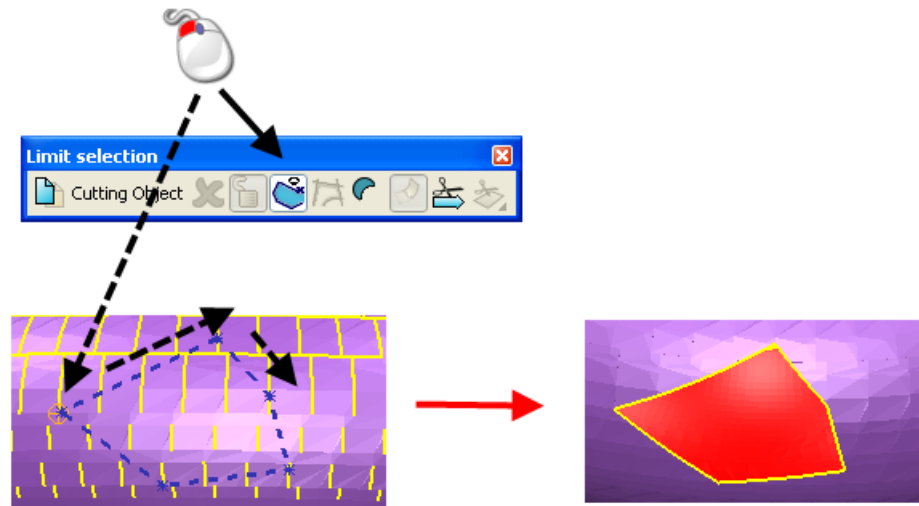
The following changes have been made to the **General Edits** toolbar:

- Use **Align items**  to adjust the alignment of the model using the **Align items** dialog.
- **Limit to polygon** has been added to the **Limit selection** toolbar.




1. Select a mesh.
2. Select **Limit selection**  (*Limit flyout, General Editing toolbar*) to display the **Limit selection** toolbar.
3. Click  (*Limit selection toolbar*).



- Click the start point and click additional points to create a polygon on the mesh. Click the start point again.




The polygon is used as the cutting tool.

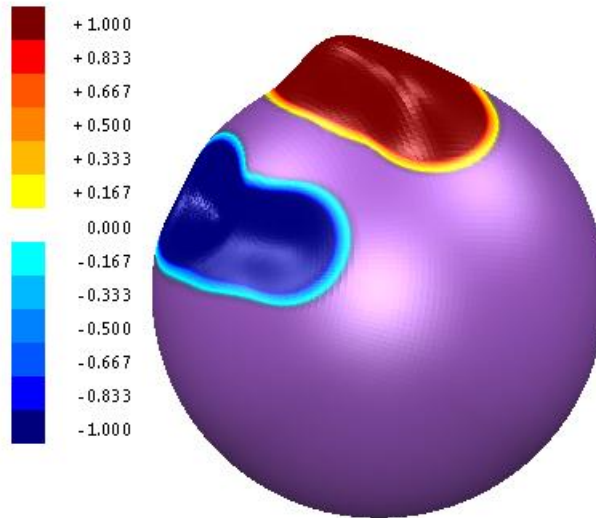
- **Show deviations**  has been added to the **Sculpting** toolbar. Use this option to see the difference between the original and sculpted models when using the editing tools.




- Select a mesh.
- Select  (*General Edits toolbar*) to display the **Sculpting** toolbar.
- Click  (*Sculpting toolbar*) and move the mouse to add material to the mesh.



4. Click  (*Sculpting toolbar*) to see the difference between the original and the sculpted model. The analysis scale lets you see the percentage material that you have added to the model.

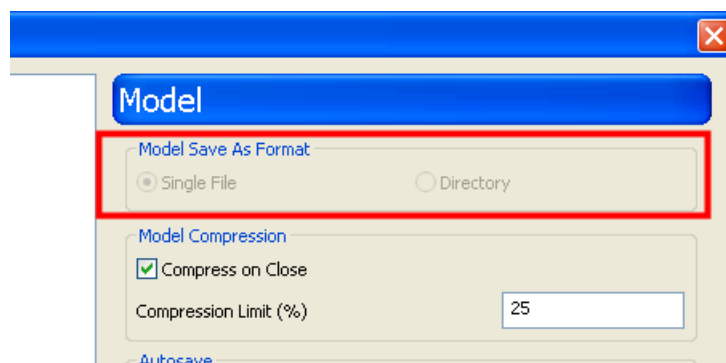



Alternatively, click  before adding the material to see the dynamic changes.

## Dialogs

Changes have been made to dialogs in the following areas of PowerSHAPE 2011:

- Solid modelling (see page 9)
- Delcam Draft (see page 11)
- Triangle modelling (see page 11)
- General editing (see page 12)
- PowerSHAPE models are saved as a **Single File** by default. The **Directory** option is no longer available on the **Tools > Options > File > Model** dialog.

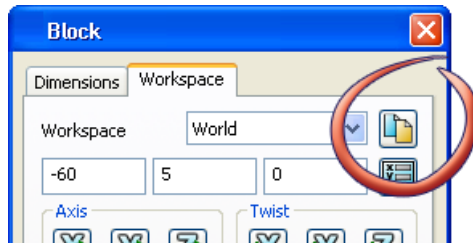


- Create a copy of the workplane by clicking  when using one of the following edit dialogs:

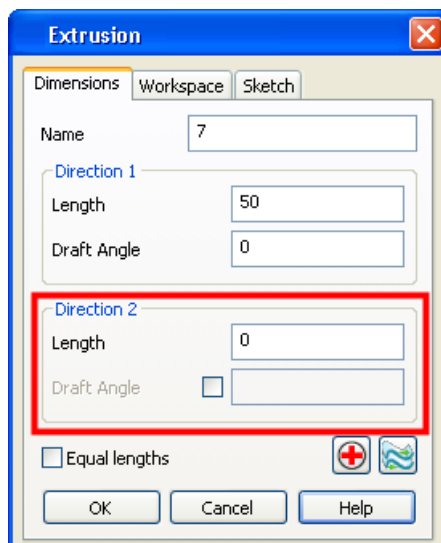
primitive surfaces.

primitive solids.

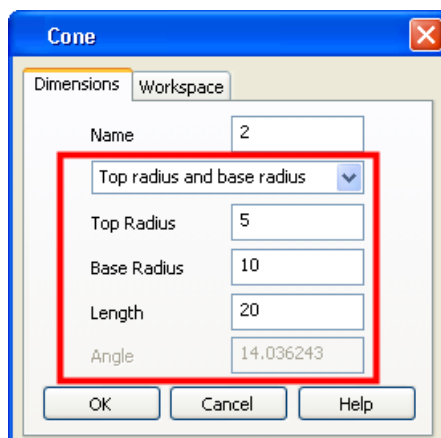
primitive solid features.



- Primitive extrusion dialogs have been modified to let you define a second draft angle on the **Dimension** tab.



- Changes have been made to the **Cone** dialog box, so that you can specify which dimensions are used to define the primitive cone.



1. Select one of the following options from the drop-down list:

**Base radius and top radius**

## Top radius and angle

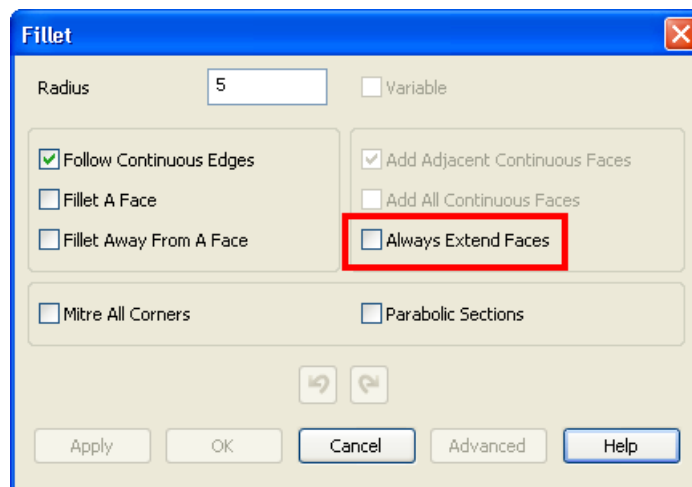
## Base radius and angle

2. Enter the dimensions for the cone. The option that you selected from the drop-down list determines which options that are available on the dialog. It also affects the dimensions that can be changed using graphical editing.

## Solid modelling

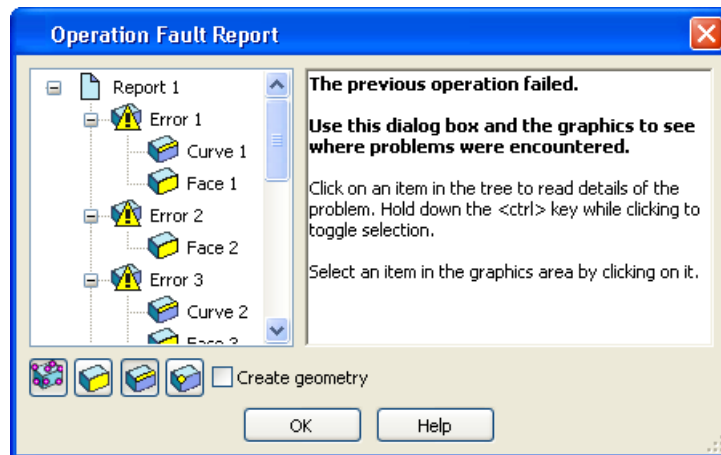
The following changes have been made to solid modelling dialogs:

- Creating and editing a **Solid Chamfer** and **Solid Fillet** has been streamlined. The same dialog is now used to create and edit a feature, making chamfers and fillets consistent with other features.
- **Solid Fillet** and **Edit Solid Fillet** dialogs now include **Always Extend Faces**.



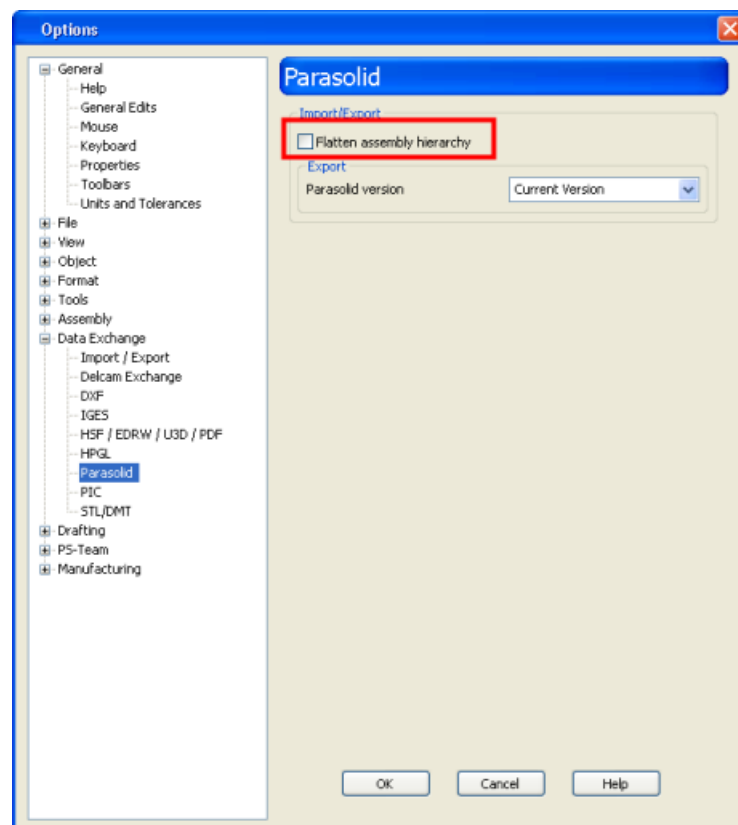
- If selected, this option will always extend any face that will overlap the fillet, in order to maintain a fixed radius. For further details see Solid features (**see page 19**).

- **Solid Hints** displays the **Operation Fault Report** when an operation fails when working with Parasolid solids.



Use the information in the two sections of the dialog to help identify the areas of the model where problems were encountered (see page 21).

- **Flatten assembly hierarchy** has been added to the Parasolid **Options** dialog.
  1. Select **Tools > Options > Data Exchange > Parasolid** to display the **Options** dialog.




