

Fitting External Objects Into Boxes

Table of Contents

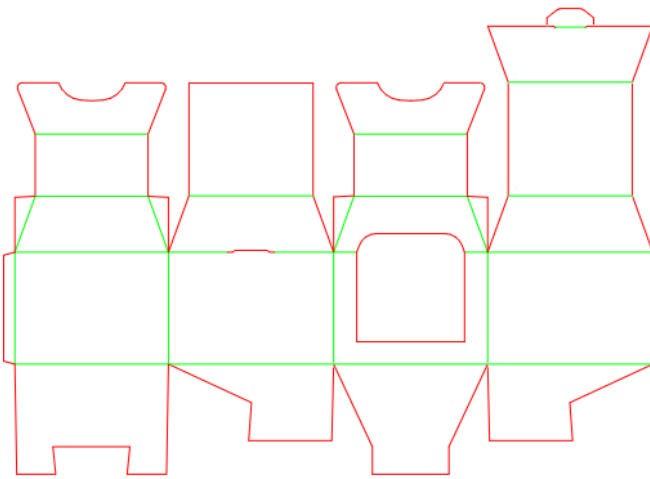
| | |
|--|----|
| Task | 2 |
| Drawing additional rectangle | 4 |
| Using the Intersect mode | 9 |
| Editing the intersection-generated objects | 12 |
| Inserting an external object | 19 |
| Intersecting with External Object | 23 |
| Objects Approximation | 26 |
| Hide/Show the external object | 37 |

Task

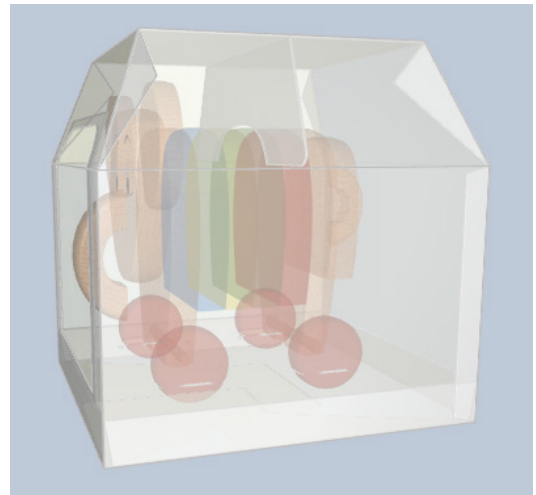
In this task, we will learn how to insert an external object in a box to produce a packaged product. The task consists of:

- * Using the intersection mode, which ensures that inserted objects cross panels correctly.
- * Inserting an external object.
- * Using the object approximation functionality to smooth out multiple adjacent tiny lines into a single oval curve.

Complete Folding Box and Its 3D Presentation



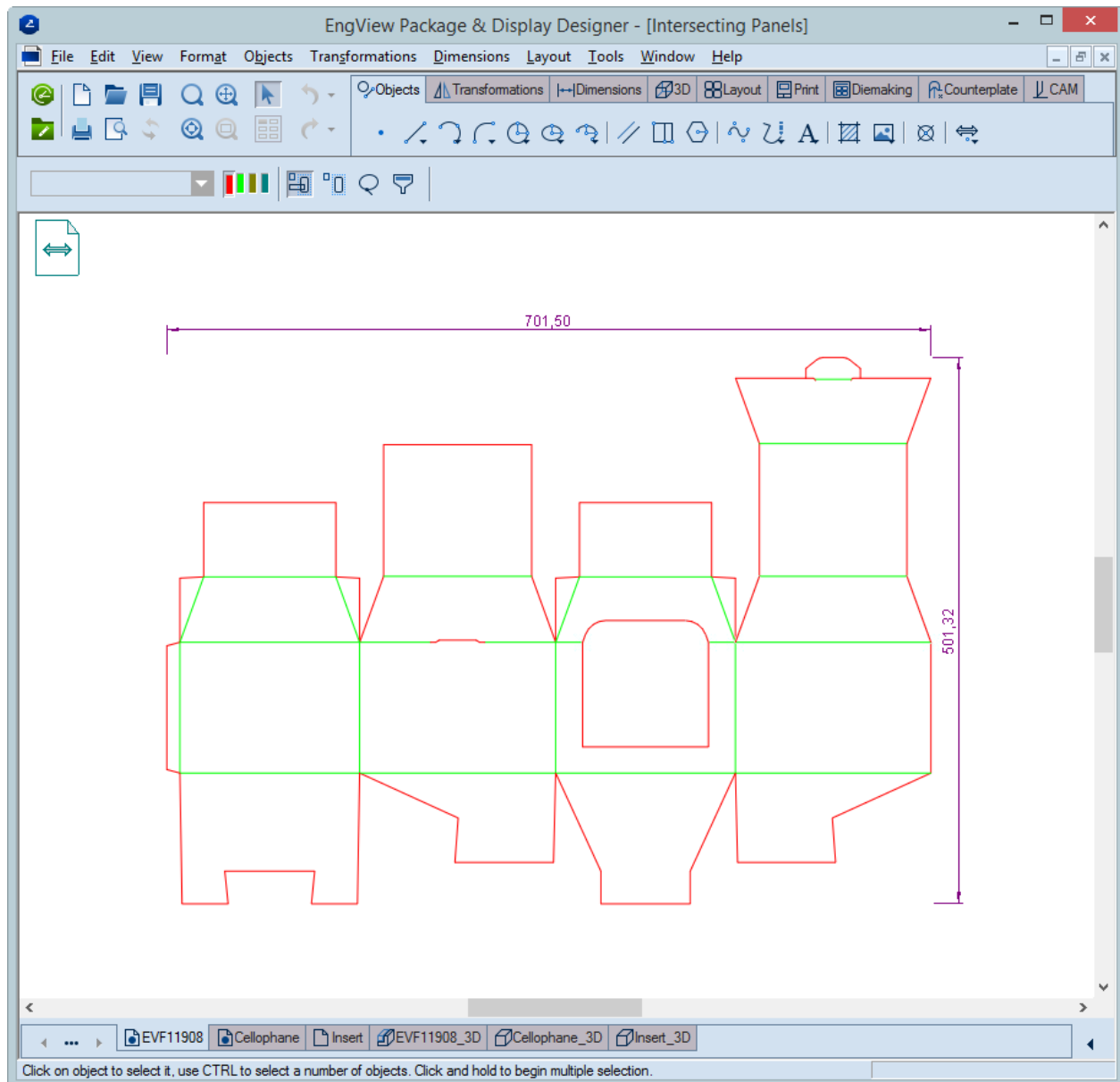
2D representation of the folding box



3D representation of the folded box with an inserted external object

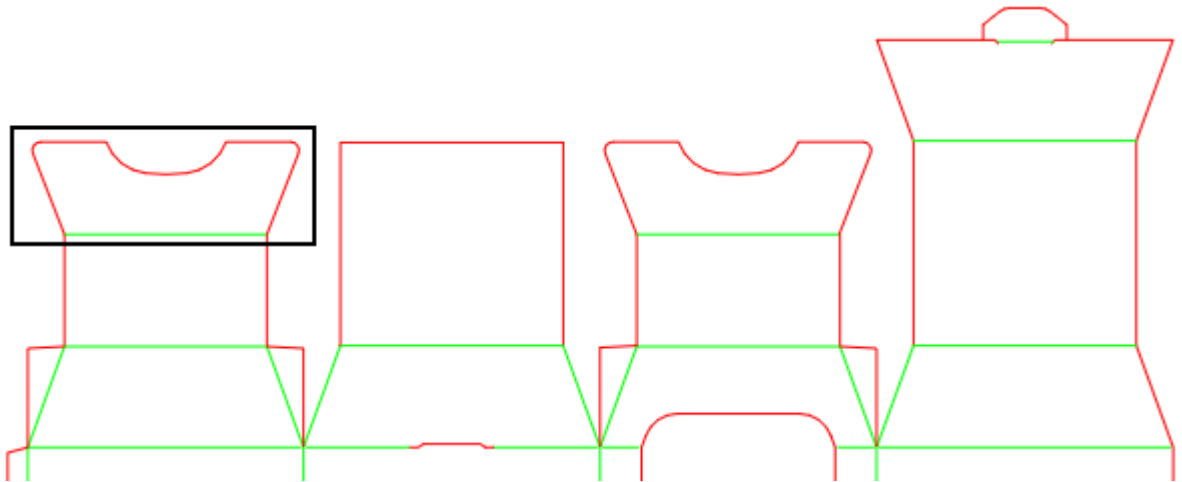
Exercise Description

1. From the folder C:\EngViewWork6\EngView Samples, open the file Elephant Box.evd.




Drawing an Additional Rectangle

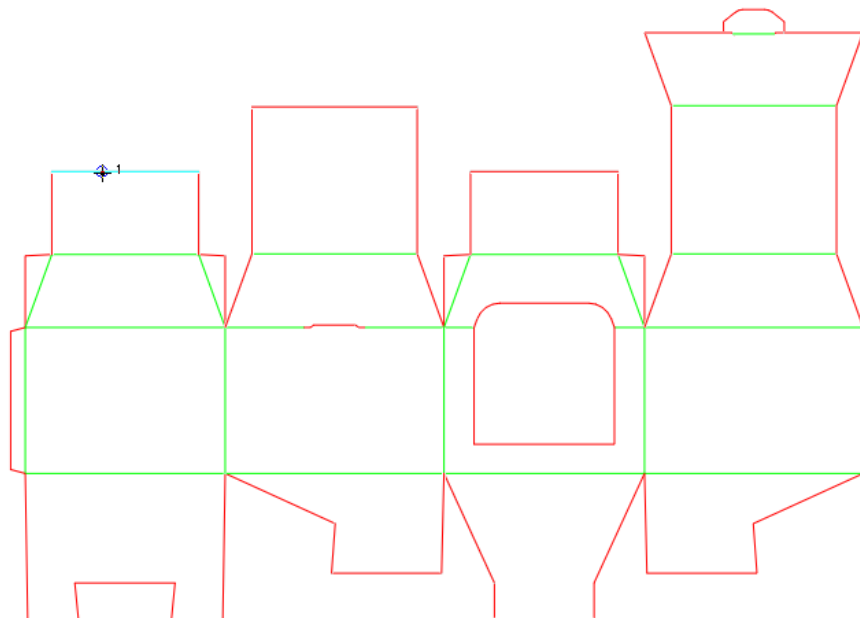
We will use an additional panel to hold the inserted object from above. Our aim is to obtain the following structure:



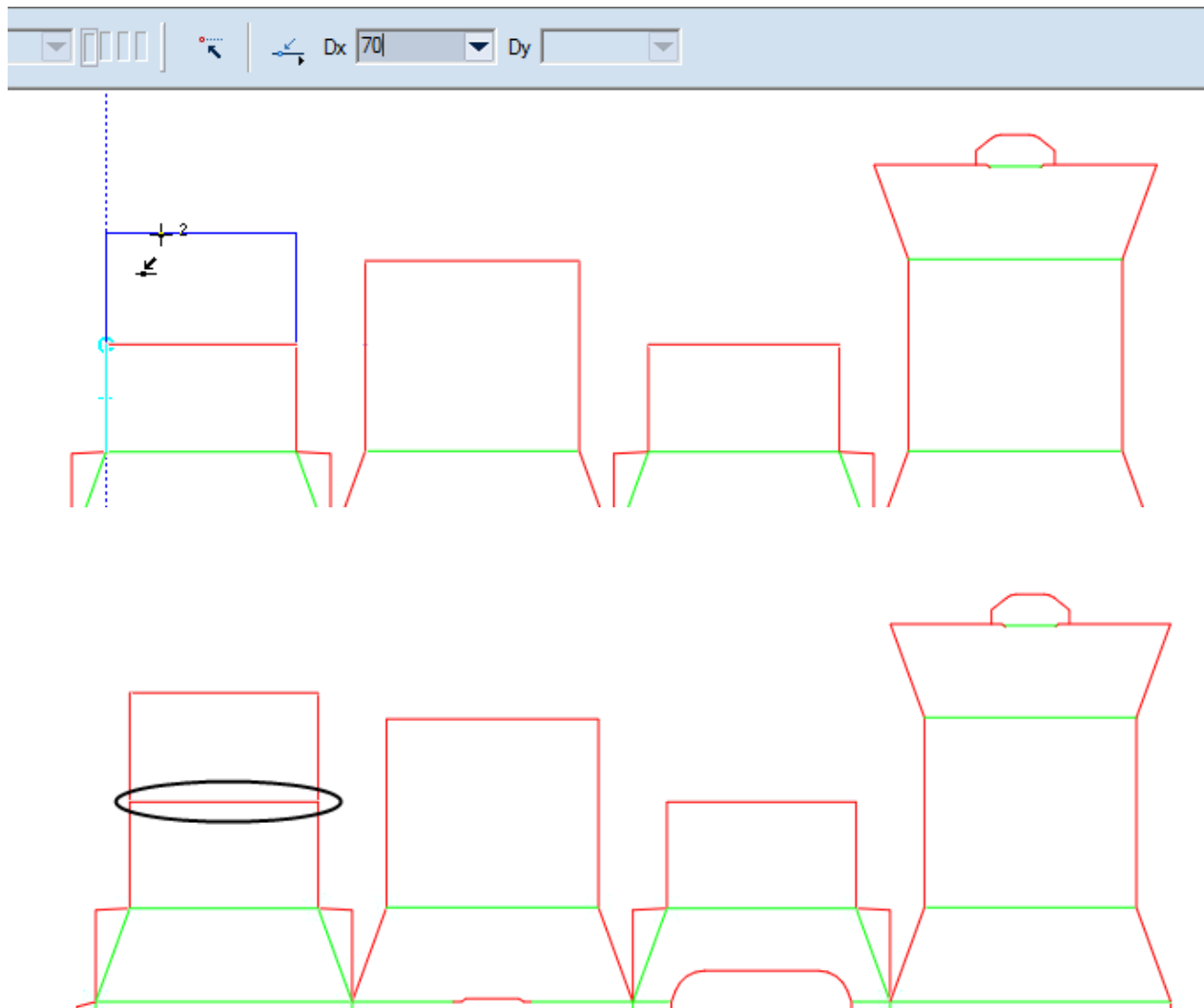
The shape of the panel can be extracted by using the Intersect functionality in the 3D module. To achieve this, we will draw a regular rectangle in the 2D drawing and then we will continue in the 3D drawing.

We assume that the sizes of the box are final and will not change. This makes it possible for us to use conventional drafting to create the additional rectangle.

2. To begin, on the **Objects** toolbar, click **Rectangle** .
3. Click the line (pictured) and begin drawing upward.



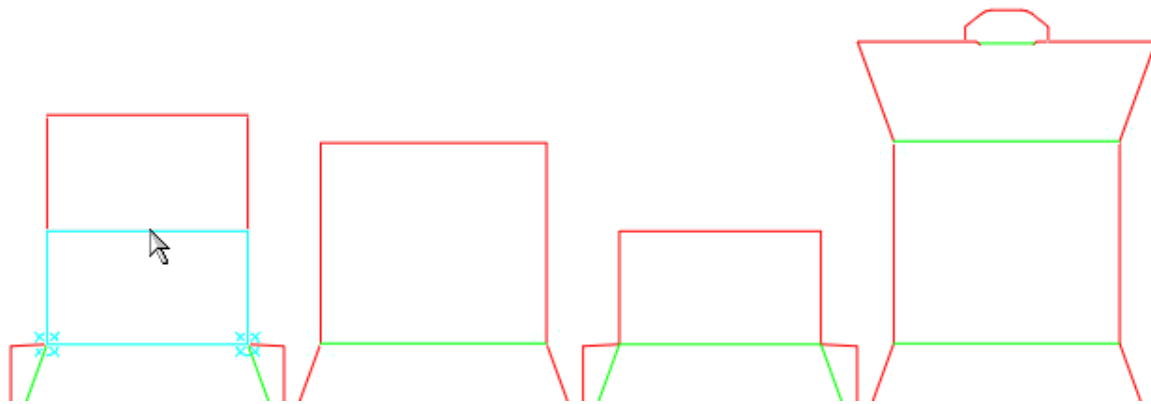
We can use any height of the rectangle — for example, 70 mm.



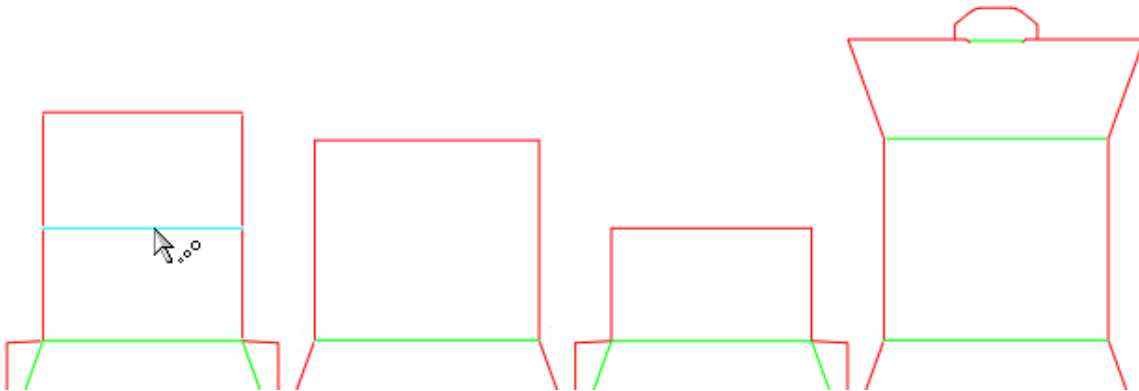
We need to change the style of the enclosed line (pictured) from Cutting to Creasing.

4. Make sure you're in the Select mode.

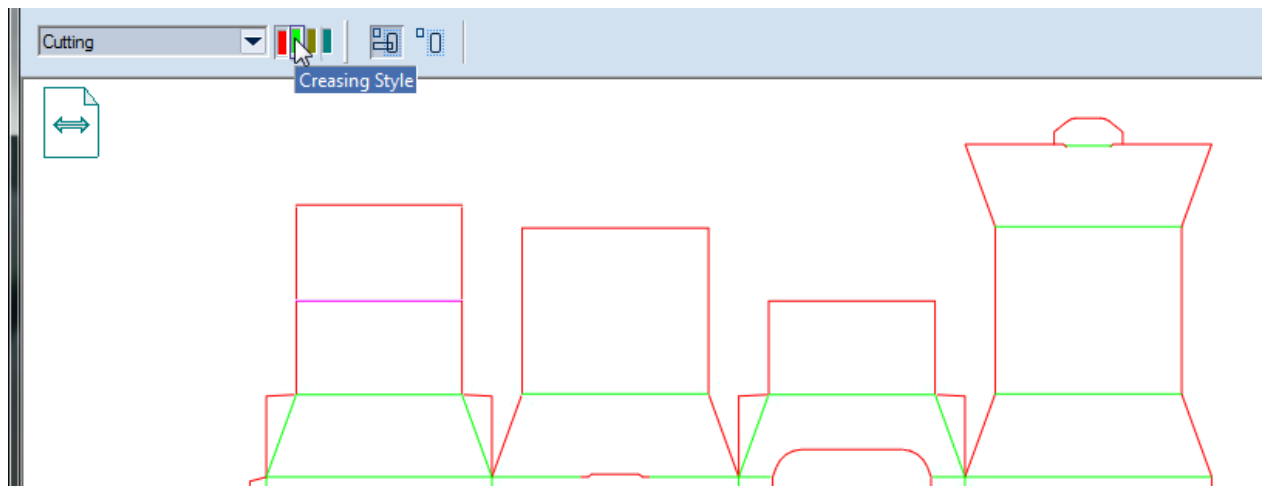
As this line is part of a component, when we try to select it, the entire component is selected.



5. To select only the line, press CTRL + SHIFT, and then click the line.



6. Select the Creasing style.



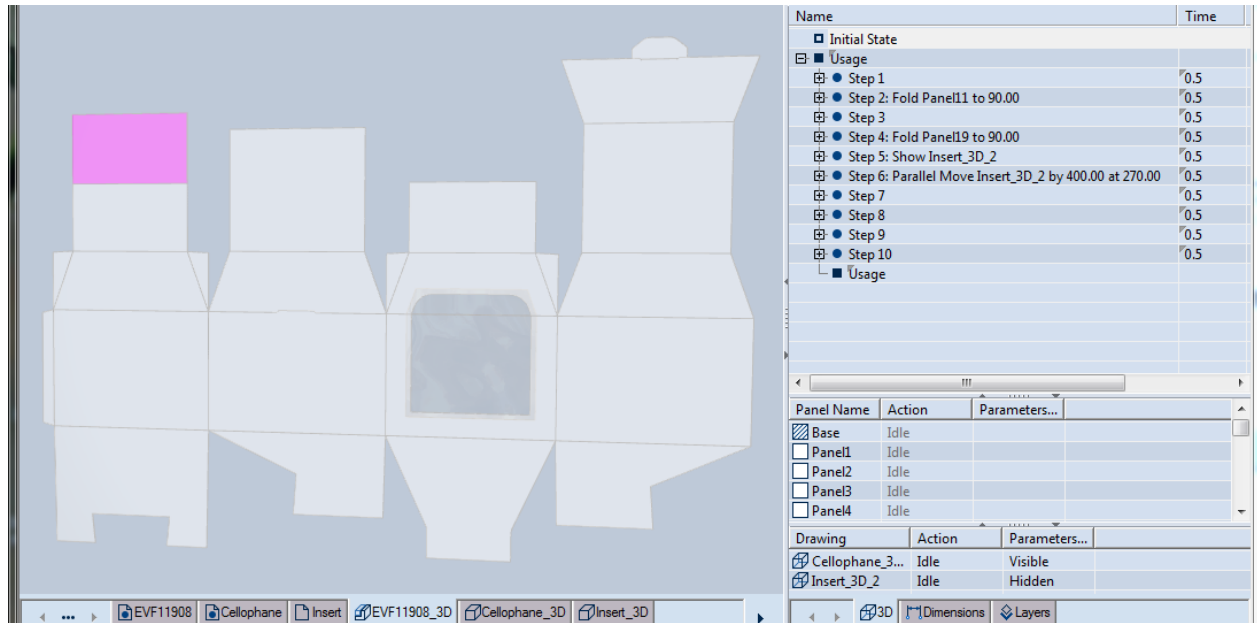
We proceed by moving to the 3D view of the design.

1. Go to the design's 3D drawing, and then click **Refresh** .

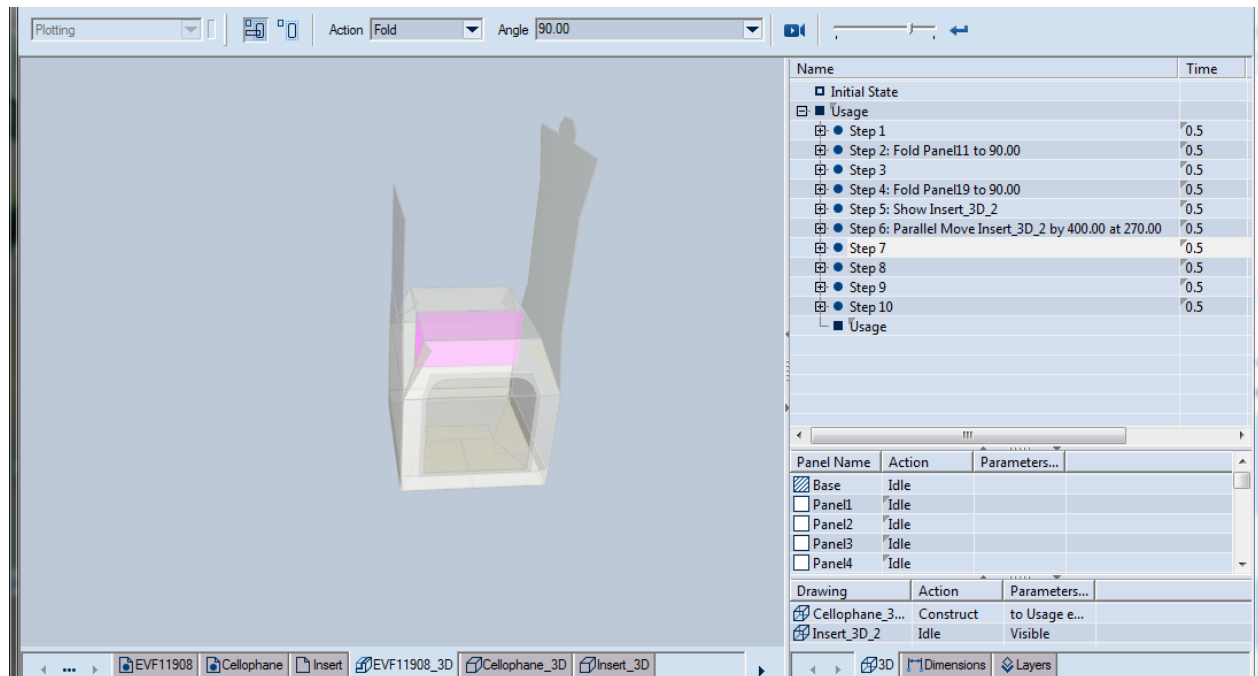
The panel appears.

2. In the tabular area, click Initial State.

The Initial State view lets us take a look at the full structure, and we are able to select the new panel more easily.



3. After we have selected the panel, click Step 7.
4. On the contextual edit bar, in **Action** select Fold, and then in **Angle** select 90 degrees.

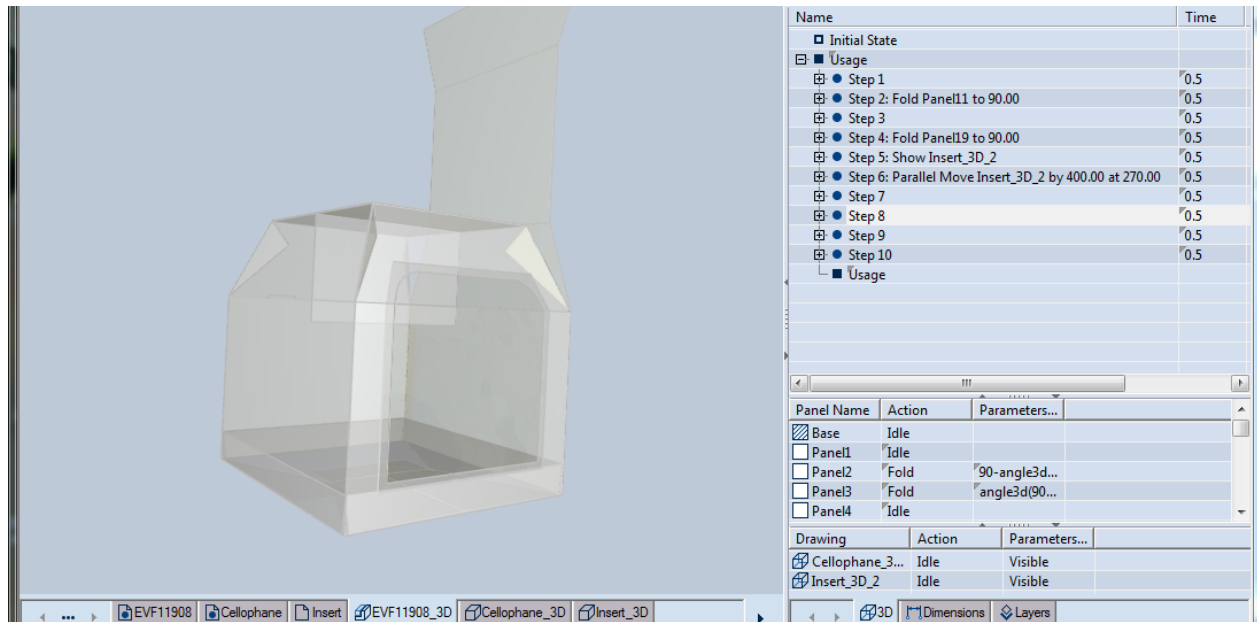


To extract information about how to change the shape of the panel, we need to close also the neighbouring panel.

5. Click Step 8.

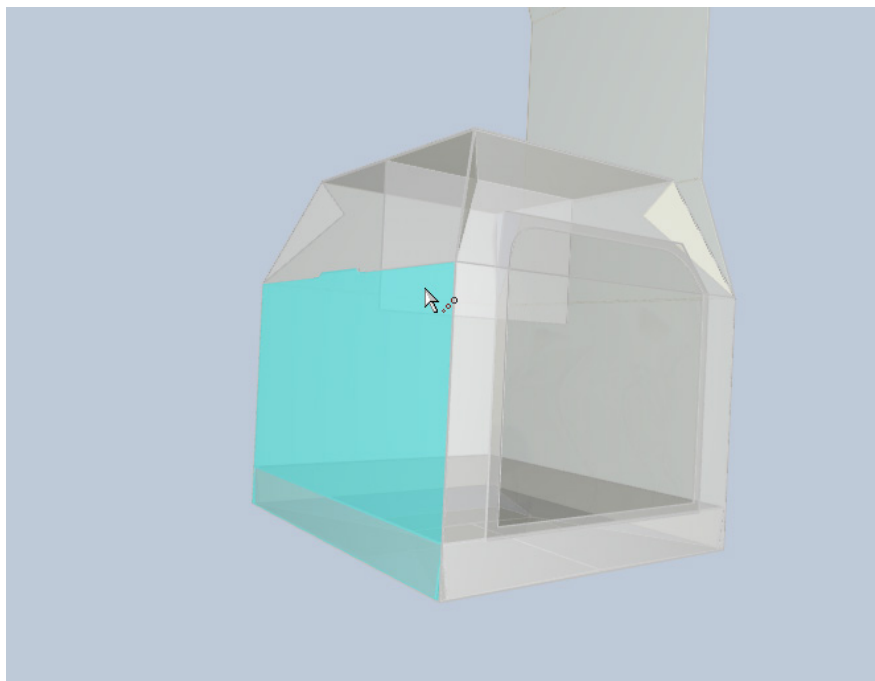
Using the Intersect Mode

The Intersect mode enables us to run panels through other panels, thus changing their geometry.