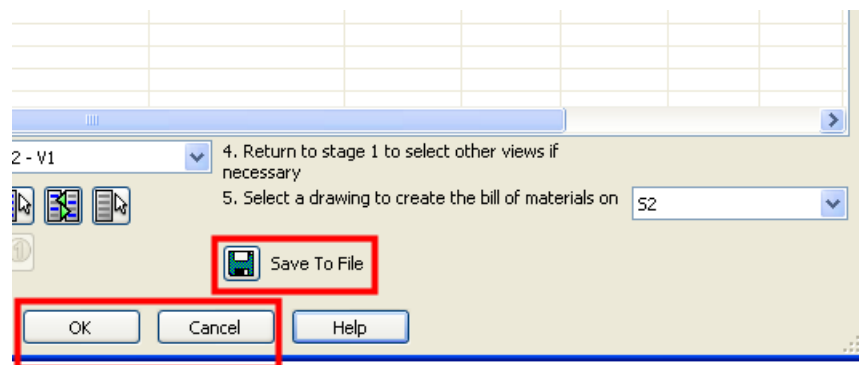
2. Select **Flatten assembly hierarchy** to flatten the assembly hierarchy when exporting or importing Parasolid.

This option should be used when exporting Parasolid files to a system that does not support assemblies. It can also be used if you wish to work with the geometry as individual solids without the assembly structure.

## Delcam Draft

The following changes have been made to the dialogs in Delcam Draft:

- There is a new **Options** dialog for **Bill of Materials**:
  1. Select **Tools > Options > Drafting > Bill of Materials** to display the **Options** dialog (see page 54).
  2. Enter **Rough Oversize Value**. This value is the additional allowance that is added to the bounding box to calculate the stock size required to make the item.
- The **Bill of Materials** and **Schedule** dialogs have been updated as follows:
  - The **Drawing** and **Save** buttons have been replaced by the  **Save to file**. This button toggles between drawing the BOM/schedule on the diagram and saving to a file using the **Save As** dialog.
  - **Dismiss** has been replaced by **OK** and **Cancel**. These operate in the normal way.

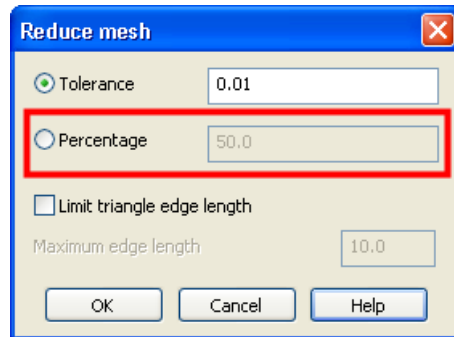




## Triangle modelling

The following change has been made to the dialogs in triangle modelling:

- **Reduce Mesh** dialog has been updated to include a **Percentage** option.

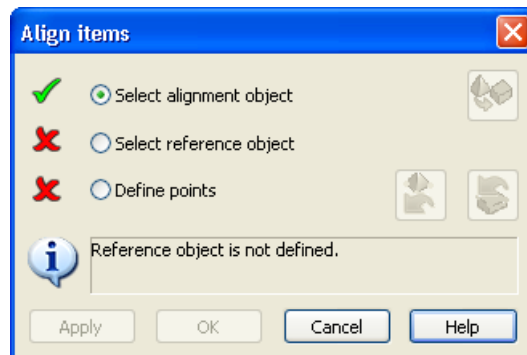


Enter a value to specify the percentage of the original number of triangles you want in the new mesh. For further details see Other changes to triangle modelling (see page 51).

## General editing

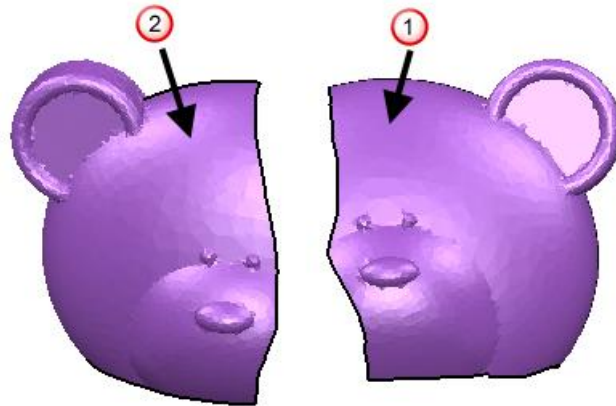
Use the **Align items** dialog to adjust the alignment of the model.


1. Click  (General edits toolbar) to display the **Align items** dialog.



2. Select the alignment object ①. This is the object that will move.

3. Click **Select reference object** and select the object ②. This is the object that will not move.



If necessary, click  to move the alignment object alongside the reference object. This is not necessary in this example.

4. Click **Define points** and select points on the alignment and reference object. You must define at least three sets of points; the information panel tells you that you have sufficient points selected.

Choose points in one of the following ways:

- all points on alignment object followed by all points on the reference object.
- pairs of points, one on the alignment object and one on the reference object.



5. Adjust the point selection as appropriate, using the following buttons:



to undo the last selected point on the alignment object.



to undo the last selected point on the reference object.

6. Click **Apply**. The alignment object will move so that the selected points are aligned.



Continue to select objects and points to adjust the alignment as necessary.


7. Click **OK** to accept the changes and close the dialog box.

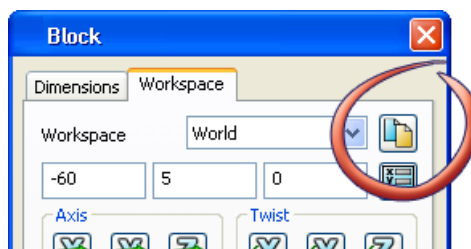


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## Surface modelling

Changes have been made to the following areas of surface modelling:

- Primitive cone (see page 15).
- Primitive extrusion (see page 15).
- Surface from a mesh (see page 16).
- When editing a primitive surface, create a copy of the workplane by clicking  on the dialog.

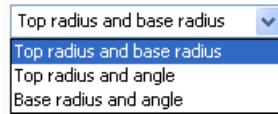


The new workplane does not become the active workplane.

## Primitive cone (surface)

A primitive cone is now specified as follows:

1. Enter the **Length** of the cone.
2. Select one of the options from the drop-down list.



Your selection determines the other options that are available on the dialog. It also affects the dimensions of the cone that can be changed using graphical editing.

3. Enter the other parameters.
4. Click **OK**.

## Primitive extrusion

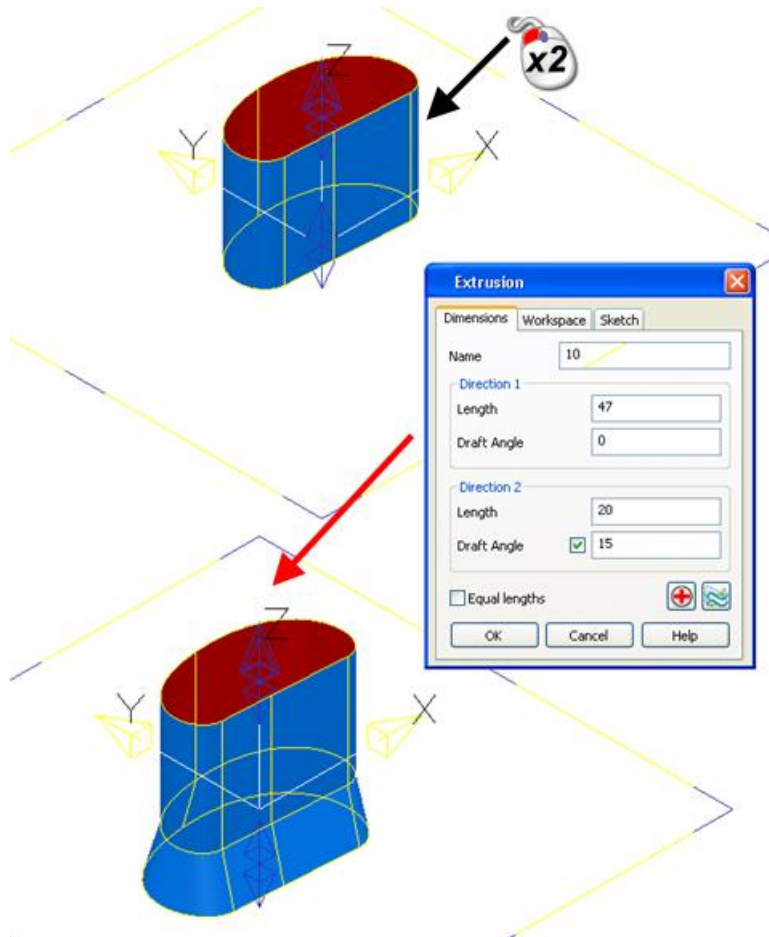
Use the **Extrusion** dialog to define a draft angle for the negative length of a primitive extrusion.

1. Create an extrusion from wireframe.



2. Double click the extrusion to display the **Extrusion** dialog.

3. Enter the **Length** and **Draft Angle** for **Direction 1**. The model will be updated to reflect the values you entered. The model below has a **Length** of 47 and a **Draft Angle** of 0.



4. Enter the following values for **Direction 2**:

20 (**Length**)

15 (**Draft Angle**)

The model is updated to reflect the **Direction 2** values.

5. Click **OK**.

## Create surface from a mesh

The following functionality has been added to provide more flexibility when creating a surface from a mesh:

- Use the following operations when creating a surface from a mesh






Insert discontinuity to a surface edge.



Finish a surface edge.



Add an intermediate point to a surface edge. This option is also used to finish a surface contour, when the  is used to indicate the start point of the contour.

- Use  to undo points when creating the curve. Once the surface has been created,  cancels the whole surface creation.

---

## Solid modelling

Changes have been made to the following areas of solid modelling:

- Select one or more solids to display the **Solid Edit** toolbar. Use the buttons on the toolbar to convert the solids to surfaces or meshes, as required.



- The **Undo** button on the **Solid Doctor** dialog now allows each repair operation to be undone. Previous releases only allowed the last operation to be undone.
- Solid primitives (see page 17)
- Solid features (see page 19)
- Solid Hints (see page 21)

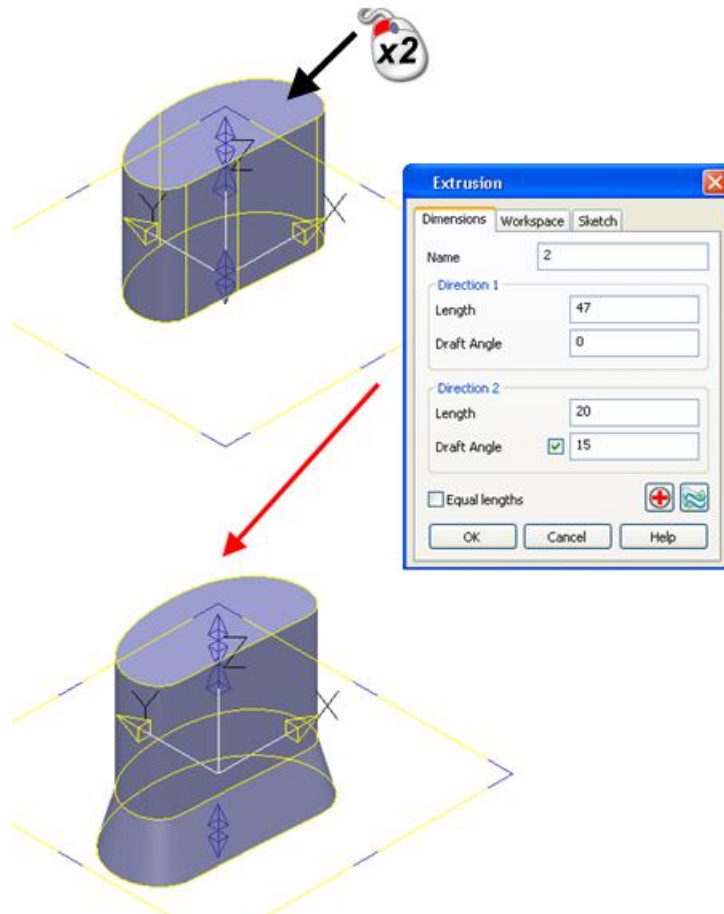
### Solid primitives

- Use the **Extrusion** dialog to define a draft angle for the negative length of a primitive extrusion.
  1. Create an extrusion from wireframe.