1. On the **3D** toolbar, click **Intersect** , and then select the newly drawn panel.

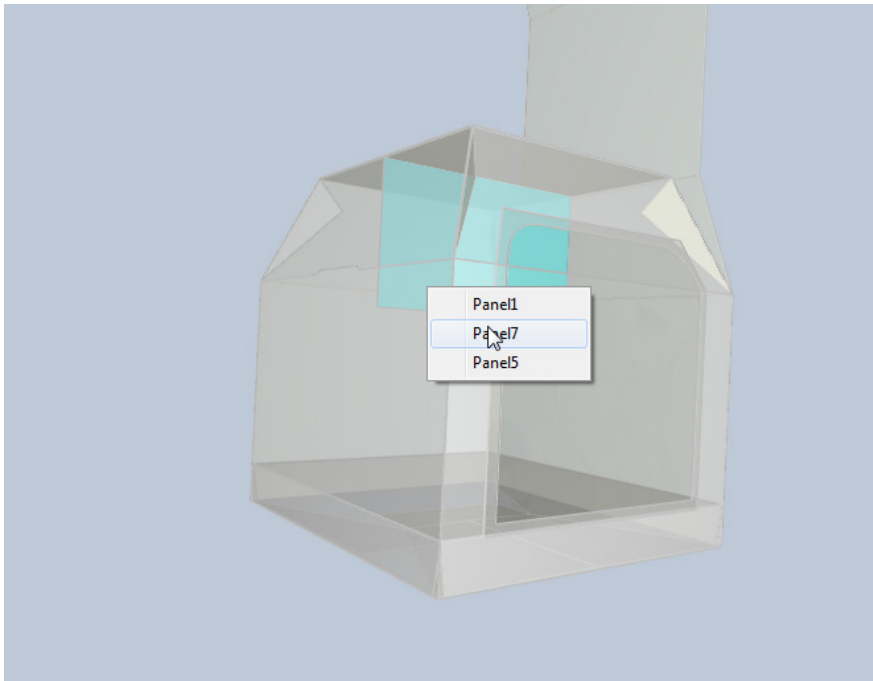
As the panel is inside the box (when it is folded), we need to wait for the bubbles to appear to make a selection.



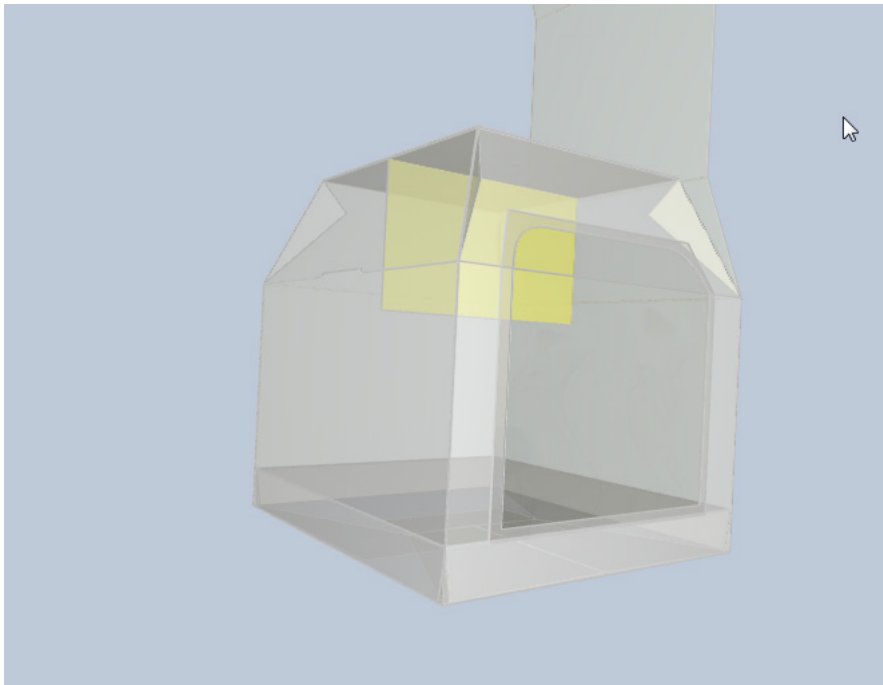
2. After the bubbles appear, click.

A list appears (pictured) showing the panels that lie behind the mouse pointer.

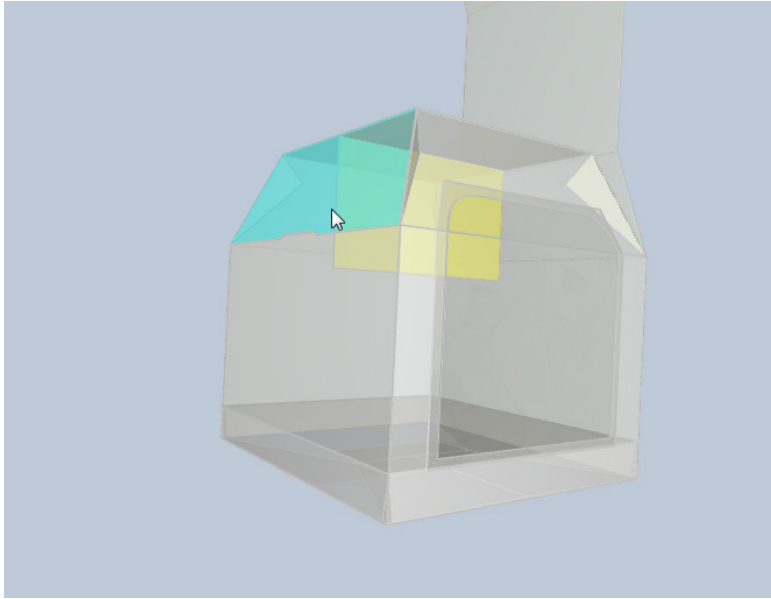
3. In the list, click the name of the new panel to select it.



The panel is highlighted in yellow. Now we need to point to the panel with which we want to intersect it.

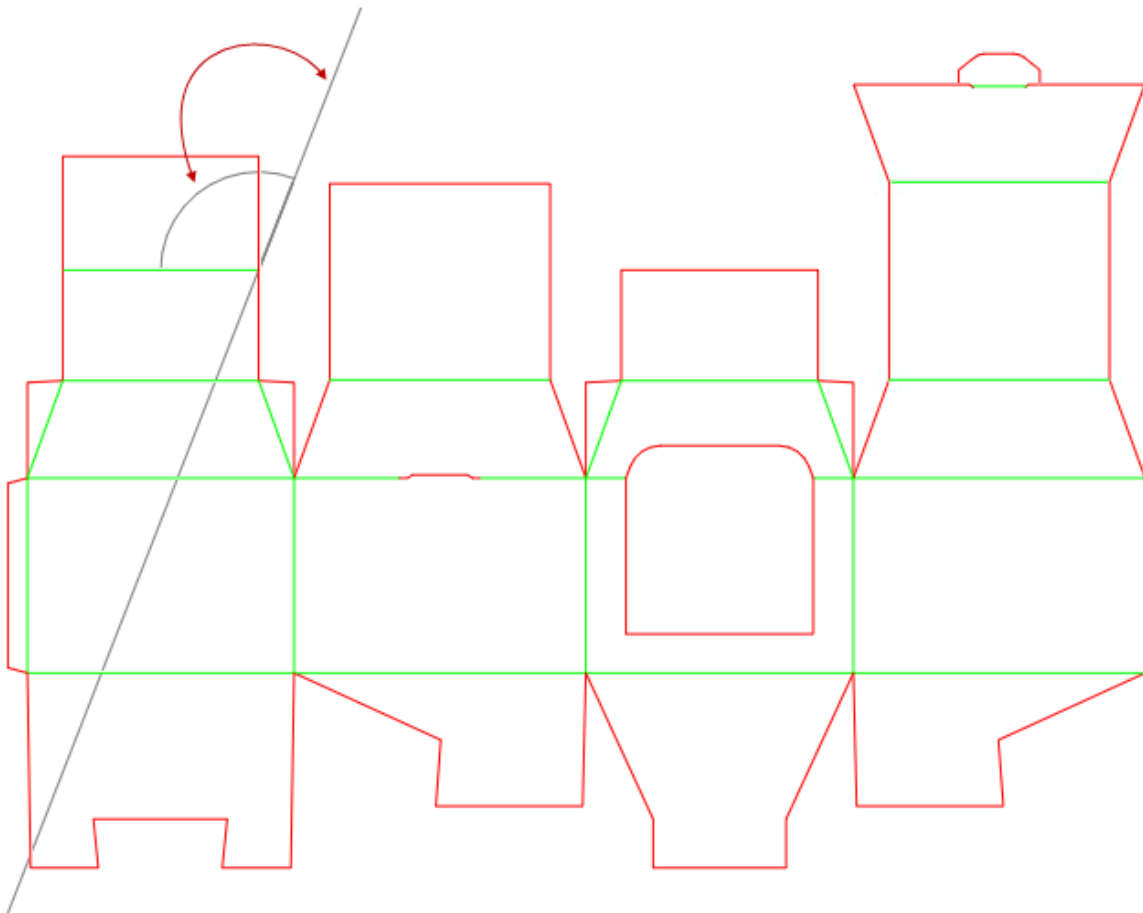


4. Click the slanted panel (pictured).



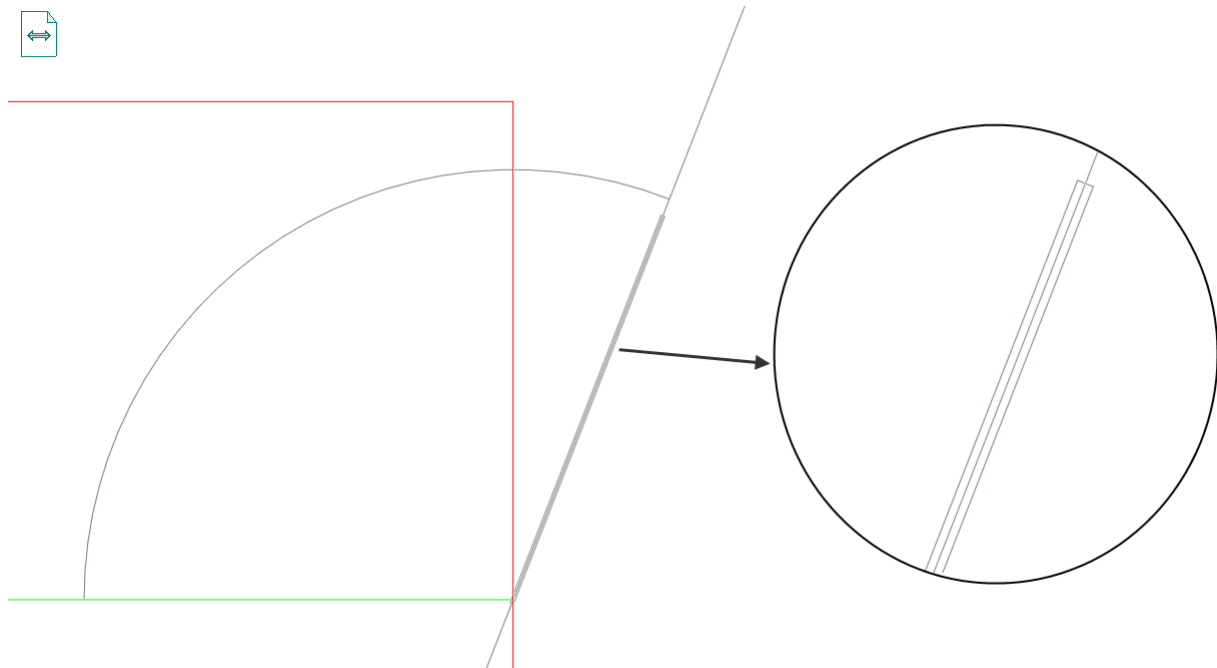
5. To see the result of the intersecting, go to the 2D drawing.

IMPORTANT: Note the arc. It shows that the panel relates to the newly drawn line, which is the result of the intersection.

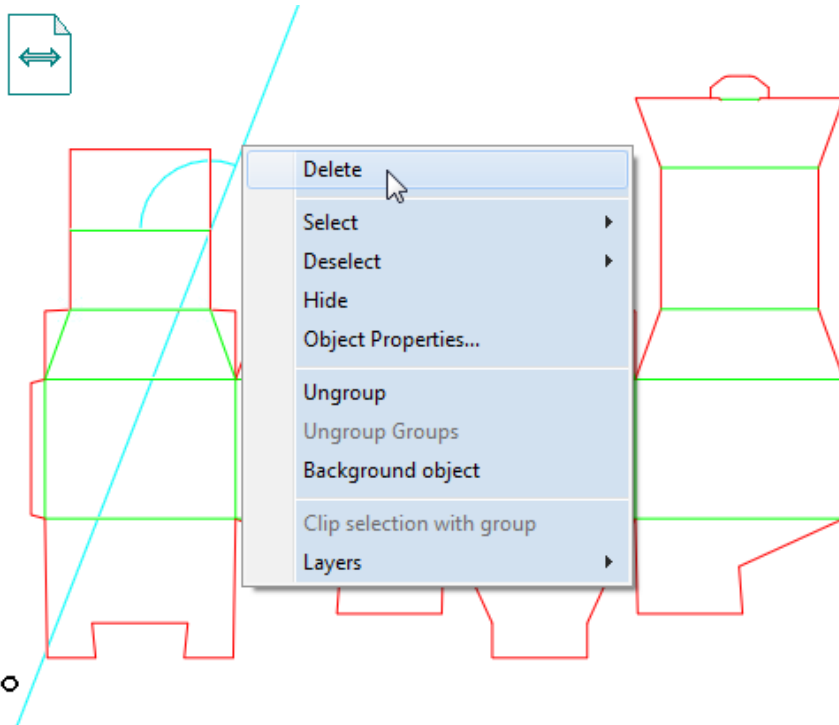


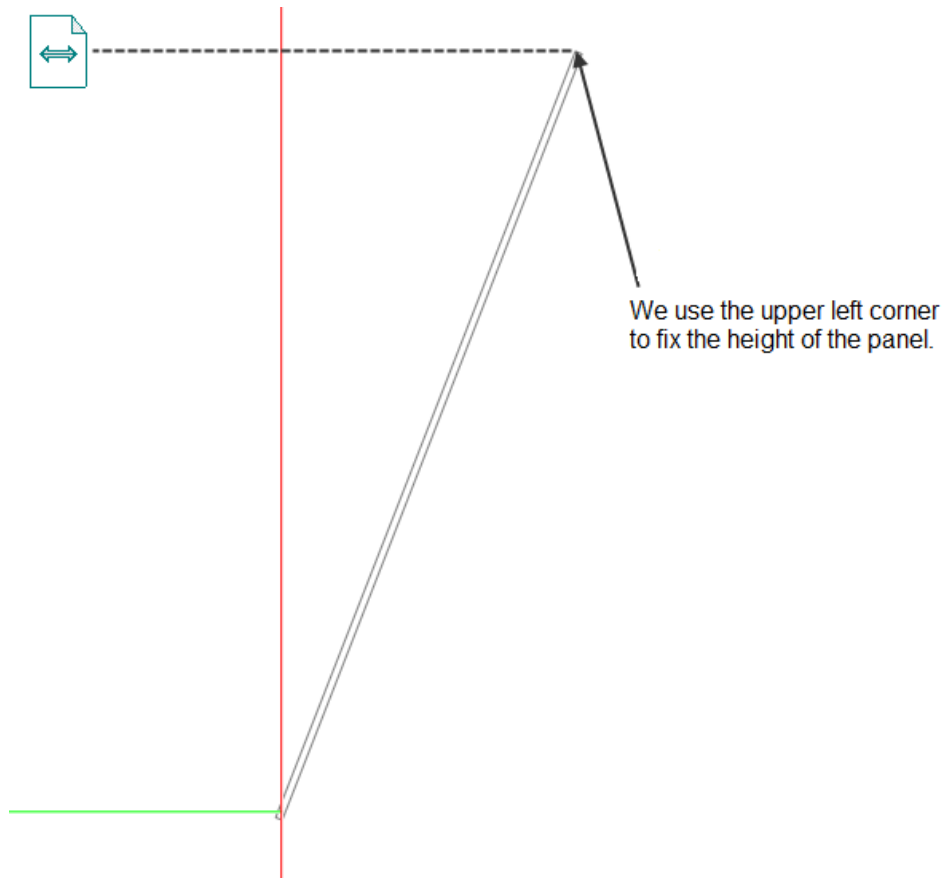
Editing the Intersection-Generated Objects

Note the thick section of the line. It indicates the height of the panel and is the section that we need. We will delete the rest of the line.



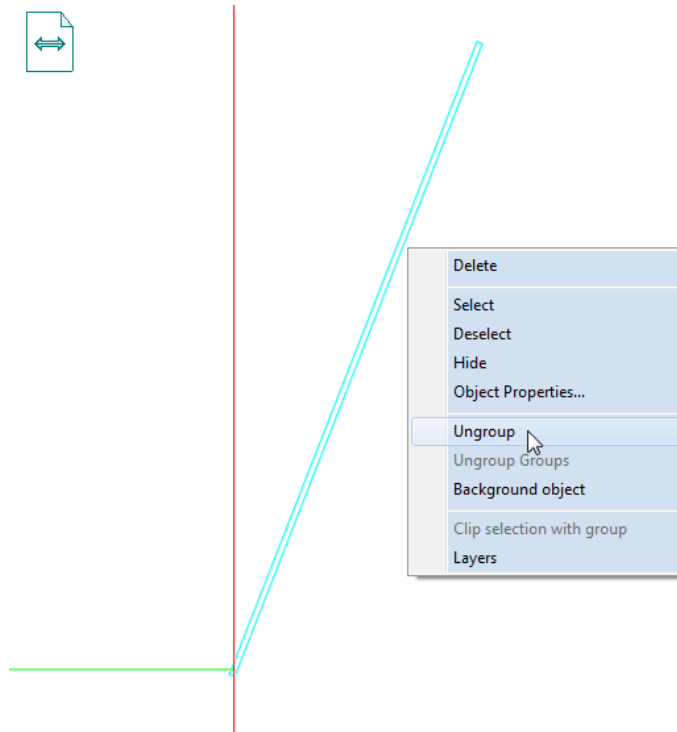
1. Right-click the line (pictured), and then click **Delete**.



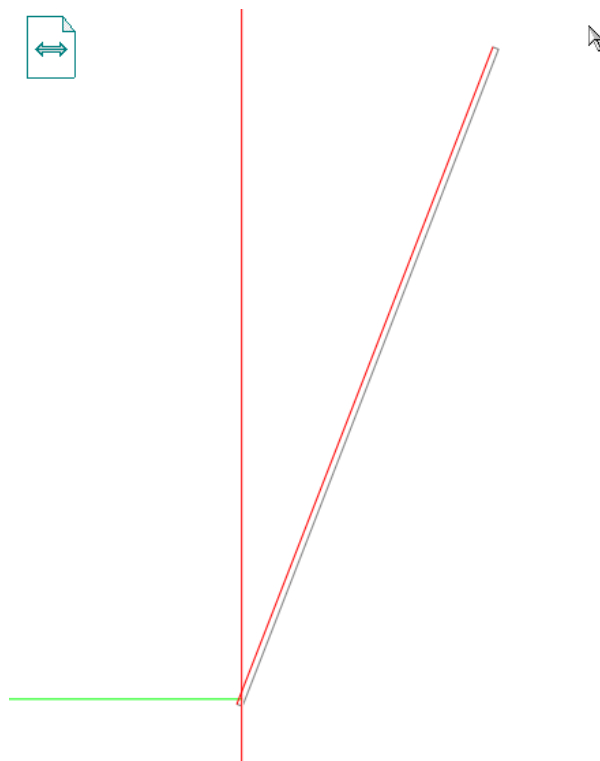


We need the left line. As the two lines are parts of a group that's treated as one object, we need to break up this group before deleting the unnecessary objects.

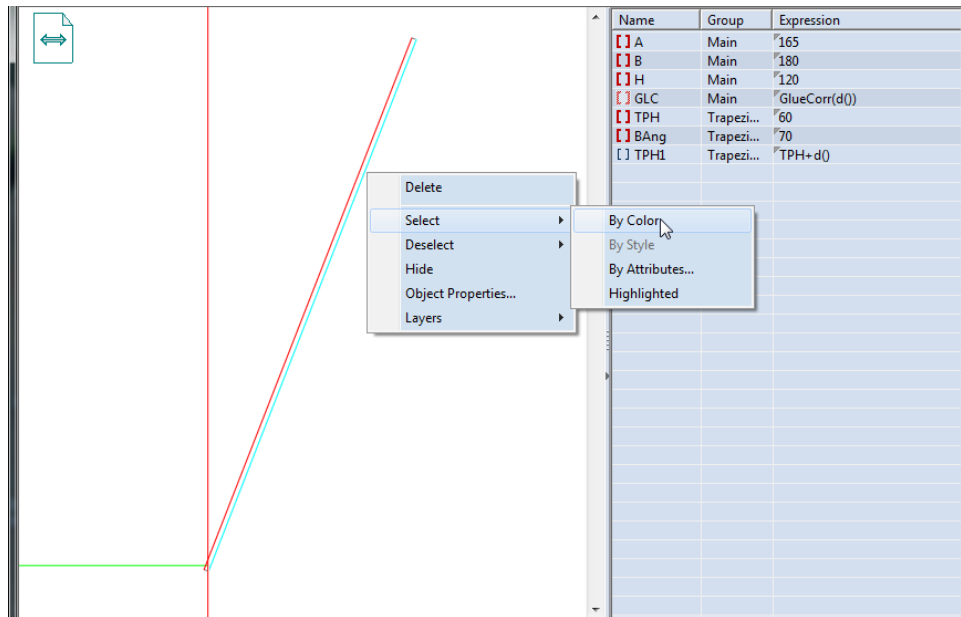
2. Right-click, and then click **Ungroup**.



3. Apply the Cutting style to the left line.

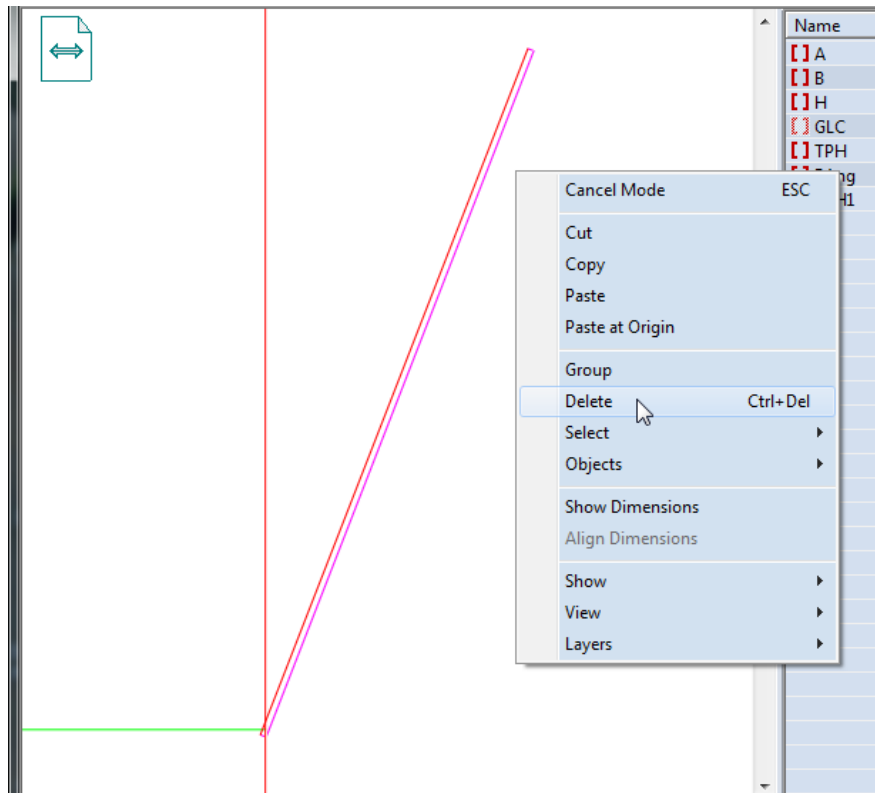


4. To delete the unnecessary lines, right-click the object, point to **Select**, and then click **By Color**.

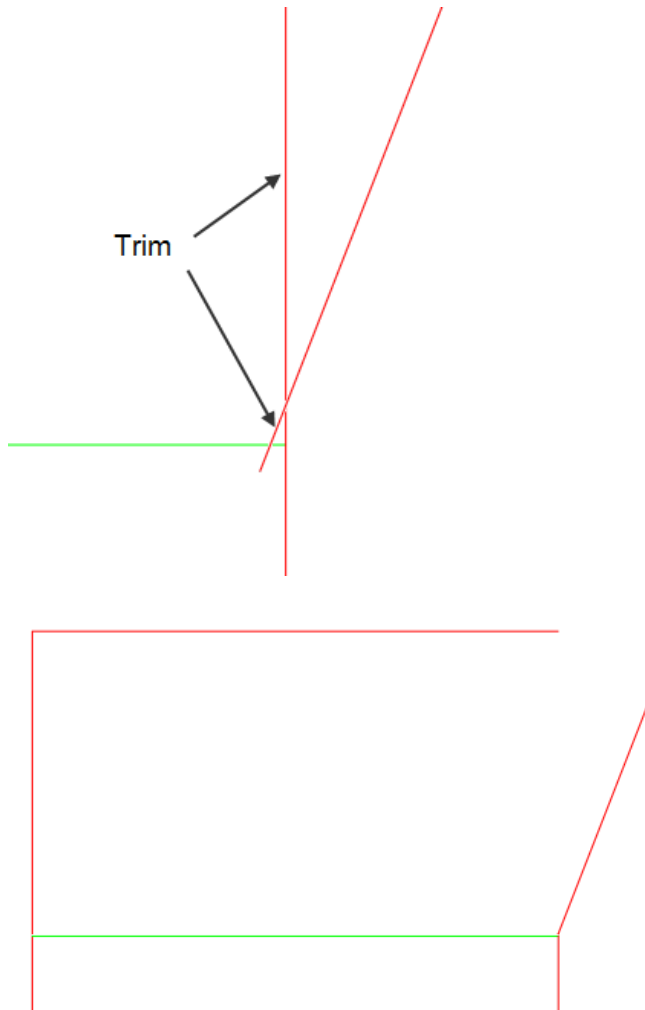


5. After selecting the objects, do any of the following:


- Press CTRL+ DEL.
- Right-click, and then click **Delete**.

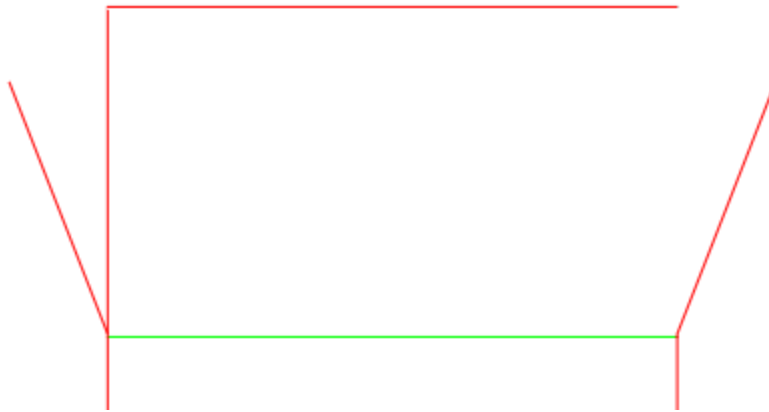


6. Next we will trim the unnecessary line sections: On the **Transformation** toolbar, click **Trim**, and then click the line (pictured).

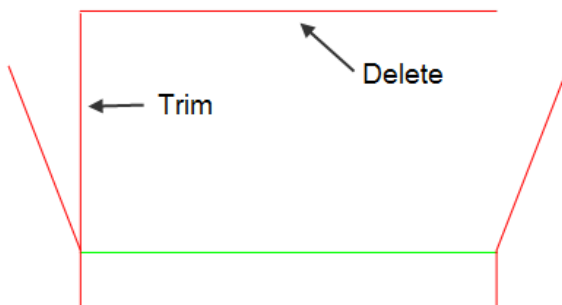


7. Mirroring the line

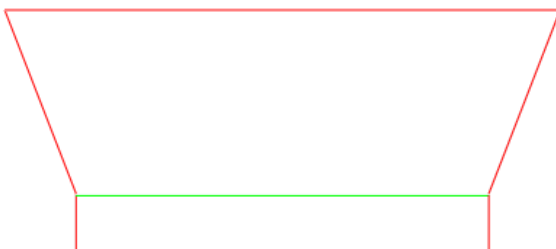
- Select the line.
- On the **Transformation** toolbar, click **Mirror** .
- On the contextual edit bar, click **Copy** , and then do the mirroring.



8. Delete and trim the lines as shown on the next picture.




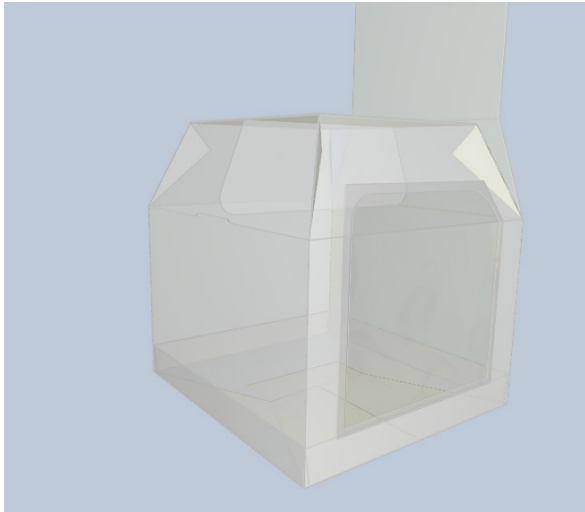
9. Now draw a line (pictured).