2. Double click the extrusion to display the **Extrusion** dialog.

3. Enter the **Length** and **Draft Angle** for **Direction 1**. The model will be updated to reflect the values you entered.




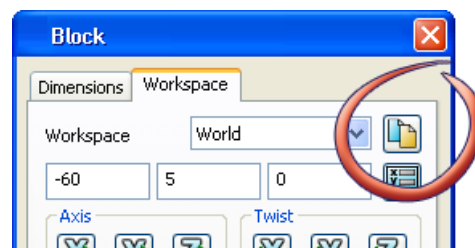
4. Enter the **Length** and **Draft Angle** for **Direction 2**. The model is updated to reflect **Direction 2** values:

20 (**Length**)

15 (**Draft Angle**)

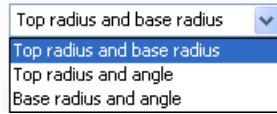
5. Click **OK**.

- When editing a primitive solid or primitive solid feature, create a copy of the workplane by clicking  on the dialog.



The new workplane does not become the active workplane.

- A primitive **Cone** is now specified as follows:
  1. Enter the **Length**.
  2. Select one of the options from the drop-down list.




3. Your selection determines the other options that are available on the dialog. It also affects the dimensions of the cone that can be changed using graphical editing.
4. Enter the other parameters.
5. Click **OK**.

## Solid features

The following changes have been made to modelling with solid features:

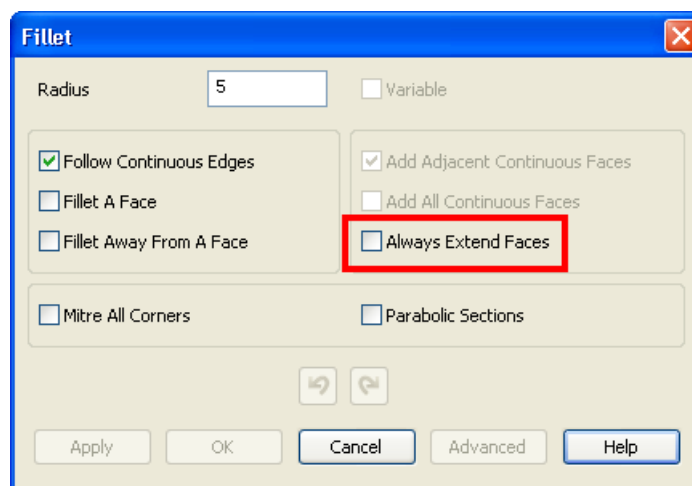
- The default creation mode has been removed from solid feature creation.




1. Click  (*Main toolbar*).

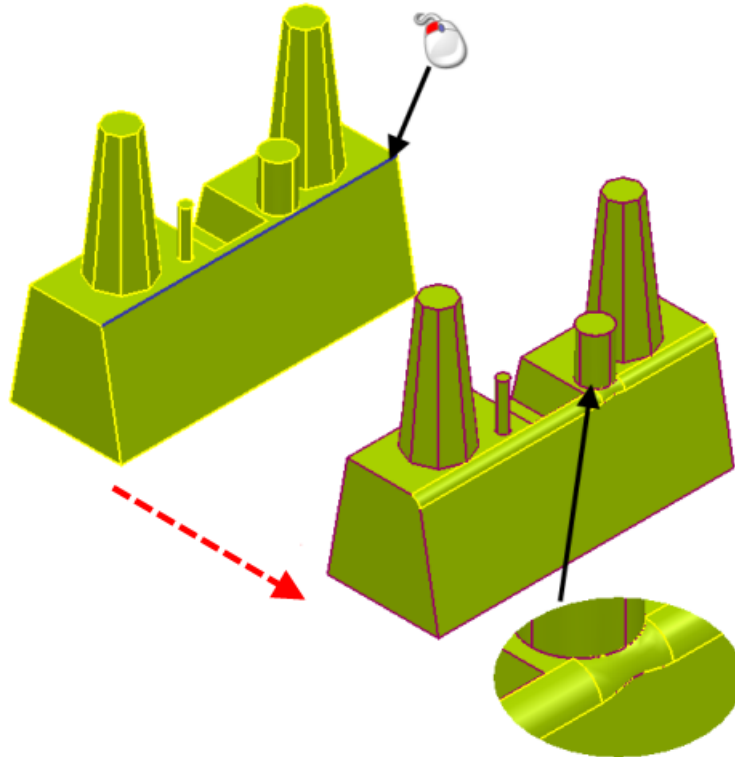
2. Select the required feature from the feature toolbar.


- **Edit Solid Chamfer** and **Edit Solid Fillet** dialogs have been revamped. The updated dialogs have a similar layout to the corresponding creation dialog.
- **Solid Fillet** and **Edit Solid Fillet** dialogs now include **Always Extend Faces**. If this option is selected, any face that will overlap the fillet is extended to maintain a fixed radius.



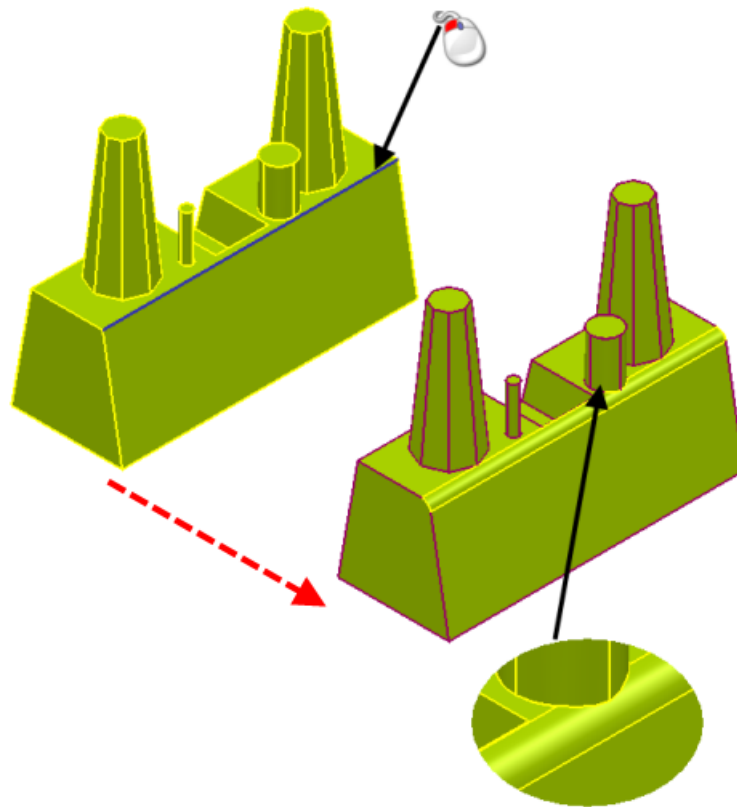


1. With the solid displayed, click  to display the **Fillet** dialog
2. Select edge of the fillet.
3. Click **Apply**. The fillet partially overlaps additional non-tangential geometry, giving an imperfect fillet.



4. Click  to undo the fillet.
5. Select **Always Extend Faces**.
6. Select the edge of the fillet.

7. Click **Apply**. The fillet radius is maintained.

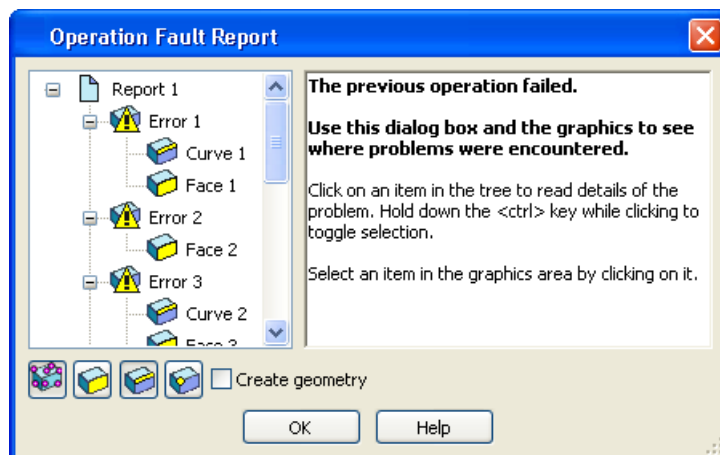


8. Click **OK** to accept the changes.

## Solid Hints

**Solid Hints** may help you identify the areas of a model that are causing problems.

If an operation fails when using a Parasolid solid, the Operation Fault Report dialog may be displayed.



The dialog indicates any problem areas when performing the operation. Use the options on the dialog to identify the area that requires attention.

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# Modelling with triangles

There are a large number of changes to triangle modelling in PowerSHAPE 2011. As well as changes to the functionality, there are some changes to licensing.

Full details of the changes to triangle modelling are described in the following sections:

- Mesh Edit toolbar (see page 22).
- Mesh Fixing and Editing toolbar (CopyCAD) (see page 48).
- Other changes to triangle modelling (see page 51).

A table showing the complete list of functionality that is available with different licences is included (see page 49). To improve clarity in the documentation, licensed options are indicated using the following icons:

★ Requires a PowerSHAPE Pro, Delcam Designer or CopyCAD Pro licence.

★★ Requires a PowerSHAPE Pro or CopyCAD Pro licence.

★★★ Requires a CopyCAD Pro licence.

## Mesh Edit toolbar

- The following buttons have been added to the **Mesh Editing** toolbar.

Lasso (see page 23)

Select Triangles (see page 24)

Smooth mesh (see page 42) ★

Paint Triangles (see page 42) ★

Morphing triangles (see page 28) ★

Add triangle (see page 46) ★★

Each button also has a corresponding option on the **Object > Mesh** sub-menus.

- Licensing of **Draft wall** has changed. It now requires a PowerSHAPE Pro, Delcam Designer or CopyCAD Pro licence. ★

- The following buttons have been restyled



**Reduce Triangles** ☆



**Refine Triangles** ☆






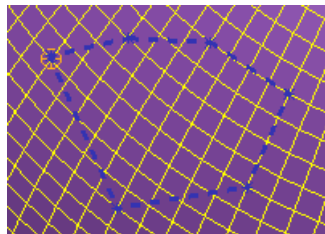
**Delete Triangles**

## Lasso

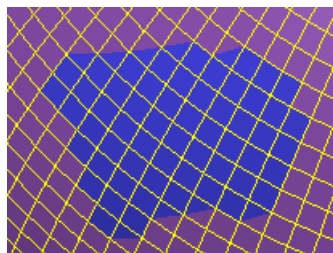
Use the new **Lasso** flyout on the **Mesh Edit** toolbar to pick triangles.



- Use  to pick triangles on a mesh using a continuous lasso. Lasso functionality was added to the **Mesh Edit** toolbar in PowerSHAPE 2010 R2.
- Use  to pick triangles on a mesh using discrete lasso:
  1. With an active mesh, select  from the lasso flyout.
  2. Click the mesh to define the points on the boundary of the picking area.



3. Click the first point again to create the picking area. All the triangles that lie within picking area are selected.






*away from the model to deselect the selected triangles, but leave the mesh selected.*

*Use CTRL D to deselect the selected triangles and the model.*

## Select triangles

Use the new **Select triangles** flyout to select triangles on a mesh.