10. Draw fillets on either corner of the upper line (Radius: 10 mm).



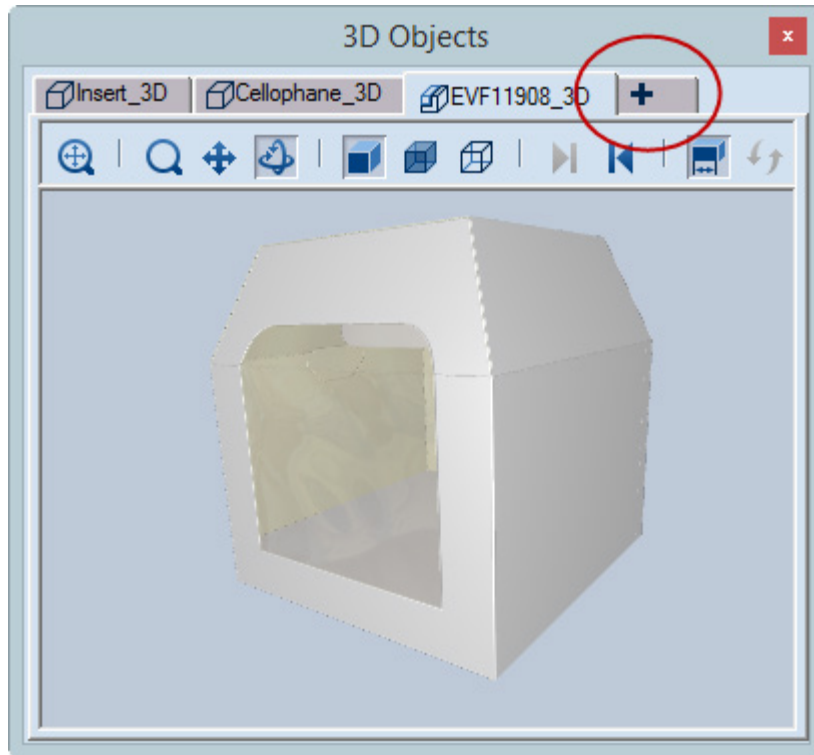
11. Go in the 3D drawing and click **Refresh** .



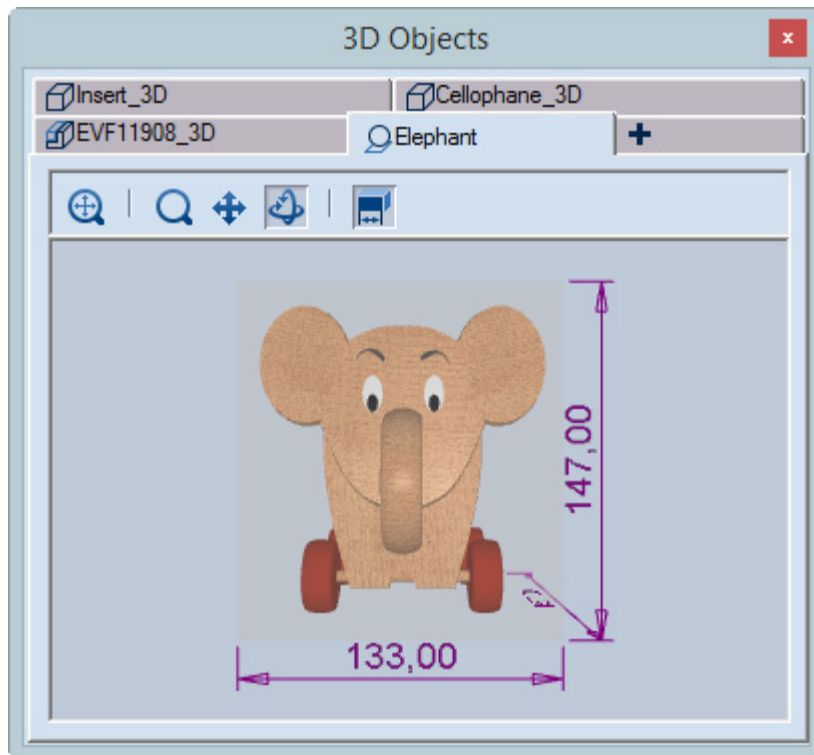
Inserting an External Object

We will insert an external object into the box. It will be the product that the box will serve as packaging to.

1. To begin, on the **3D** toolbar, click **3D Objects** .

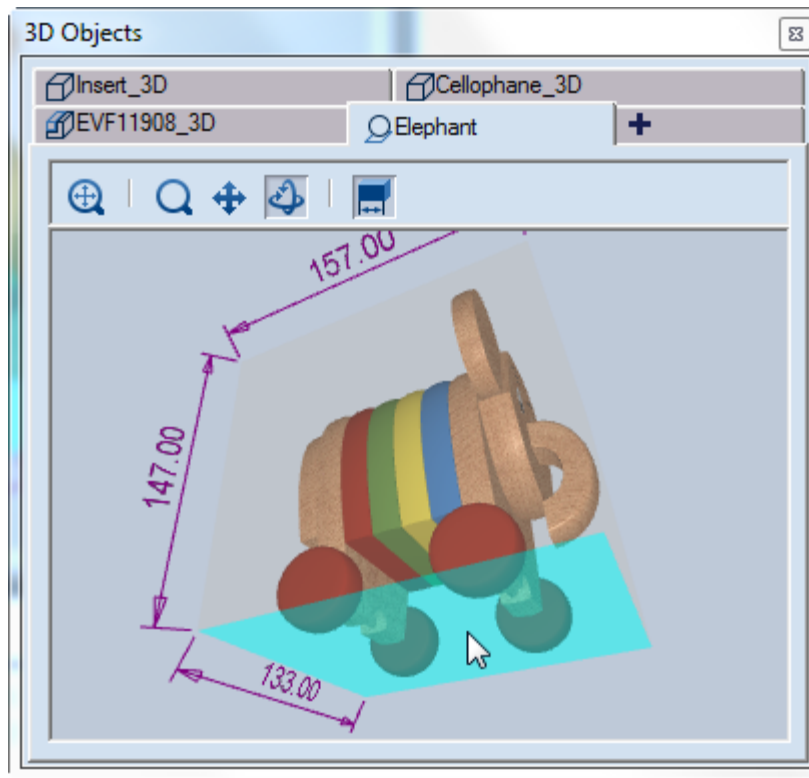


2. Browse the sequence: EngViewWork6 | External 3D | OBJ | Toys | Elephant.obj



We will attach the external object (elephant) to the insert.

3. In the **3D Objects** window, turn the elephant to get a hold of the bottom plane.



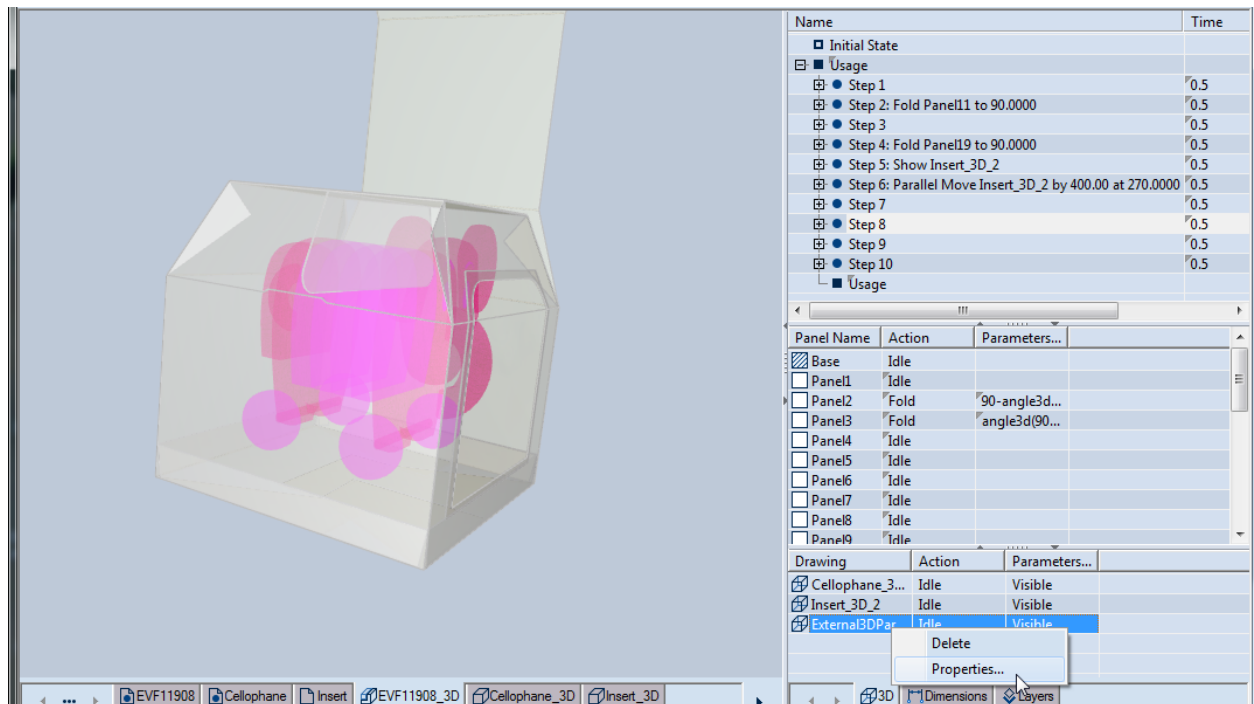
4. Click the elephant's bottom, and then begin dragging into the 3D work area.

When the hosting panel (the upper panel of the insert) is highlighted, click (the insert's upper panel becomes yellow). In this way, we point the panel to which the elephant will be attached. Note also that the program recognizes that we have pointed to the panel's front surface.

5. Click once again to align the external object to the insert.

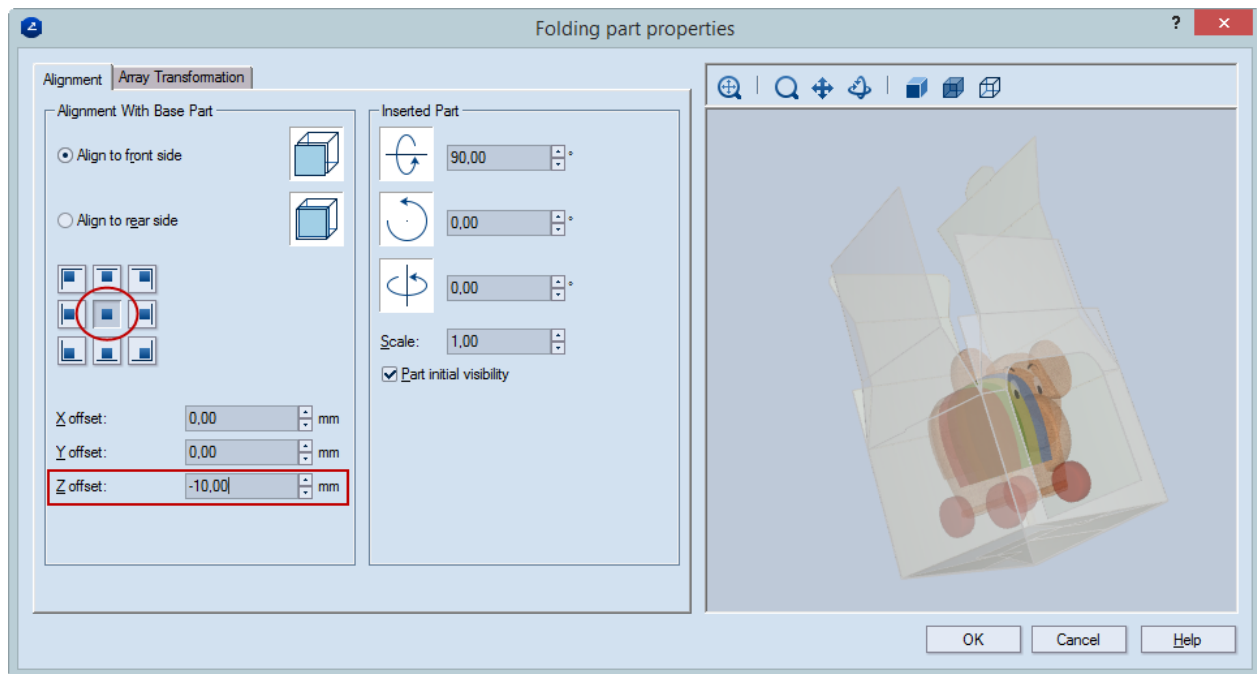
Then we begin the fine-tuning of the positioning.

6. In the tabular area, right-click the external object (External3DPart), and then click **Properties**.



The **Folding part properties** dialog appears.

7. In the dialog box, center the elephant; in **Z offset**, type -10 (pictured).

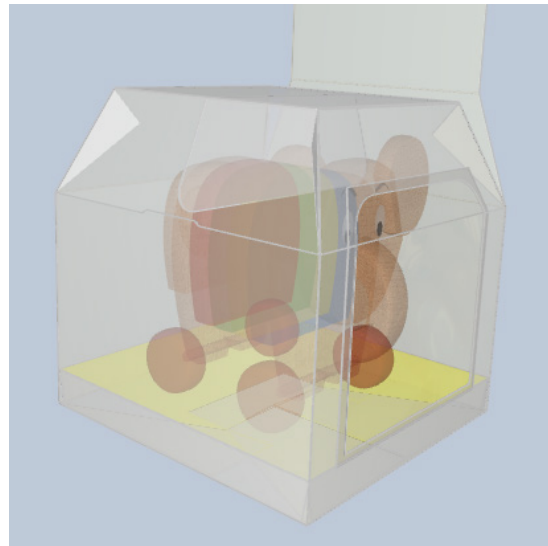
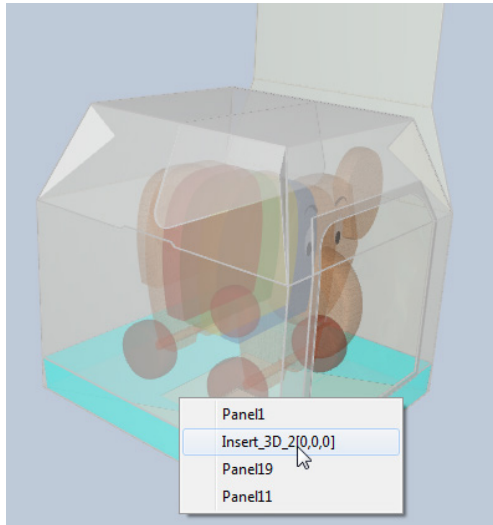


8. To apply the changes, click **OK**.

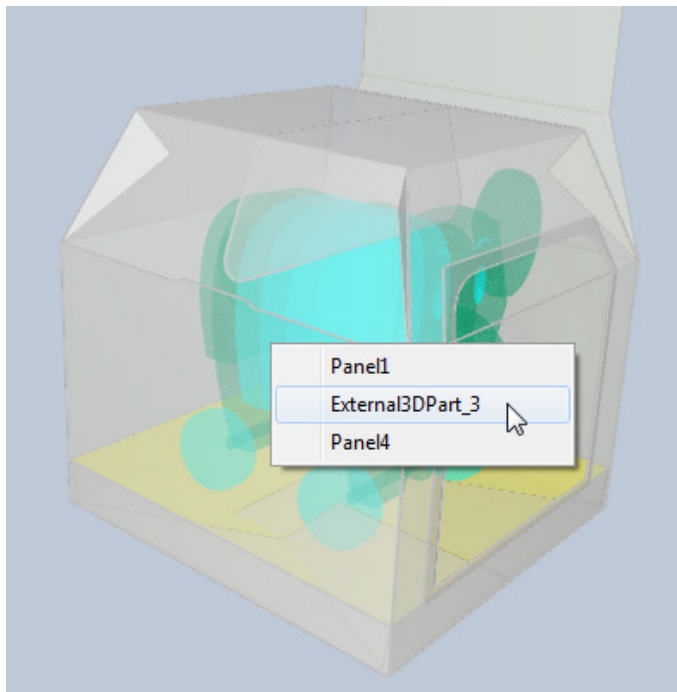
Intersecting With External Object

We need to make holes in the insert. This means to intersect the insert's upper panel with the elephant's wheels.

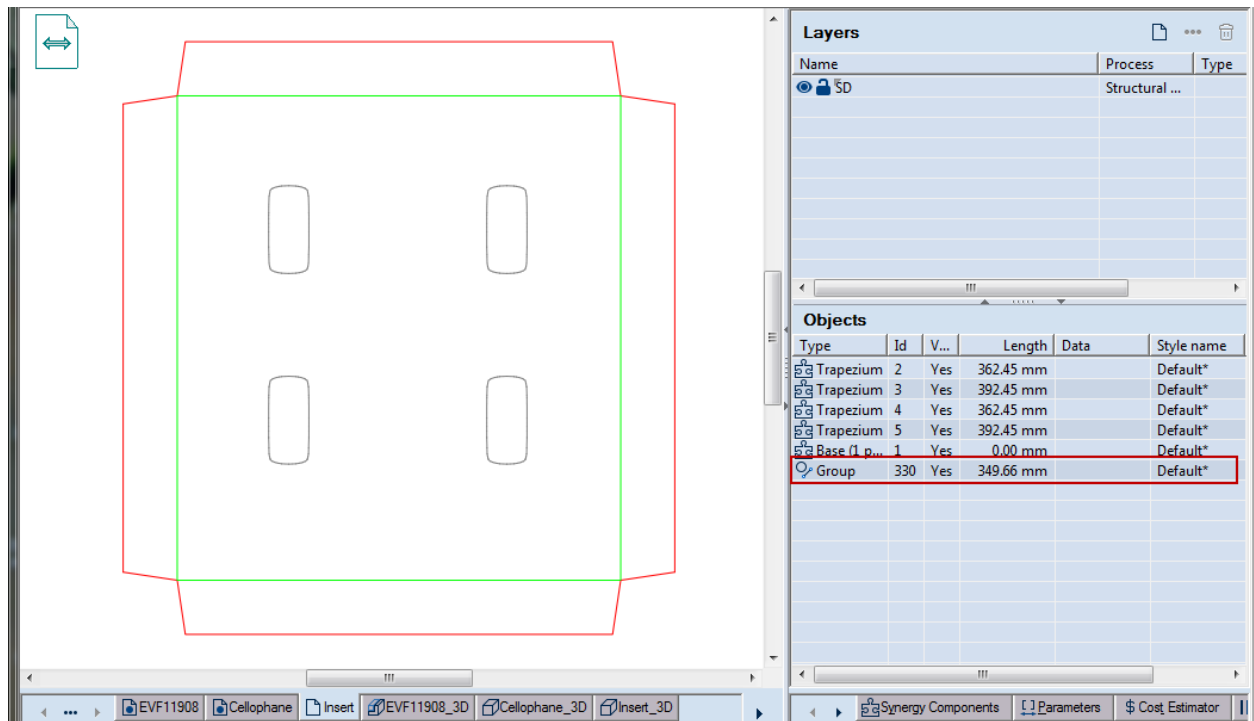
1. Select the the insert's upper panel (this is the panel that we want to intersect).



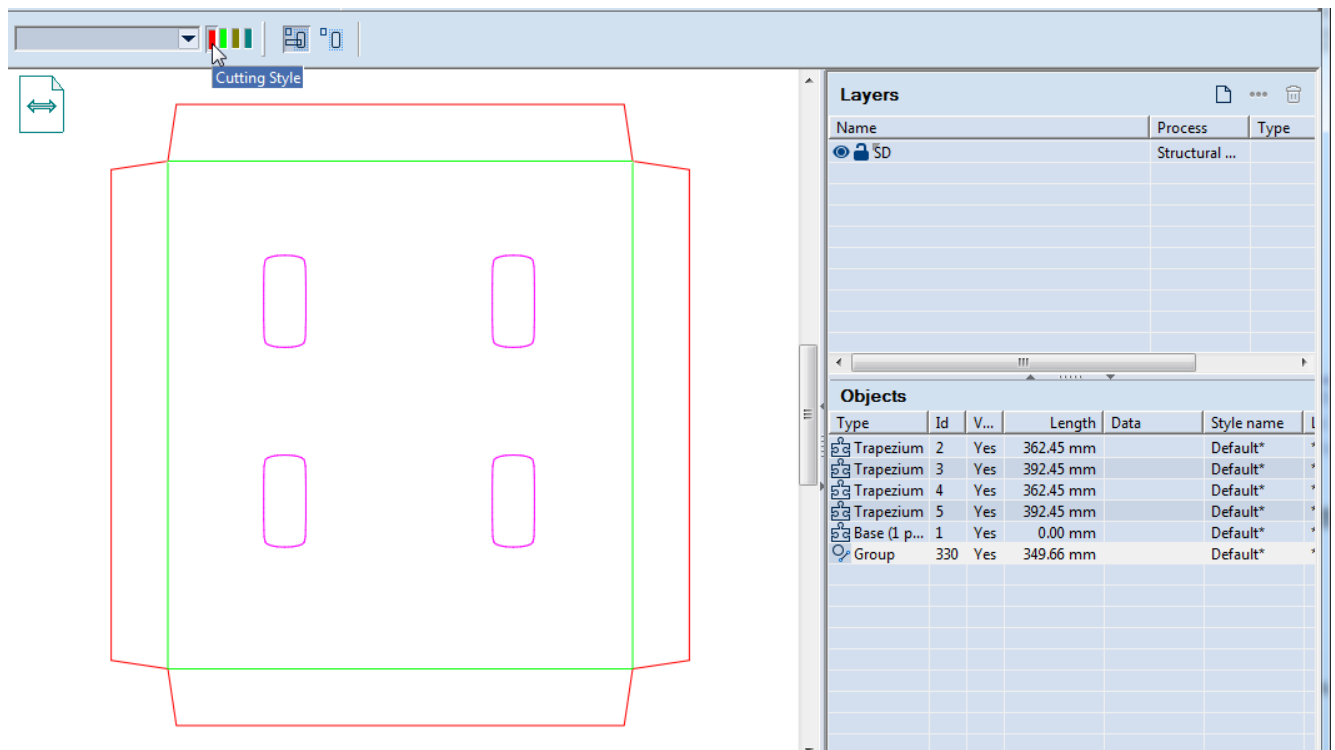
2. Select the intersecting object: the elephant.



Note that in the insert's 2D drawing, the grouped contours of the wheels have appeared.

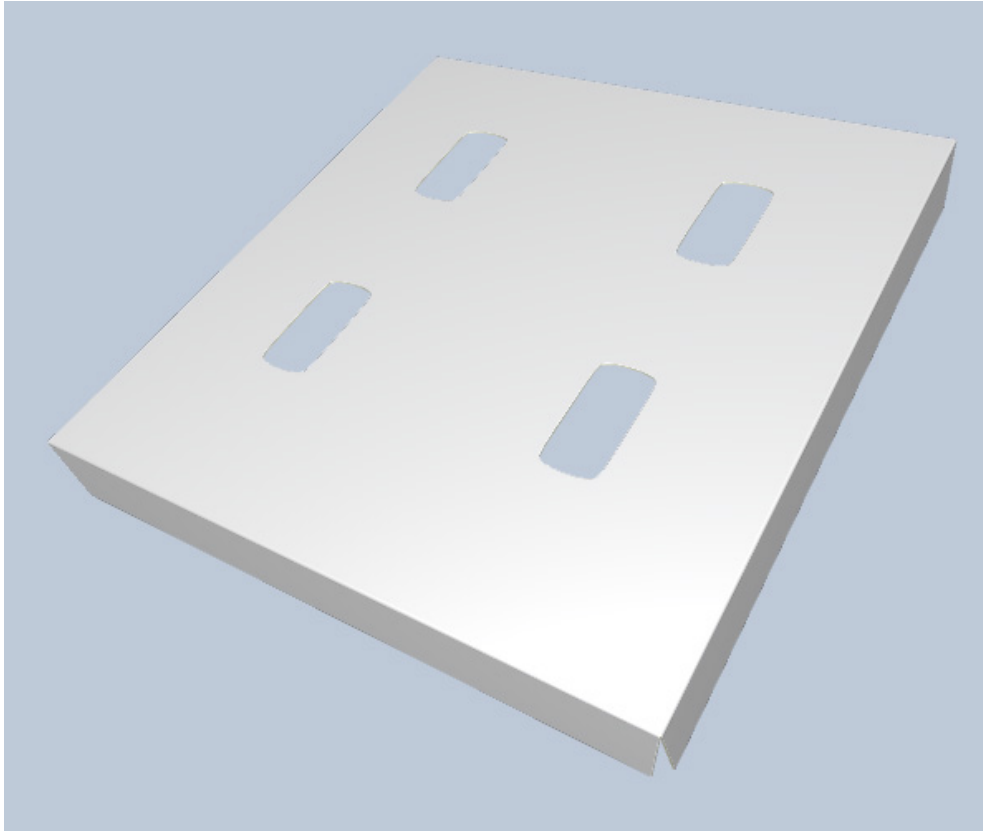


3. Select the group, and then apply the Cutting style.



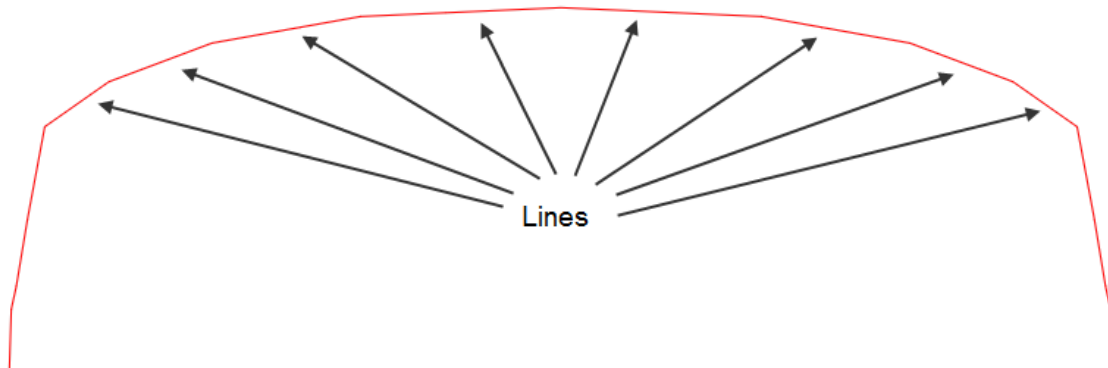
4. In the insert's 3D drawing, click **Refresh** .

The constructed holes are now visible.

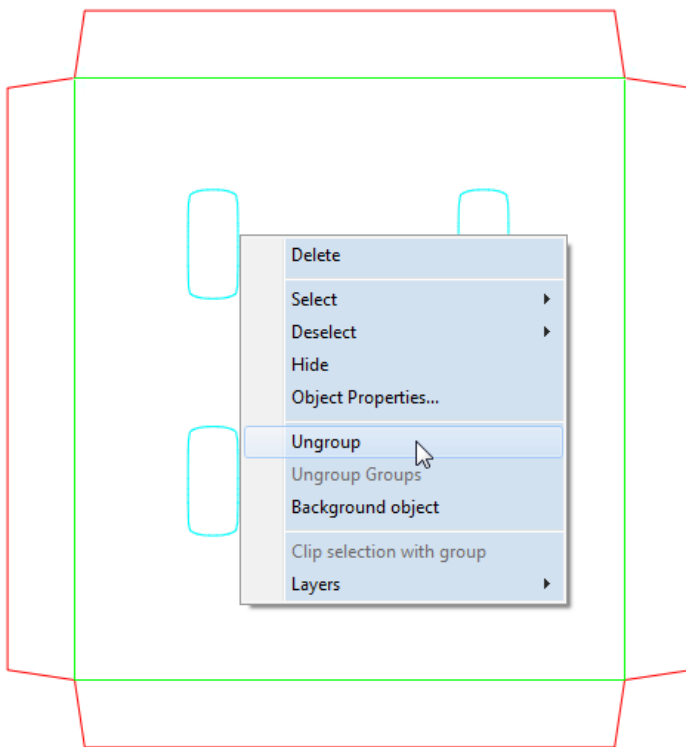



Objects Approximation

Let us take a look at the holes. Go to the insert's 2D drawing.

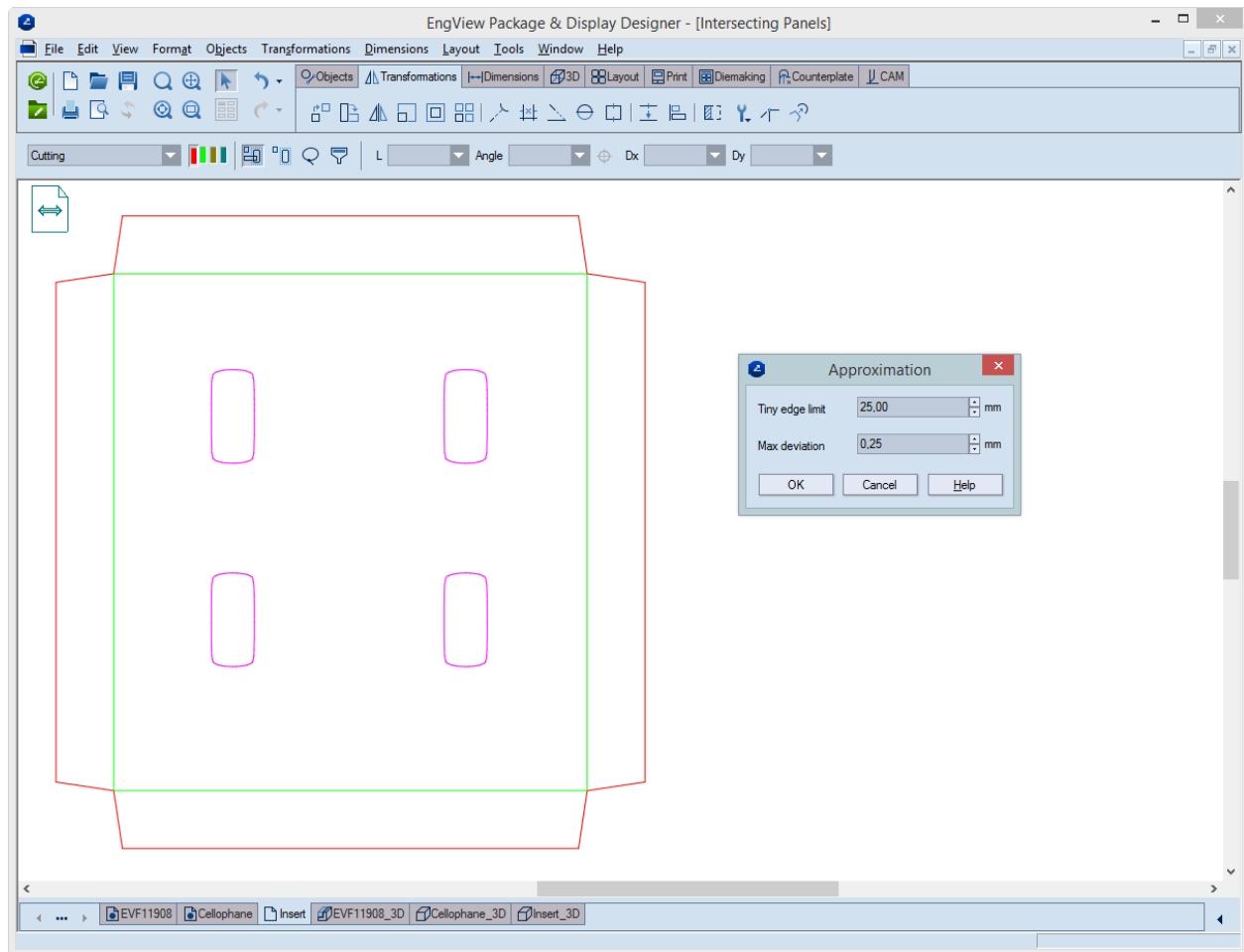


We can see that it's not a smooth shape. We will use the Object Approximation functionality to smooth it out. But before that we need to ungroup the objects that have appeared as a result of the intersection.