1. With a mesh active, click  to display the buttons on the Select triangles flyout.



2. Select one of the following options from the **Select triangles** flyout:



**Select all triangles in the mesh**



**Select triangles with the same colour**



**Select triangle area to discontinuity angle**





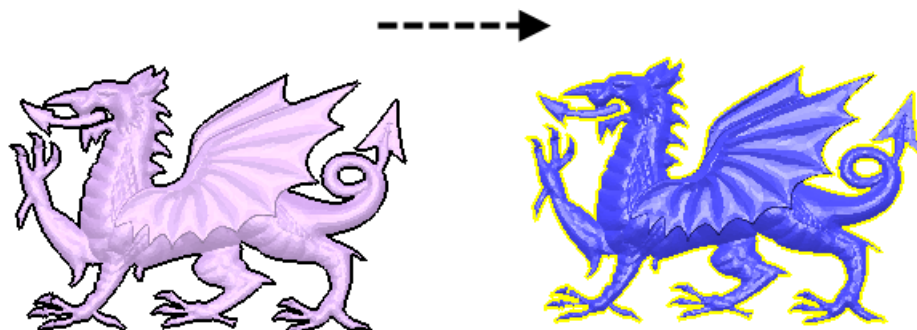
**Select triangle area to local horizon angle**





**Select triangle area to distance**

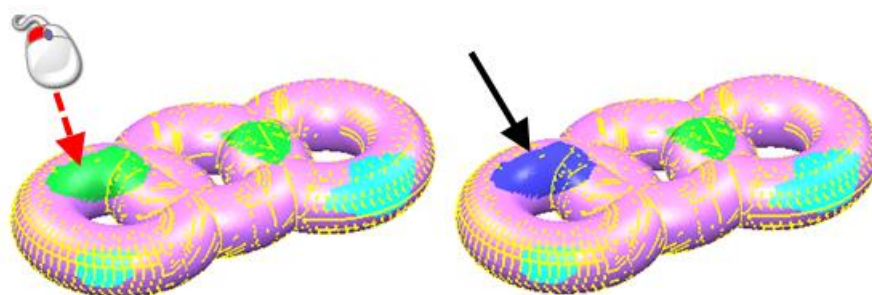
## Selecting all triangles in a mesh

1. Select a mesh and click  to display the **Select Triangles** flyout.
2. Click  to select all the triangles in the mesh.





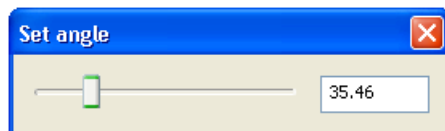
## Selecting triangles with the same colour

1. Select a mesh that contains some coloured triangles.
2. Click  to display the **Select Triangles** flyout.
3. Click .
4. Click in the coloured area that you wish to select. All the triangles in that are selected.

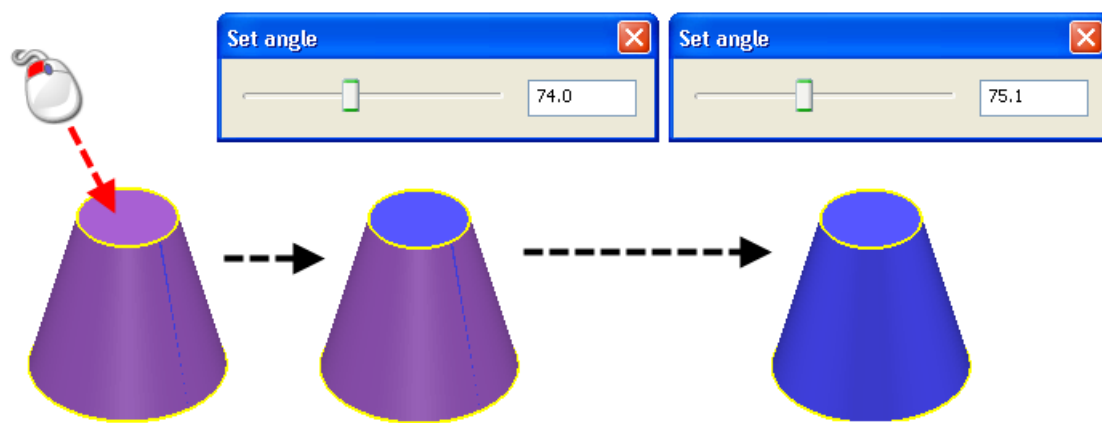


## Select triangle area to discontinuity angle



1. Select a mesh and click  to display the **Select Triangles** flyout.
2. Click  to display the **Set angle** dialog.

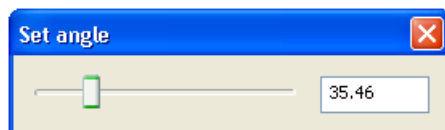


3. Click the model. Triangles are selected that lie within the discontinuity angle defined by the slider. Use the slider to increase or decrease the triangles that are selected. The example shows a cone with a  $15^\circ$  angle.

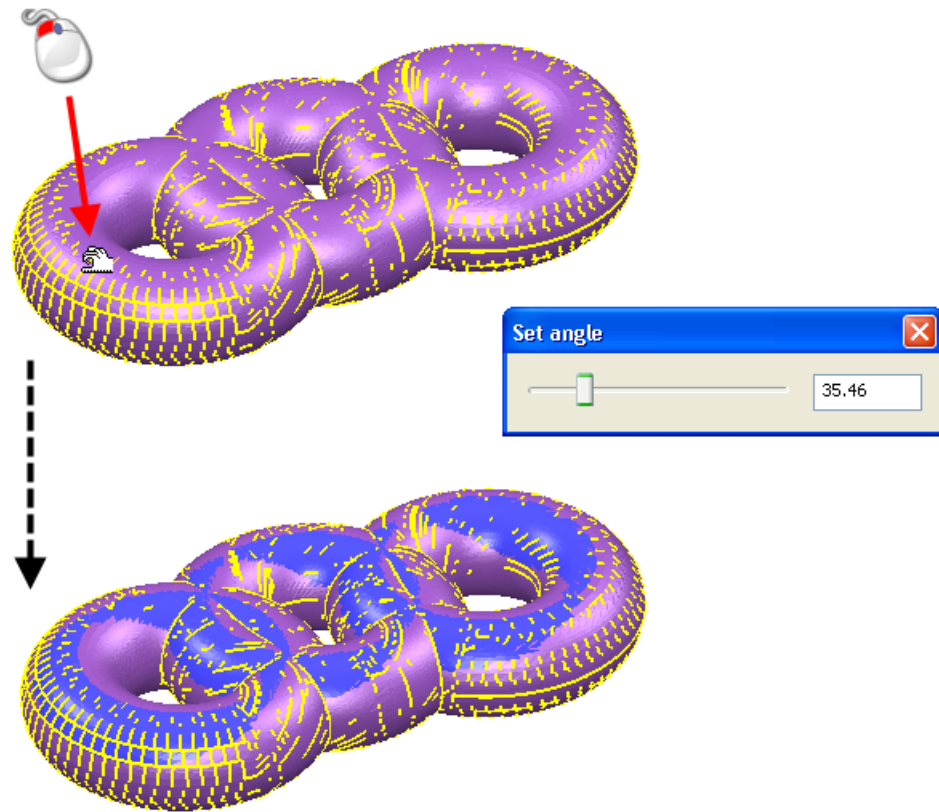


## Select triangle area to local horizon angle

1. Select a mesh and click  to display the **Select Triangles** flyout.
2. Click  to display the **Set angle** dialog.





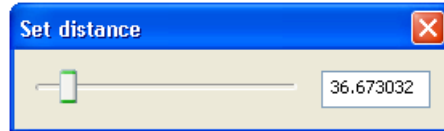
3. Click the model. Triangles are selected that lie within the angle defined by the slider in the **Set angle** dialog. Use the slider to increase or decrease the triangles that are selected.



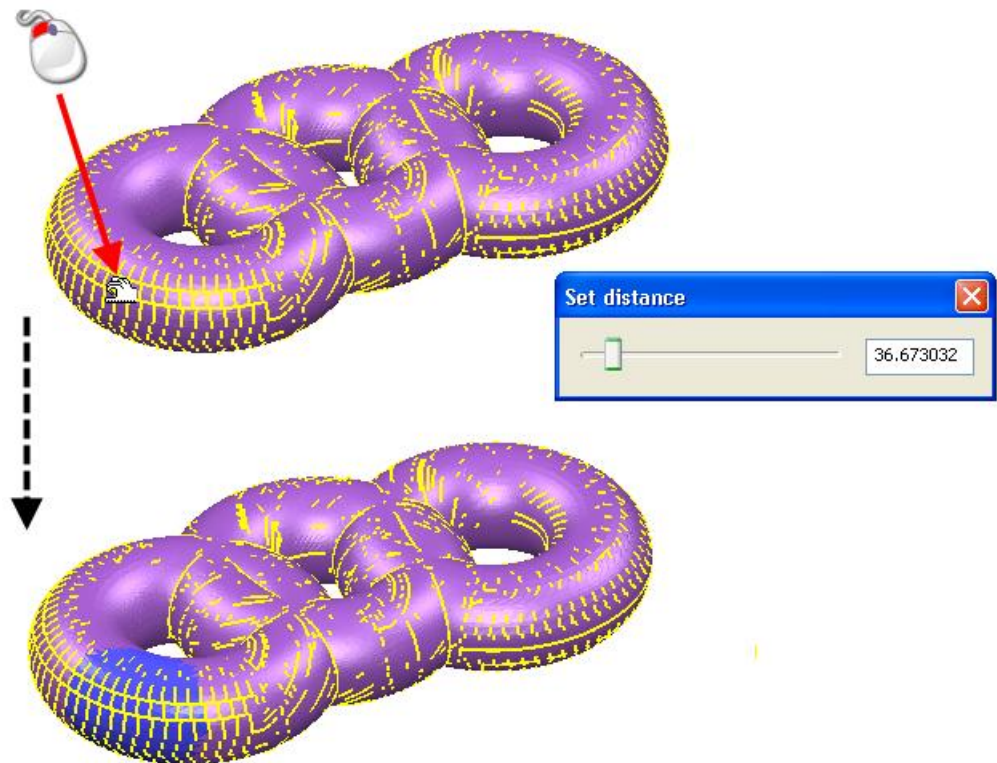


## Select triangle area to distance

1. Select a mesh and click  to display the **Select Triangles** flyout.
2.  to display the **Set Distance** dialog.



3. Click the model. Triangles are selected that lie within the distance defined by the slider in the **Set distance** dialog. Use the slider to increase or decrease the triangles that are selected.



## Morph mesh


A **Morph** flyout has been added to the **Mesh Edit** toolbar. ☆

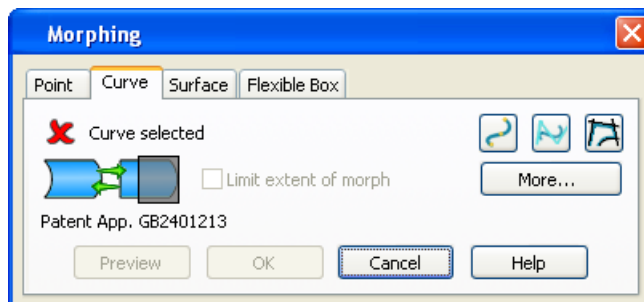


Use the buttons on the flyout to

- Use morph techniques to change the shape of the mesh (see page 29).
- Morph triangle regions that are defined by planes (see page 29).
- Morph triangle regions that are defined by polygons (see page 35).

## General morphing

1. Select  from the morphing flyout to display the **Morphing** dialog. This is the same as the dialog used with solid morphing.

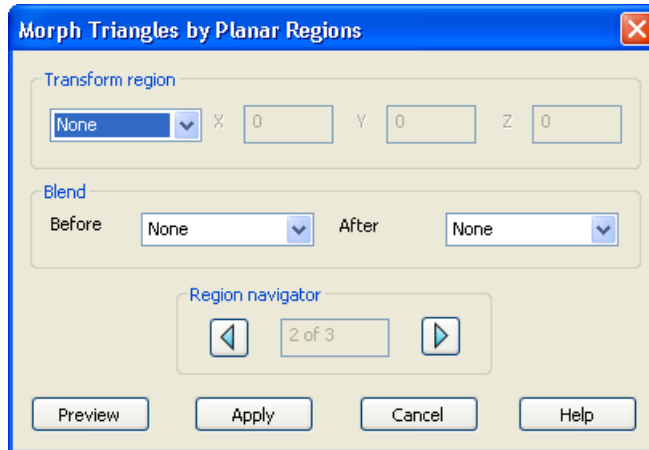


2. Use the tabs on the dialog to deform the active mesh into a different shape.

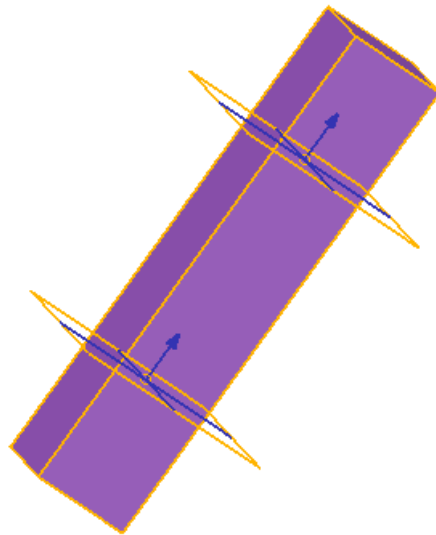
### *Morphing triangle regions defined by planes*

You can transform one or more regions of the model. The regions are defined by planes.






1. Select  from the morphing flyout to display the **Morph Triangles by Planar Regions** dialog.




Two planes are used to define the regions of the model.

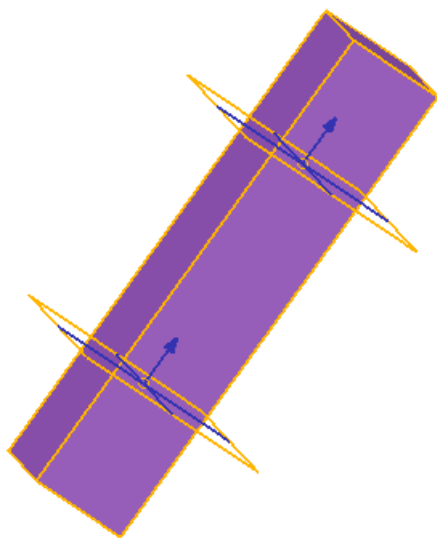


2. Adjust the position of a planes by double-clicking the plane and modifying the coordinates using the **Plane** dialog.
3. Select an option from the **Transform region** drop-down list:
  - **None** - This is the default setting. There will be no blending between the central region and the outer regions.
  - **Move** - Use this option to move the region between the two planes. Enter X, Y and Z values to indicate the amount to move along the axes.

- **Rotate** - Use this option to rotate the region between the two planes. Enter a rotation value. Use  to define a new rotation origin.
  - **Scale** - Increase or decrease the size of the region by entering a scale **Factor**. For example if you want to increase the size of the region by 20% enter a **Factor** of 1.2. By default, **Factor** will be applied in all directions. Use    locks to suppress scaling in a specific axis.  
Use  to define a new position for the scale origin.
  - **Offset** - Define the offset for the region by entering a **Distance**.
4. Specify the **Blend** to be used **Before** and **After** the transform region. Additional planes are added to the model that define the blend region.
- The following blend types are available:
- **None**. If you select this option, there will be no blend between the transformed region and the adjoining regions.
  - **Smooth**. Select this option, to create a smooth curve between adjoining transform regions. The curve is tangential at both edges of the blend region.
  - **Linear** - Select this option to create a straight-line blend between the two transform regions.
  - **Smooth to Sharp** - The transition uses a tangential curve next to the first transform region, and a linear blend next to the second transform region.
  - **Sharp to smooth** - The transition uses a linear blend next to the first transform region, and a tangential curve next to the second transform region.
5. Use the buttons on the **Region navigator** to specify the region to be morphed.
6. Click **Preview** to view the morph.
7. Click **Apply** to morph the region and continue to display the dialog. This lets you make further modifications to the same region or modify a different region.

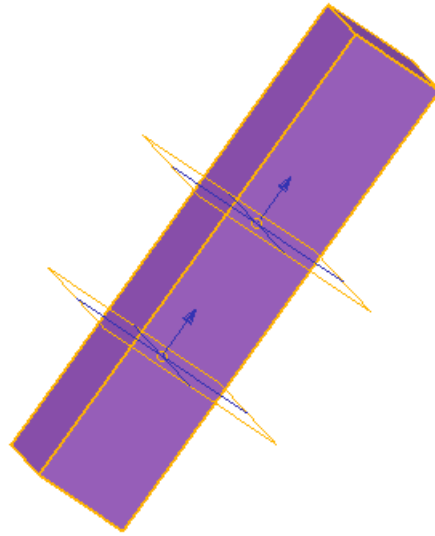
*Example of morphing triangles using planar regions.*

1. Select the mesh.
2. Click  to display the **Morph Triangles by Planar Regions** dialog. Planes are used to indicate the different regions on the model.

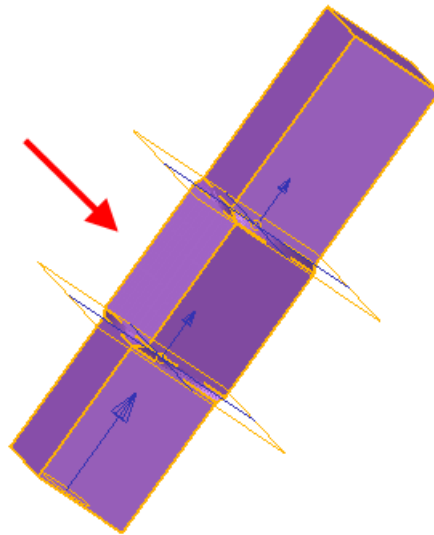


3. Double click the top plane to display the **Plane** dialog.
4. Define the top plane as follows:
  - a. Set Z to 30.
  - b. Click **OK** to move the plane.
5. Double click the bottom plane to display the **Plane** dialog.
6. Define the bottom plane as follows:
  - a. Set Z to 15.

- b. Click **OK** to move the plane. The top and bottom planes now look like this:



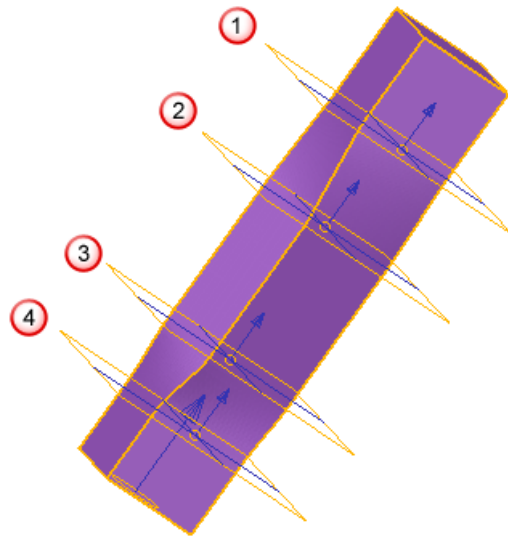
7. Define the **Transform region** as follows:
- Select **Rotate** from the drop-down list.
  - Set the **Angle** to 10.
  - Click **Preview**. The region between the two planes is rotated by 10 degrees.




8. Specify the **Blend** as follows:
- Select **Smooth** from the **Before** drop-down list.
  - Select **Linear** from the **After** drop-down list.
  - Click **Preview**.

The bottom blend between ③ and ④ is created using the smooth algorithm

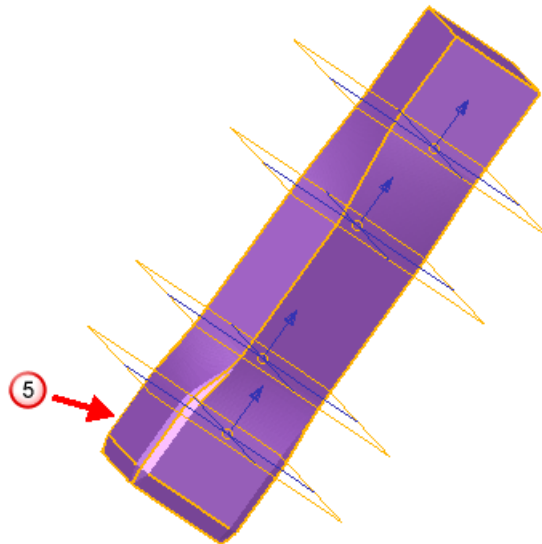
The top blend, between ① and ②, is created using the linear algorithm.



9. Press  to move to the bottom region ⑤.

10. Create an offset region as follows:

- a. Select **Offset** from the **Transform Region** drop-down list.
- b. Set **Distance** to 1.
- c. Click **Preview**. Region ⑤ is offset by 1.

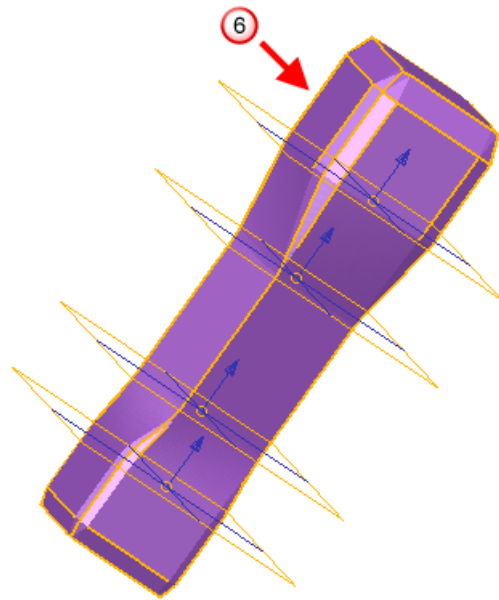


11. Press  twice to move to the top region ⑥.

12. Create an offset region as follows:

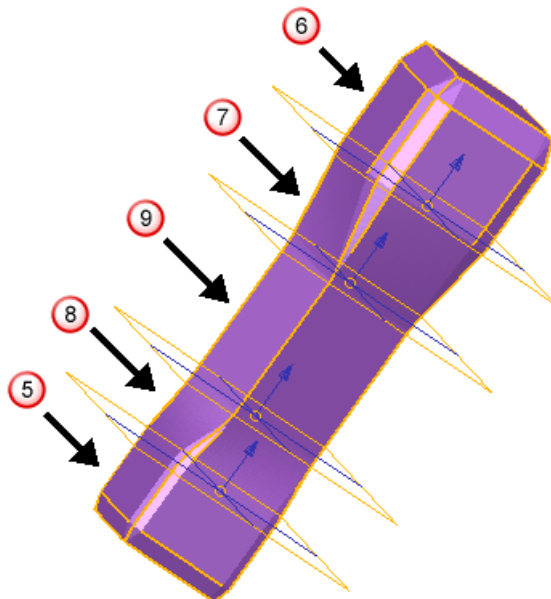
- a. Select **Offset** from the **Transform Region** drop-down list.
- b. Set **Distance** to 2.

c. Click **Preview**. Region ⑥ is offset by 2.



Steps 1 to 12 have modified the original model as follows:

- Region ⑨ is rotated by 10°.
- Bottom blend ⑧ uses the smooth algorithm.
- Top blend ⑦ uses the linear algorithm.
- Bottom region ⑤ is offset by 1.
- Top region ⑥ is offset by 2.



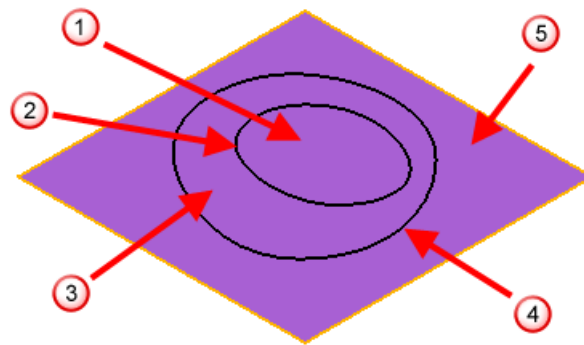


### *Morphing triangle regions defined by polygons*

Morph regions on a model, using polygons to define the areas. Using polygons lets you reshape up to three regions:

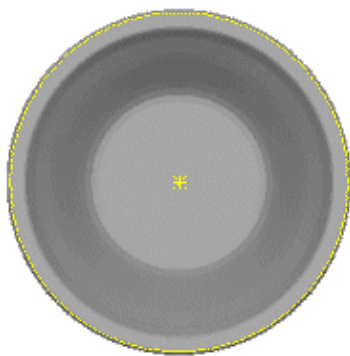
- within an inner polygon,
- outside an outer polygon
- between the two polygons

Use the following example to identify these regions and the polygons:



- ① Inner transform region.
- ② Inner polygon.
- ③ Blend region.
- ④ Outer polygon.
- ⑤ Outer transform region.

Using this method, it is possible to move a single point and blend the move into the rest of the model. This technique is useful to counteract the sagging of the centre of a part after manufacture.




The example uses the centre of gravity to compensate for sag that will occur at the centre of a plate after it has been made. In this case the centre of the plate is moved by 2.0 and a smooth blend applied to the outer polygon around the edge of the plate.