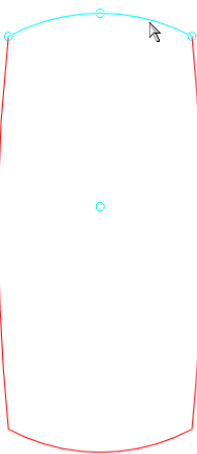
1. Select the holes.
2. On the **Transformations** menu, click **Objects Approximation** .

The **Approximation** dialog box appears.

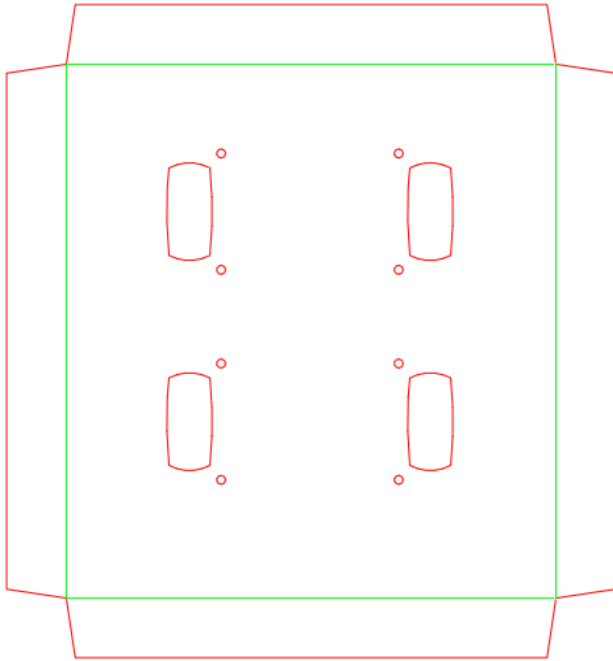



3. For **Tiny edge limit** type 25; for **Max deviation** type 0.25; and then click **OK**.


The program bulks the objects taking into account the set criteria and produces an arc instead of the many lines we had before.

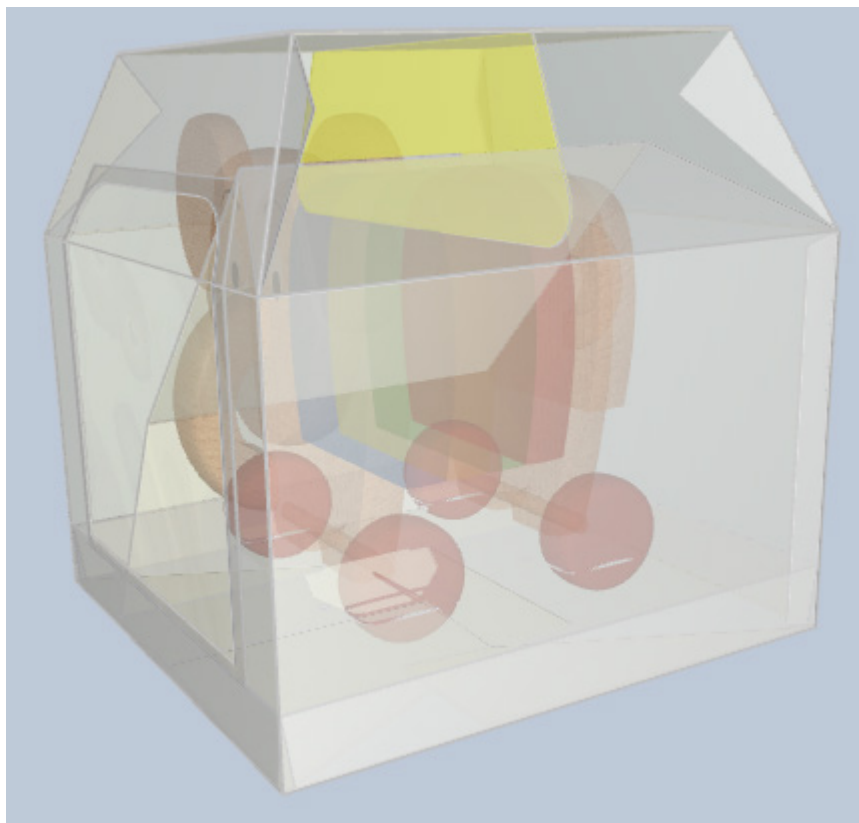
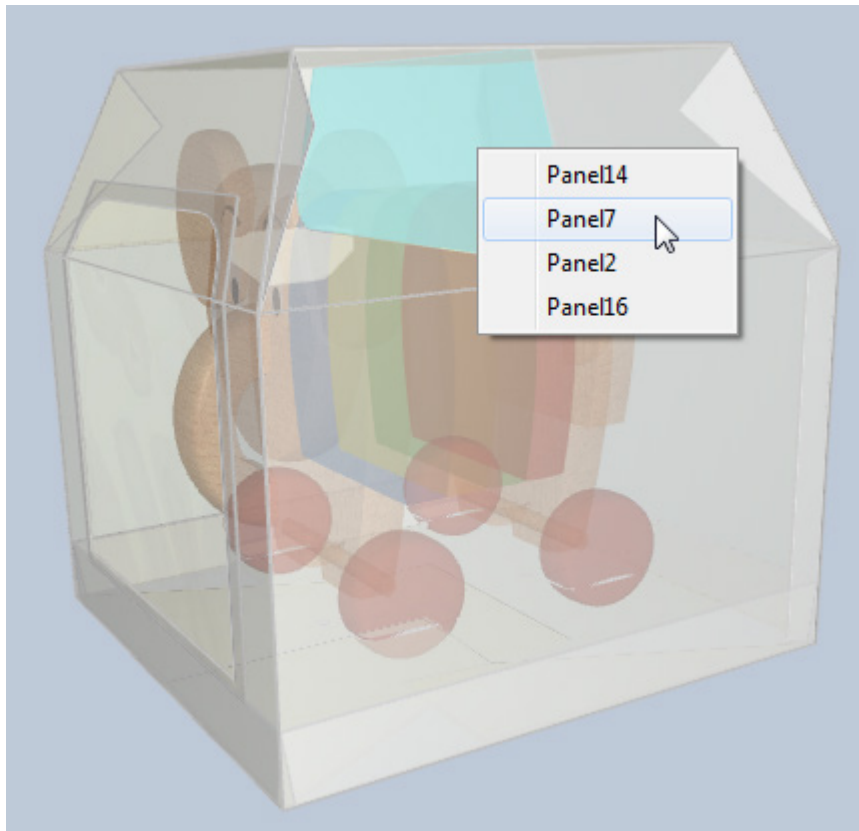


We proceed by drawing holes in which the elephant will be held to the insert.

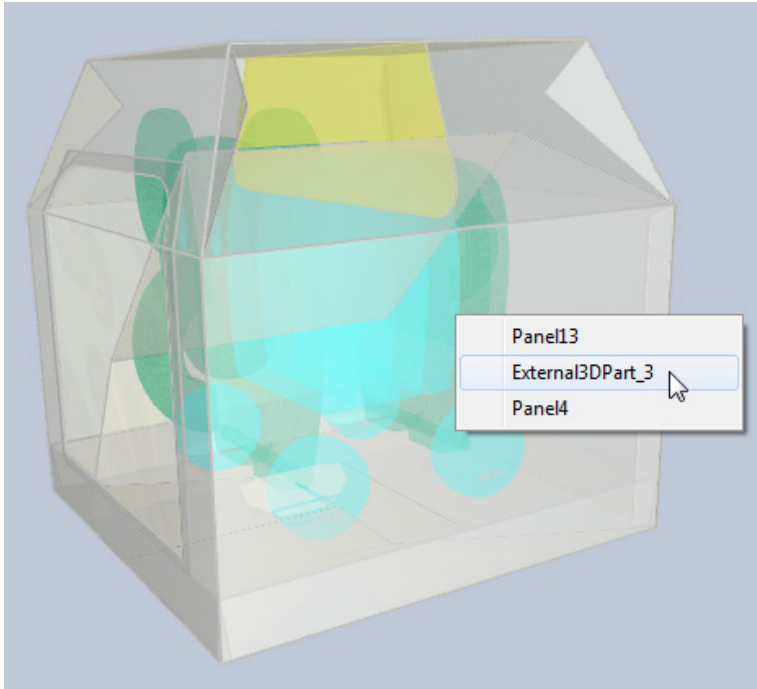


4. To update the visualization of the insert, go to the assembled 3D drawing, and click **Refresh** . Now we will cross-section the upper panels with the elephant's body.

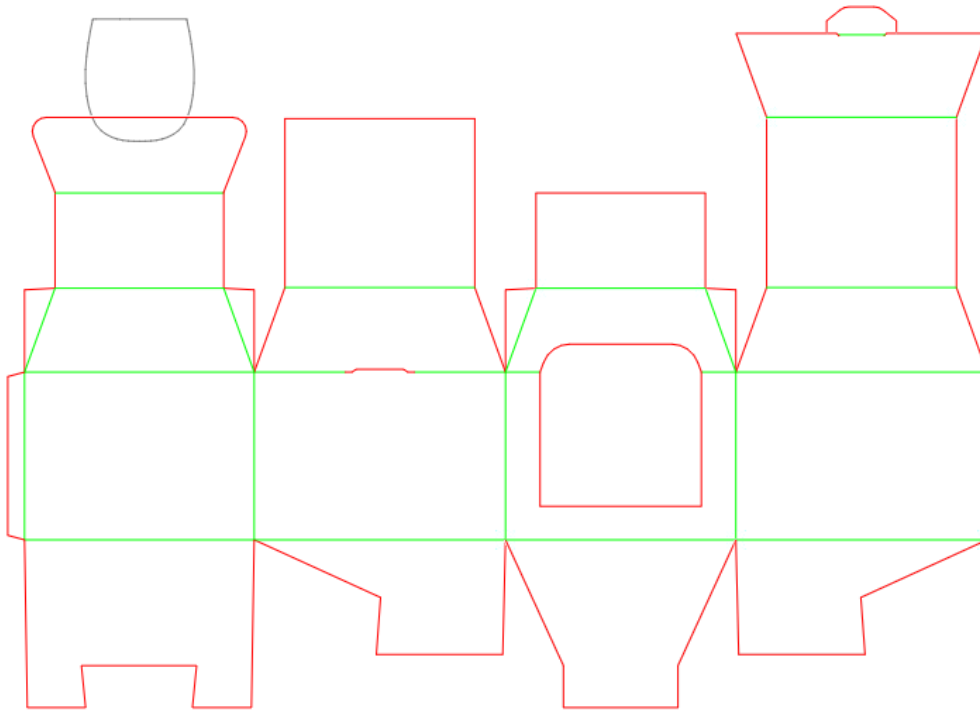
1. On the **3D** toolbar, click **Intersect Mode** .
2. Point to the panel (pictured).



3. Point to the elephant.



4. To inspect the change, go to the design's 2D drawing.



The newly drawn contour outlines fitly the shape of the elephant.

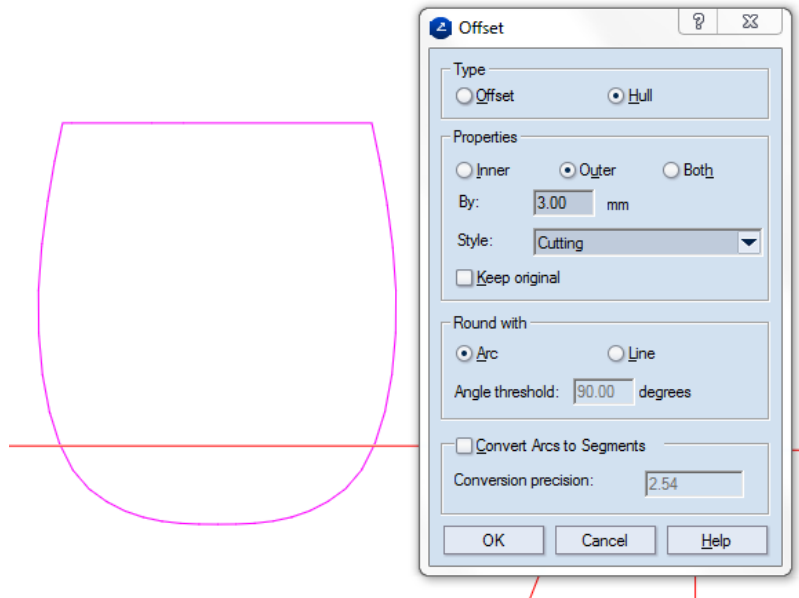
Let's now make a small slack. We will use the offset transformation.

5. Click the contour to select it.

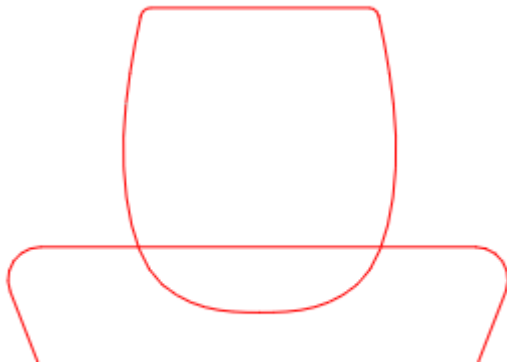
We proceed by applying an offset to the selected shape.