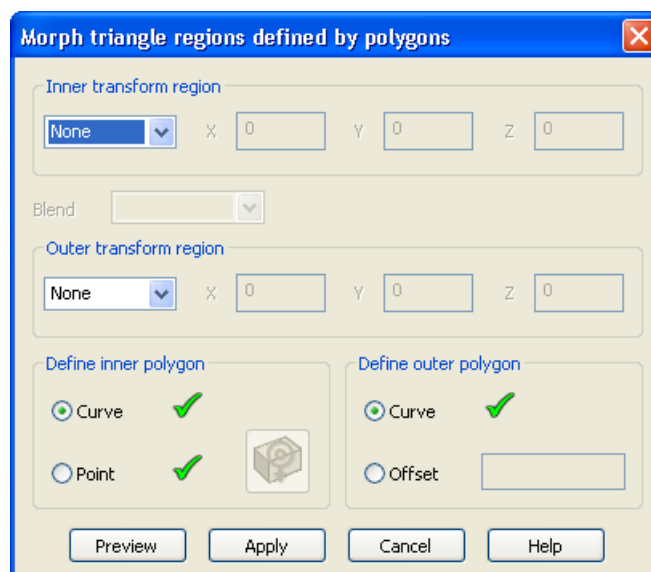
## Creating the inner and outer polygons

Use one of the following methods to create the inner and outer polygons:







- Sketch a polygon on the model, using as many points as required and clicking on the first point to close the polygon.
- Select an open model; the boundary will be used as the polygon. You can use triangle or closed polyline models. Use this option for the outer polygon, to create a polygon around the boundary of the model. If you use this method, you can define an inner polygon and blend from this to the edge of the model.
- Select a single point for the inner polygon. This has the effect of creating a blend region from the model's centre of gravity to the outer polygon.

## To morph the regions defined by polygons

1. Select a mesh that includes sketched inner and outer polygons.
2. Select  from the morphing flyout to display the **Morph Triangles by Planar Regions** dialog.

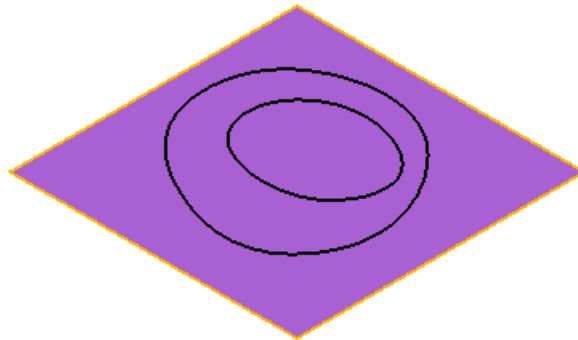



3. Select an option from the **Inner transform region** drop-down list:
  - **None** - This is the default setting. There will be no morphing of the inner region.

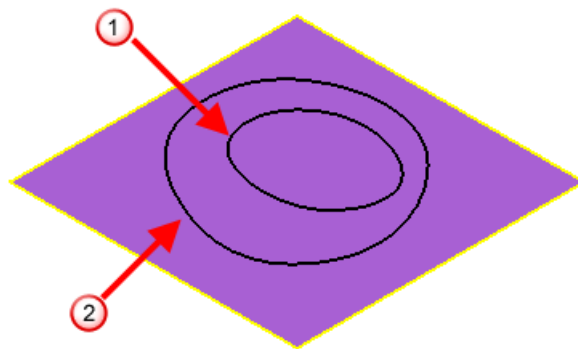
- **Move** - Use this option to move the inner region. Enter X, Y and Z values to indicate the amount to move along the axes.
  - **Rotate** - Use this option to rotate the inner region. Enter a rotation value. Use  to define a new rotation origin.
  - **Scale** - Increase or decrease the size of the region by entering a scale **Factor**. For example if you want to increase the size of the region by 20% enter a Factor of 1.2. By default, **Factor** will be applied in all directions. Use    locks to suppress scaling in a specific axis.  
Use  to define a new position for the scale origin.
  - **Offset** - Define the offset for the region by entering a **Distance**.
4. Select the type of blend to be used. The following blend types are available in the drop-down list:
    - **Linear** - Select this option to create a straight-line blend between the two transform regions.
    - **None** - If you select this option, you cannot define an **Outer transform region** or select an outer polygon. There will be no blend between the transformed region and the adjoining regions;
    - **Smooth** - Select this option to create a smooth curve between adjoining transform regions. The curve is tangential at both edges of the blend region.
  5. Select an option from the **Outer transform region** drop-down list. If you selected a blend type, you must specify how you want to morph the region outside the outer polygon.
  6. Choose one of the following options to **Define inner polygon**:
    - **Curve** and select the inner polygon.
    - **Point** and click  to select the **Centre of Gravity**.
  7. Choose one of the following options to **Define outer polygon**:
    - **Curve** and select the outer polygon.
    - **Offset** and enter the offset value.
  8. Click **Preview** to view the morph.
  9. Click **Apply** to morph the region and continue to display the dialog. This lets you make further modifications to the same region or modify a different region.

### *Example of morphing triangle regions defined by polygons - Two contours*

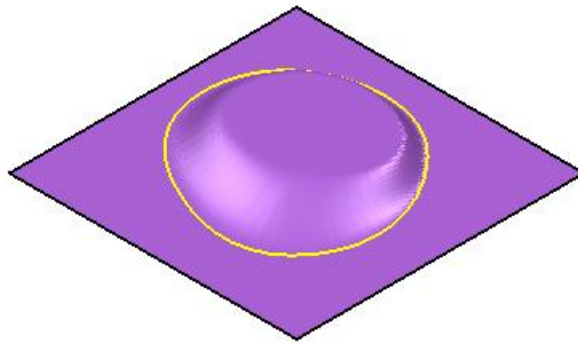
1. Select the mesh.



2. Click  to display the **Morph triangle regions defined by polygons** dialog.
3. Select **Move** from the **Inner transform region** drop-down list.
4. Enter a **Z** value of 5.
5. Select **Smooth** as the **Blend** type.
6. Click inner contour ①.
7. Click outer contour ②.



8. Click **Preview**.



This shows the following changes:

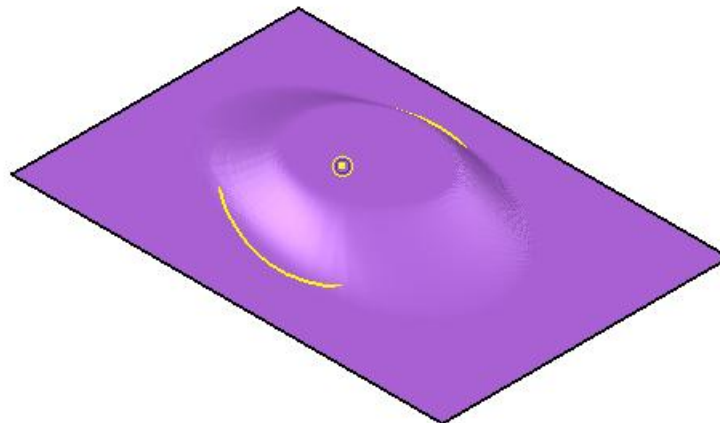
- The inner region has moved upwards by 5.
- Blend area (between the two contours) is created using the smoothing algorithm.

9. Select **Scale** from the **Outer transform region**.

10. Enter **1.5** as the scale **Factor**.

11. Click  to lock the X axis.

12. Click **Preview**.

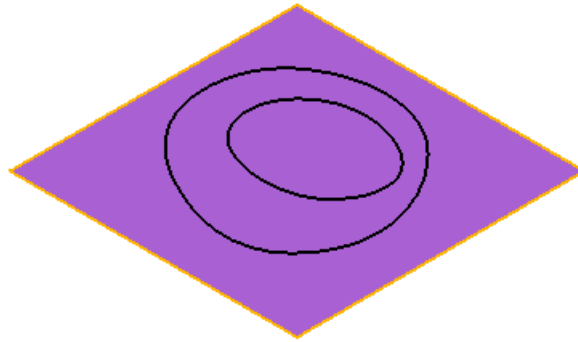




This shows that:

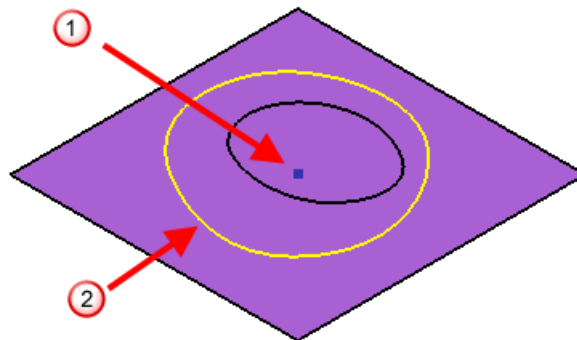
- The outer region is scaled by 1.5.
- The region has not been scaled in the X direction.

### Example of morphing triangle regions - contour and point

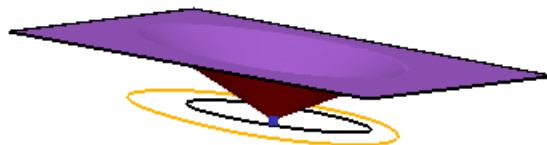
1. Select the mesh.



2. Click  to display the **Morph triangle regions defined by polygons** dialog.
  3. Select **Linear** from the **Blend** drop-down list.
  4. Select **Move** from the Outer transform region drop-down list.
  5. Enter a **Z** value of 10.
  6. Click **Point** to define the inner polygon.
  7. Click  to highlight the centre of gravity.
- The point is highlighted in blue ①
8. Click the outer contour ②.



9. Click **Preview** to display the model.



10. This shows that:

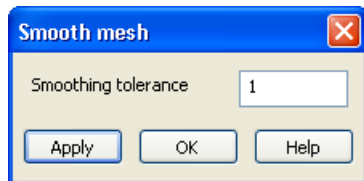
- The inner region (the point) has not moved.

- The outer region has been raised by 10.
- The blend area has been created using the linear algorithm.

## Smooth mesh

**Smooth mesh** has been added to toolbar. ☆

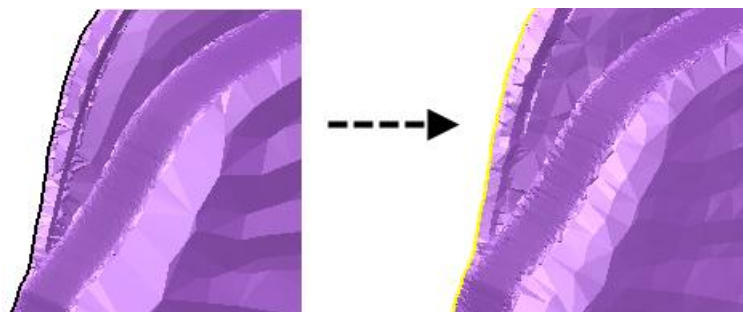
1. With a mesh selected, click  to display the **Smooth mesh** dialog.



Use this dialog to filter out noise in a mesh.

2. Enter a **Tolerance**. This distance is used to determine the nodes that are affected by the smoothing process.


In the example below, **Smoothing Tolerance** has been set to 20 so that the results of smoothing are clearly visible. Normally a much lower figure would be used.

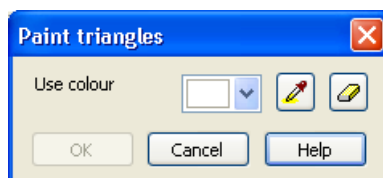


3. Click **Apply** to smooth the mesh and continue with smoothing.
4. When smoothing is complete, click **OK** to close the dialog.

## Paint triangles

**Paint Triangles** has been added to the toolbar. The functionality is also available from the **Format** menu. ☆

1. Click **Paint triangles**  to display the **Paint triangles** dialog.





2. Select the colour to paint the triangles, using one of the following methods:

- Click the drop-down list  to display the colour palette.




If the colour you want is not displayed in the palette, click **Other** button to display the **Colour** dialog. Create a custom colour by specifying the values for **RGB**, **Hue**, **Saturation** and **Luminosity**.

- To use a colour that is already used in the mesh, click  and then pick colour on the mesh. The picked colour is displayed in the colour drop-down list.
3. Pick the triangles to paint using:
    - box picking.
    - lasso (continuous or discrete (see page 23)).
    - one of the Select triangles options (see page 24).
  4. Use  to remove the colour from the selected triangles in the mesh.



## Fill holes

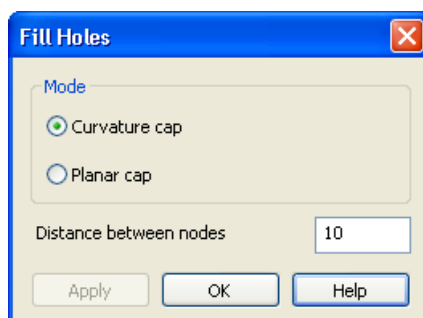
Use **Fill Holes**  to fill holes in the model by selecting the open boundaries. ★

If the hole to be filled covers an area of different curvature, split the hole into smaller regions, and fill them separately. This allows more complicated holes to be fixed without the need for full manual triangle editing. After selecting a hole to fill, you can pick two points on the boundary to split the hole into two regions. If the wrong side is highlighted by default, click to select the region that you want to fill.

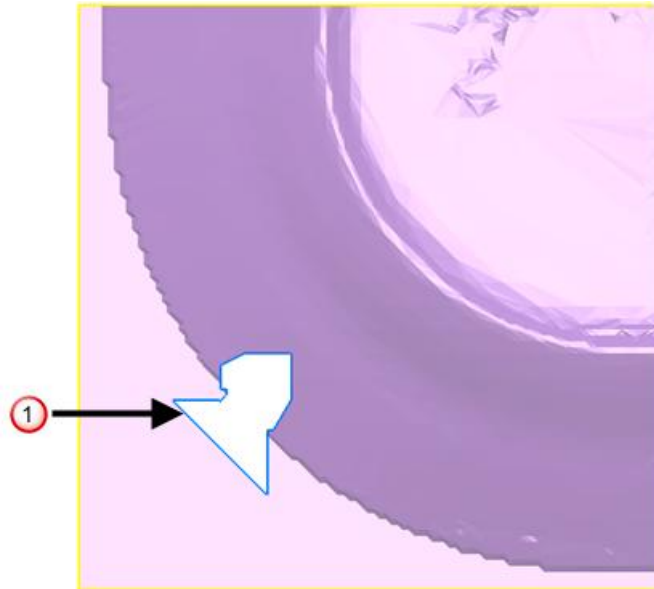
For example, using the `plate.stl` example file supplied with PowerSHAPE, fill the hole in two parts, filling the flat area with a planar cap, and the curved area with a curvature cap.



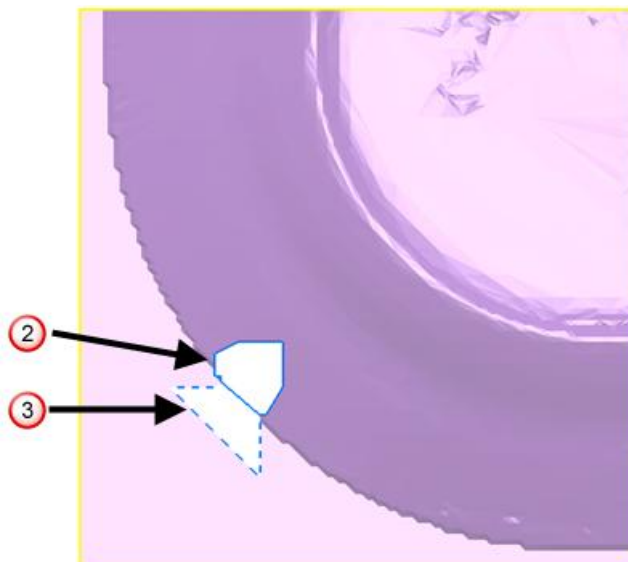
1. Select a mesh to display the **Mesh Edit** toolbar.
2. Click **Fill Holes**  to display the **Fill Holes** dialog.



3. Select the hole by clicking its boundary ①. The selected boundary turns blue.



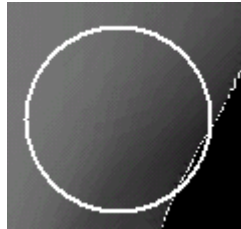
4. Select two points to specify part of hole you want to fill first. A mark is added at the position of the first point. A line connects the first point to the second point. The area to be filled is outlined as a blue hole ②. The alternative selection is outlined by a dashed blue line ③. Swap the selection by clicking the outline of the region required.



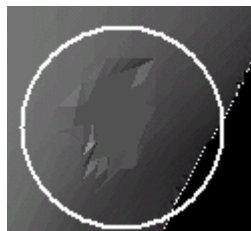
5. Select one of the following **Mode** options:
- **Curvature cap** calculates the curvature needed to fill the hole by examining the surrounding triangles. New nodes are generated on the curved area. New triangles are generated using the boundary nodes and the new nodes.

- **Planar cap** generates a nominal plane that passes through the boundary nodes (approximately if the boundary is not planar). New nodes that are within the boundary are generated on the plane. New triangles are generated using the boundary nodes and the new nodes.

The examples below show how important it is to select the correct **Mode** option. The example shows that in this case, as the hole is on a curved area, you should use the **Curvature cap** option.



Hole filled with a **Curvature cap**




Hole filled with a **Planar cap**

The average length between nodes surrounding the hole is displayed in the **Distance between cap nodes**. This value is used to determine the density of the new nodes. Change the value as required.

6. Click **Apply** to apply the changes you have made and leave the dialog displayed to continue filling holes.
7. Click **OK** when you have finished filling the hole.

## Add triangle

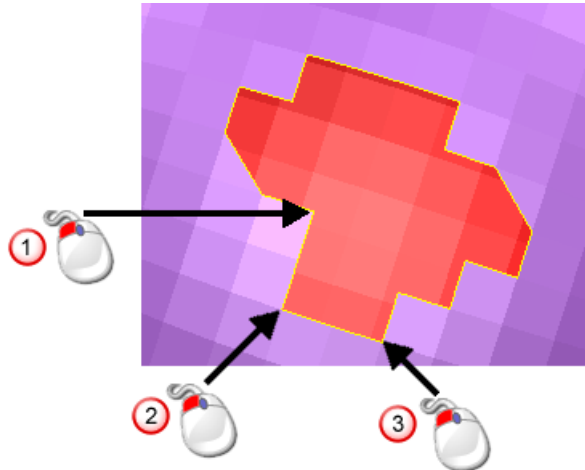
Use **Add Triangles**  to add triangles to the model by clicking on existing triangle vertices. ★

1. Select a mesh.

A section of the mesh shown below has some missing triangles:



2. Click **Add Triangles** .
3. Select the first point (or vertex) with the left mouse button ①. This point is marked in blue.



4. Select the second point ②.
5. Select the last point ③.

The new triangle is drawn. Open edges that don't match the existing triangles are drawn in yellow.




















6. Add further triangles as required.

7. When you have finished adding triangles click **Add Triangle** to cancel the operation.



## Mesh Fixing and Editing toolbar (CopyCAD)

As part of the continuing the integration of CopyCAD functionality into PowerSHAPE, the following buttons have been removed from the embedded CopyCAD toolbar. They have been added to the PowerSHAPE Mesh Edit toolbar (see page 22), unless otherwise stated in the following table:

Embedded CopyCAD		PowerSHAPE 2011	
	<b>Remove undercuts</b>		<b>Create draft wall</b>
	<b>Delete triangles</b>		<b>Delete triangles</b>
	<b>Reverse triangles</b>		<b>Reverse mesh</b>
	<b>Refine triangles</b>		<b>Refine mesh</b>
	<b>Tolerance triangles</b>		<b>Reduce mesh</b>
	<b>Align triangles</b>		<b>Move/Copy</b> (General Edits)
			<b>Align items</b> (General Edits)
	<b>Measure</b>		<b>Calculator</b> (Status bar)
	<b>Filter triangles</b>		<b>Smooth triangles</b>

## Licensing of triangle modelling functionality

Use the following table and legend to see the triangle modelling functionality that is available with each licence in PowerSHAPE2011.

	Not available
	Available
	Available in embedded CopyCAD

Tool	PS	Designer	PS Pro	CCAD Pro
Mesh Fixing & Editing toolbar				
Mesh Edit toolbar				
Add triangles				
Draft mesh				
Reduce				
Refine				
Smooth				
Divide				
Combine				
Reverse				
Hole filling				
Doctor				
Stitch				
Remove overlaps				
Z-compensation				
Mask				
Delete				
Paint				
Morph				


Pick				
Mesh/point cloud alignment ( <i>General Edits</i> )				
Surface/solid alignment				
Splitting using painted regions				
Curves from intersections with meshes				
Oblique mesh ( <i>Curve toolbar</i> )				
Draft/horizon mesh ( <i>Curve toolbar</i> )				
Booleans with meshes				
Fit surface to mesh				
Fit curves to mesh				
Sculpt				
Triangle/edge shading options				
Mesh limiting				
Curve from discontinuities				
Curve from boundaries				
Convert surfaces/solid to mesh				
Import mesh as solid				
Convert mesh to solid				
Import Point Cloud				
Import CCAD session				
Mesh offset				
Error analysis				

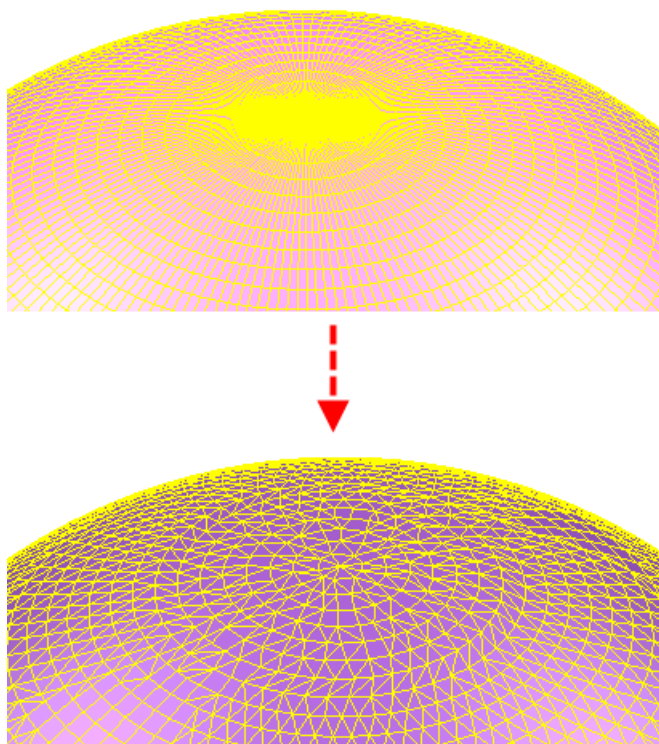
## Other changes to triangle modelling

- In addition to the **Select Triangles** options (see page 24) on the **Mesh Edit** toolbar, triangles on a mesh can be selected using the box selection method. The anchor point for the drag box must not lie on the mesh.

### Reduce Mesh

Use the **Reduce Mesh** option to specify the percentage of the original number of triangles you want in the mesh.

1. Select a mesh.
2. Click  (*Mesh edit toolbar*) to display the **Reduce mesh** dialog.
3. Select **Percentage**.
4. Enter the percentage of the original number of triangles to be in the mesh. In the example below, **75** was entered as the **Percentage**. The number of triangles in the mesh has been reduced by 25%, resulting in a less smooth mesh.

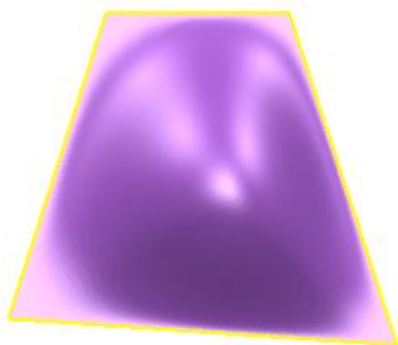






## Surface from triangles

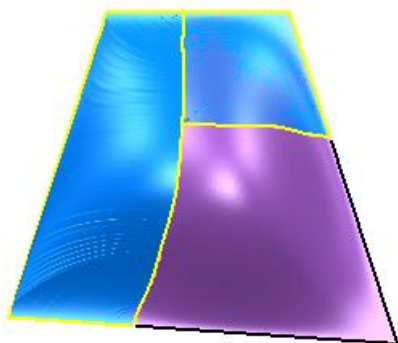
When creating a surface from the triangles in a mesh, the triangles used to create the surface will become masked.

1. Select a mesh.

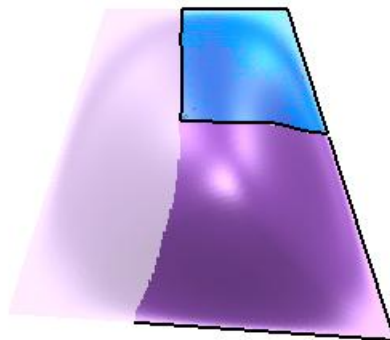
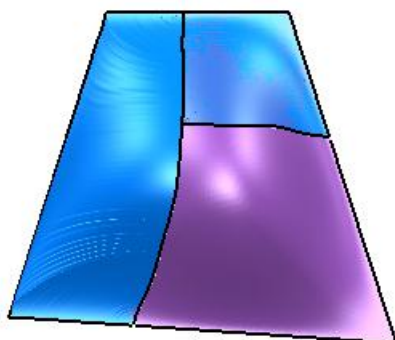


2. Click  (Surface toolbar).
3. Create a surface from a mesh by picking points on the mesh to create a closed curve. When completing the curve,  is displayed when you move the cursor near the start point

The model below shows two surfaces created from the mesh.



4. With the surface selected, click  (Views toolbar) to blank the surface. The underlying triangles are displayed as masked.



## Mesh popup menu

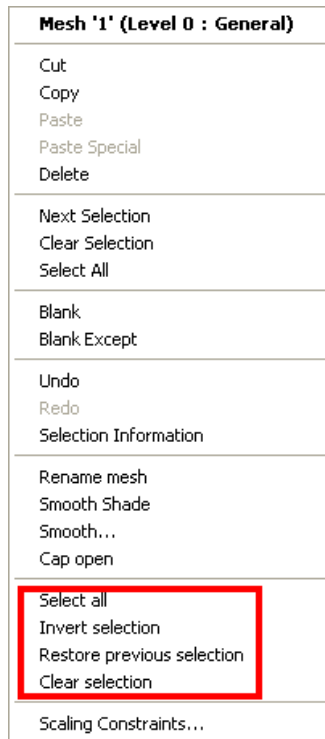
The following options have been added to the **Mesh** popup menu:

**Select all**

**Invert selection**

**Restore previous selection**

**Clear selection**

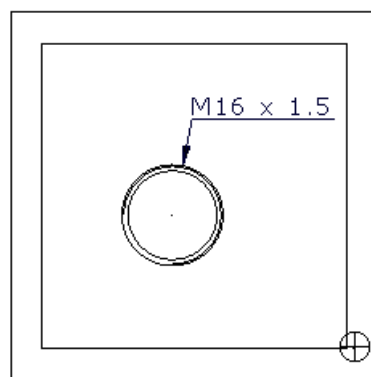


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## Delcam Draft

The following changes have been made to Delcam Draft:

- If a tapped hole is dimensioned around the perimeter of the hole, the thread details are displayed. The information that is displayed depends on the standard of the tapped hole.
- The ISO metric standard uses *thread designation/ nominal diameter/ pitch/ optional tolerance*. The following example shows, a 16mm IMF hole. This is dimensioned as *M16 x 1.5*, showing the diameter of the hole and the pitch of the thread.

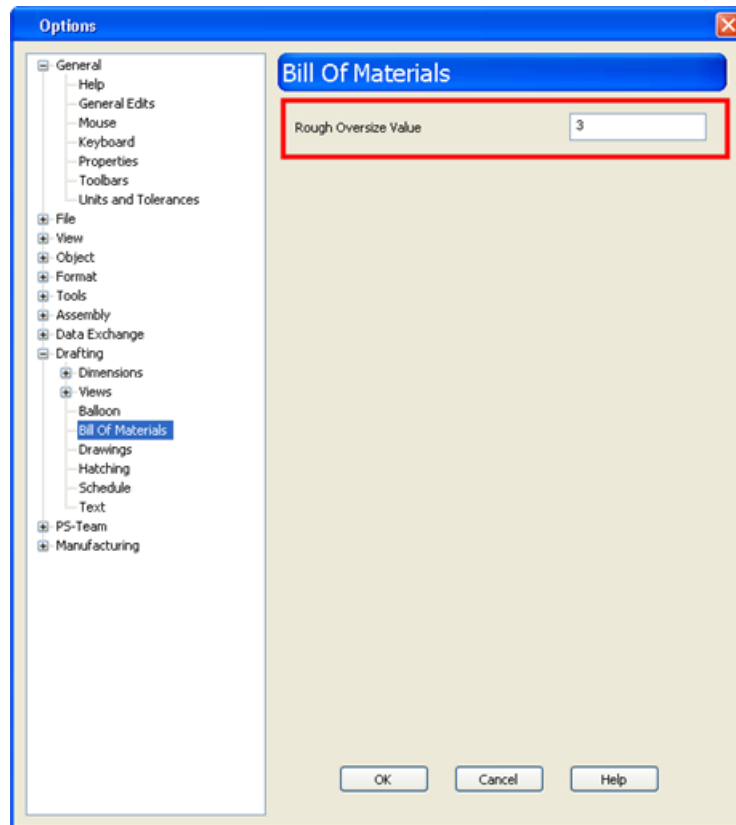


- The American standard uses *nominal diameter/ threads per inch/ thread designation*. For example, *3/4 -24 UNF*.
- The British standard uses *nominal diameter / thread designation*. For example, *1/4 BSP*.
- Bill of Materials (see page 54).
- Schedule (see page 55).

## Bill of Materials

- If the part number and catalog of components are the same, but the descriptions are different, the description will be omitted in the Bill of Materials.
- Components based on round primitives (cone, cylinder, torus, or spring) are now specified using **Length x Diameter**. Previously, **Length x Width x Height** was used.
- A best-fit bounding box is now used to specify sizes for components that are not based on primitives. This gives accurate sizes for components that are positioned at compound angles (for example, sliders)

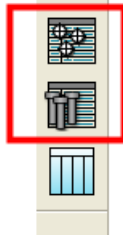
- Use **Tools > Options > Drafting > Bill of Materials** to specify the **Rough Oversize Value**.
- 1. Select **Tools > Options > Drafting > Bill of Materials** to display the **Options** dialog.



2. Enter **Rough Oversize Value**. This value is the additional allowance that is added to the bounding box to calculate the stock size required to make the item.

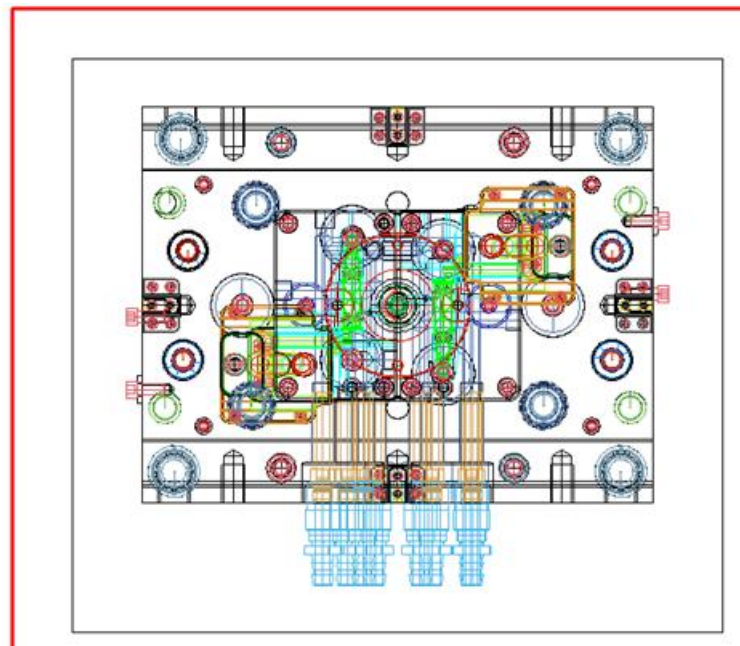
## Schedule

The **Schedule** toolbar has been updated. It now includes two schedule options:

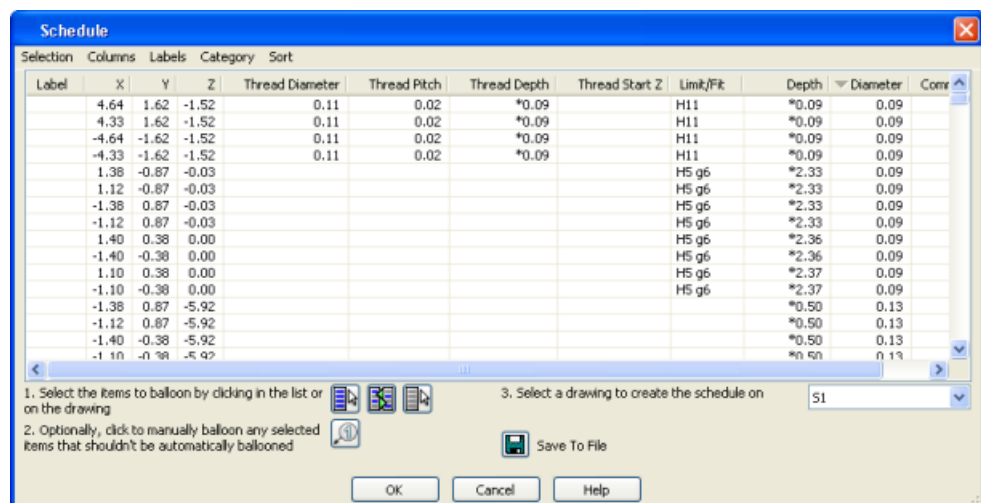



### Hole schedule

1. Create a drawing of the model.



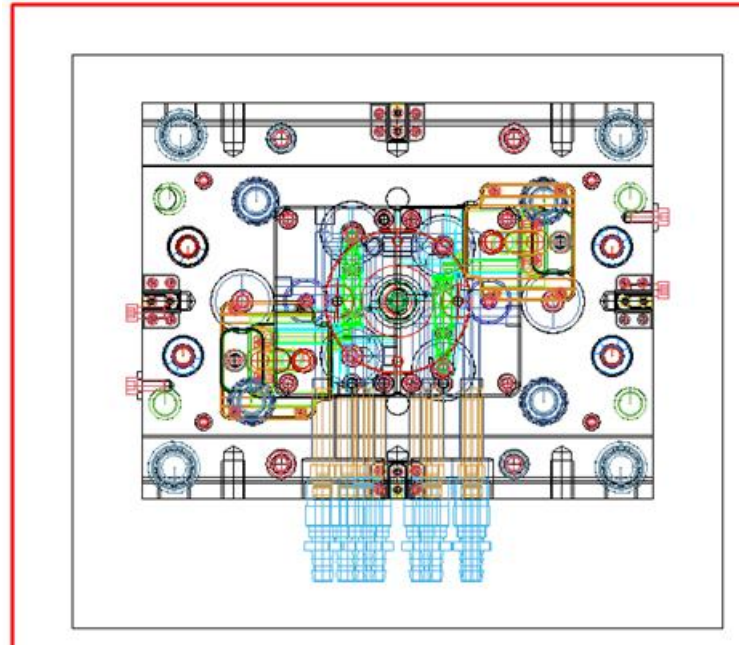
2. Click  to produce a schedule for holes.




3. Use **Save to file**  to toggle between drawing the schedule on the diagram and saving to a file using the **Save As** dialog.
4. Click **OK** to accept the changes and close the dialog.

## Ejector schedule

1. Create a drawing of the model.



2. Click  to produce a schedule for ejector pins, core pins and return pins.

**Schedule**

Selection Columns Labels Sort

Label	Item	Part	Catalogue	Material	Diameter	Length	Trimmed Length	Quantity
	Sprue puller pin 7115	7115	DMEUS		0.44	5.36	5.36	1
	Return pin 7514	7514	DMEUS		0.87	5.70	5.70	4
	Core pin CPS219L3	CPS219L3	PROGRESSIVE		0.34	2.24	2.24	2
	Ejector pin EP094L10	EP094L10	PROGRESSIVE		0.25	5.94	5.94	4
	Ejector pin EP094L10	EP094L10	PROGRESSIVE		0.25	5.90	5.90	4

1. Select the items to balloon by clicking in the list or on the drawing


2. Optionally, click to manually balloon any selected items that shouldn't be automatically ballooned

3. Select a drawing to create the schedule on

S1

Save To File

OK Cancel Help

3. Use **Save to file**  to toggle between drawing the schedule on the diagram and saving to a file using the **Save As** dialog.
4. Click **OK** to accept the changes and close the dialog.



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