6. On the **Transformation** toolbar, click **Offset**.

The **Offset** dialog box appears.

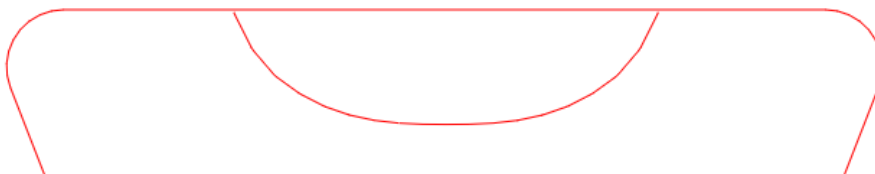


7. In the Type area, click **Hull**; in the Properties area, click **Outer**, in **By** type 3; in **Style** select Cutting and clear the check box “Keep original”.



The selected shape has adopted the Cutting style.

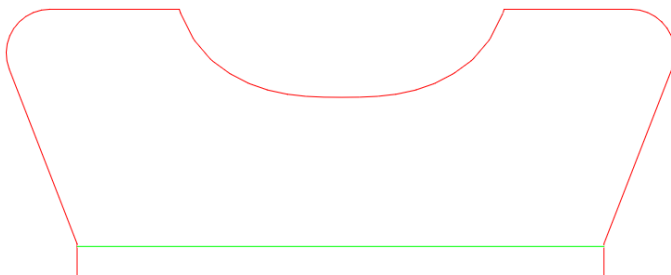
We proceed by deleting the unnecessary objects.




8. Make sure the contour touches the horizontal line. If necessary, use the Extend functionality.

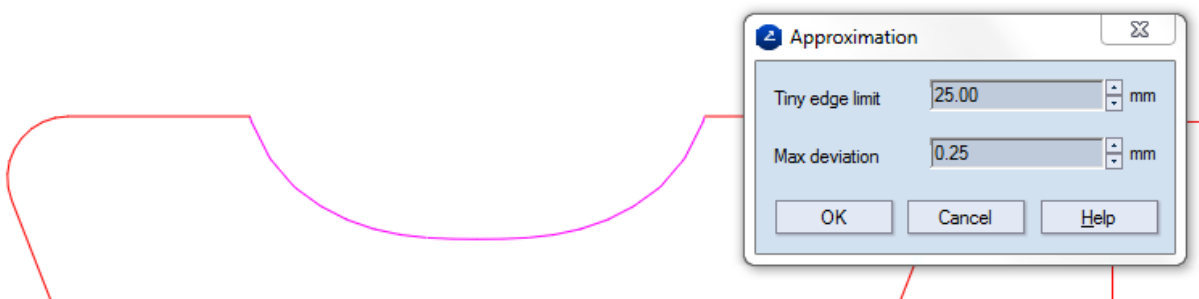


9. Trim the upper horizontal line (pictured).

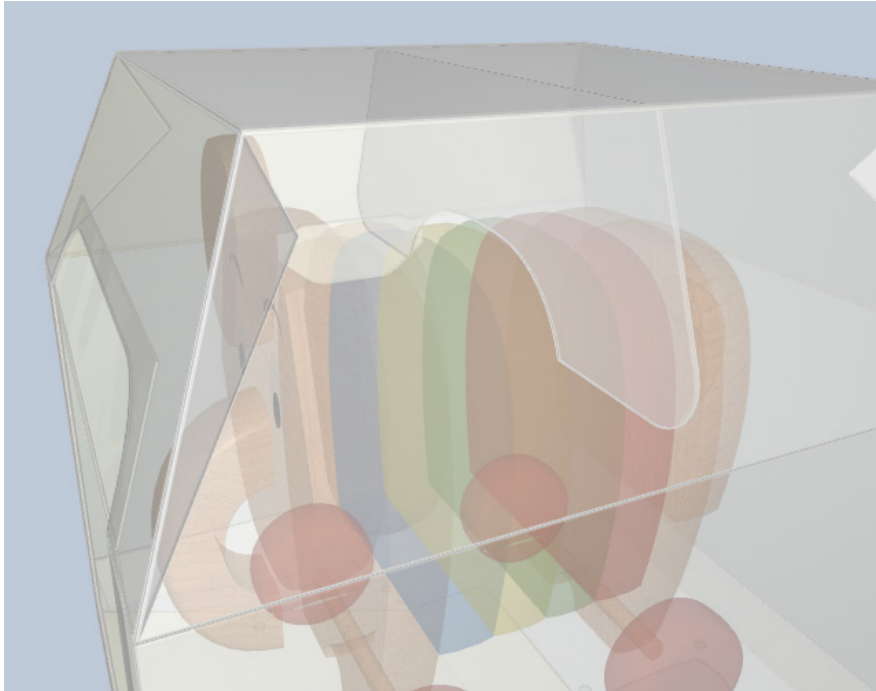


10. Now we will smooth out the oval section. On the **Transformation** toolbar, click **Objects** **Approximation** .

11. In the **Approximation** dialog box, for **Tiny edge limit** type 25; in **Max deviation** type 0.25; and then click **OK**.



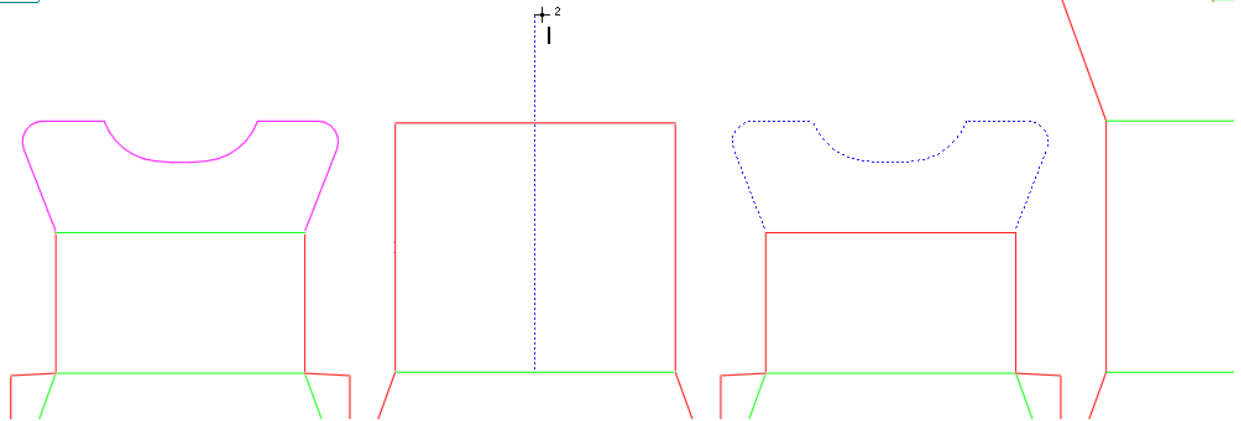
12. To see the result, go to the 3D drawing, and then click **Refresh**.



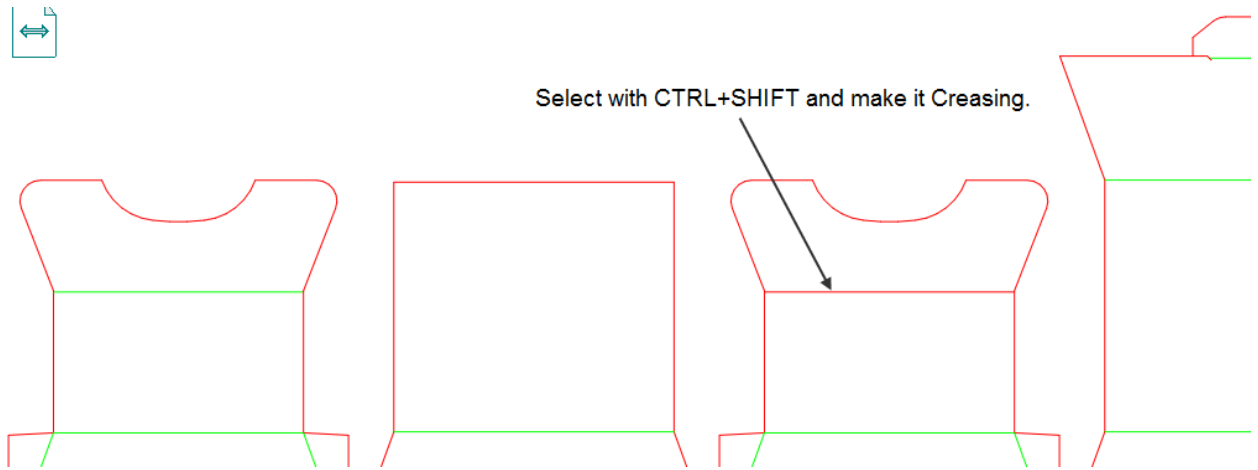
We will copy the panels also to the other side.

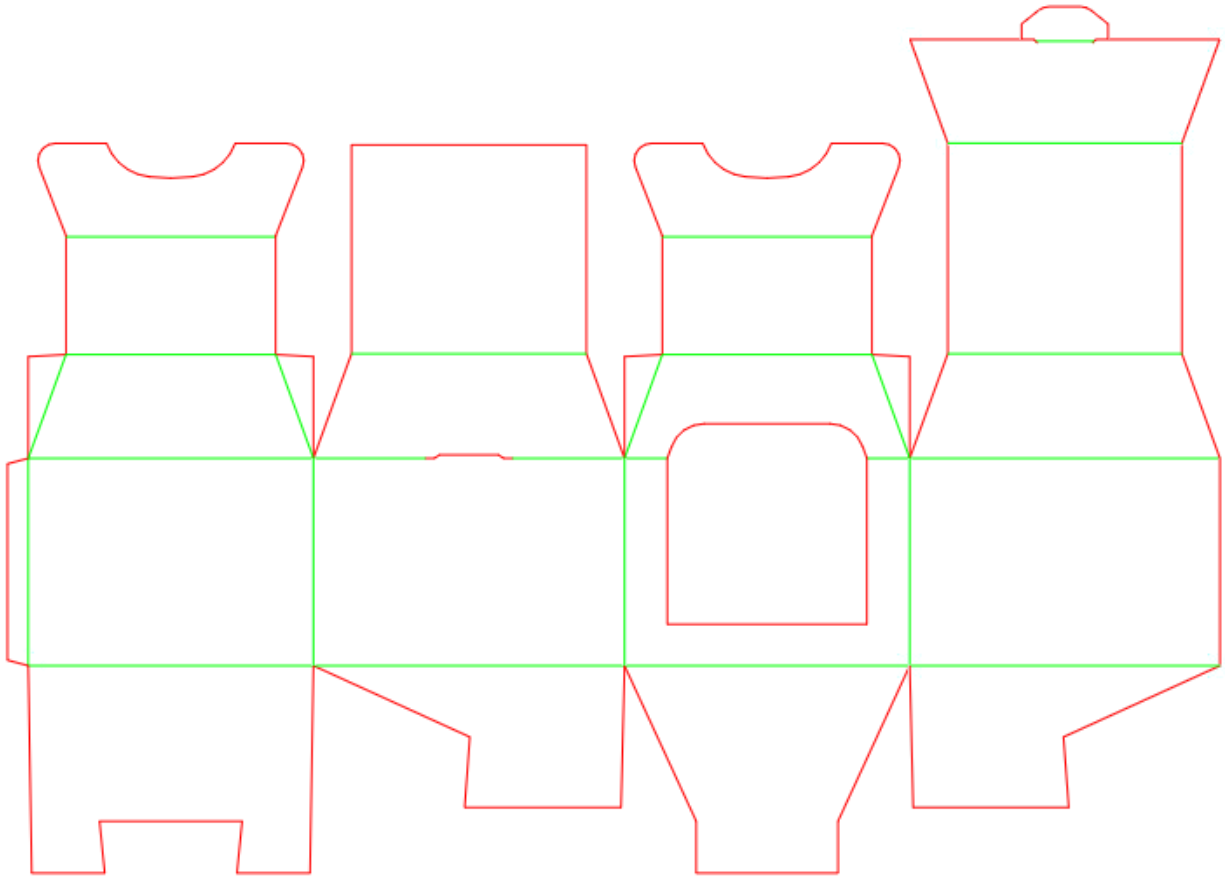
13. Go to the 2D drawing.

14. Mirror with copy the panel to the other side (pictured).



Select with CTRL+SHIFT and make it Creasing.

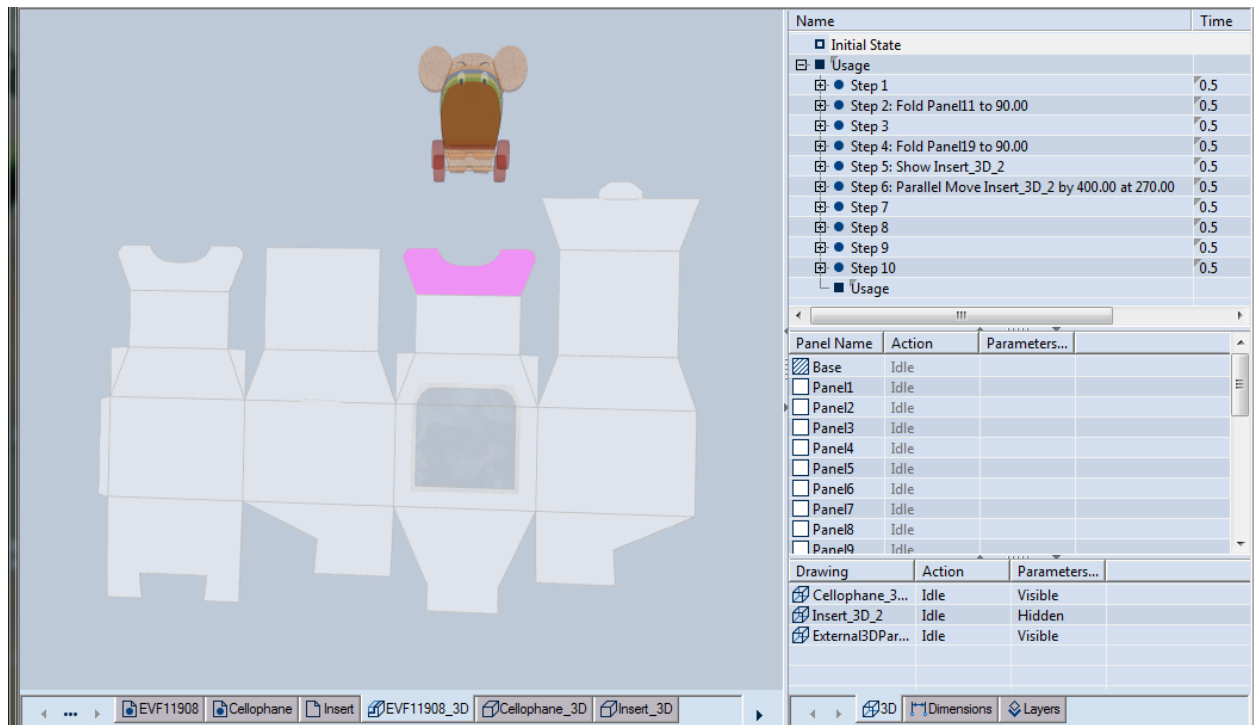




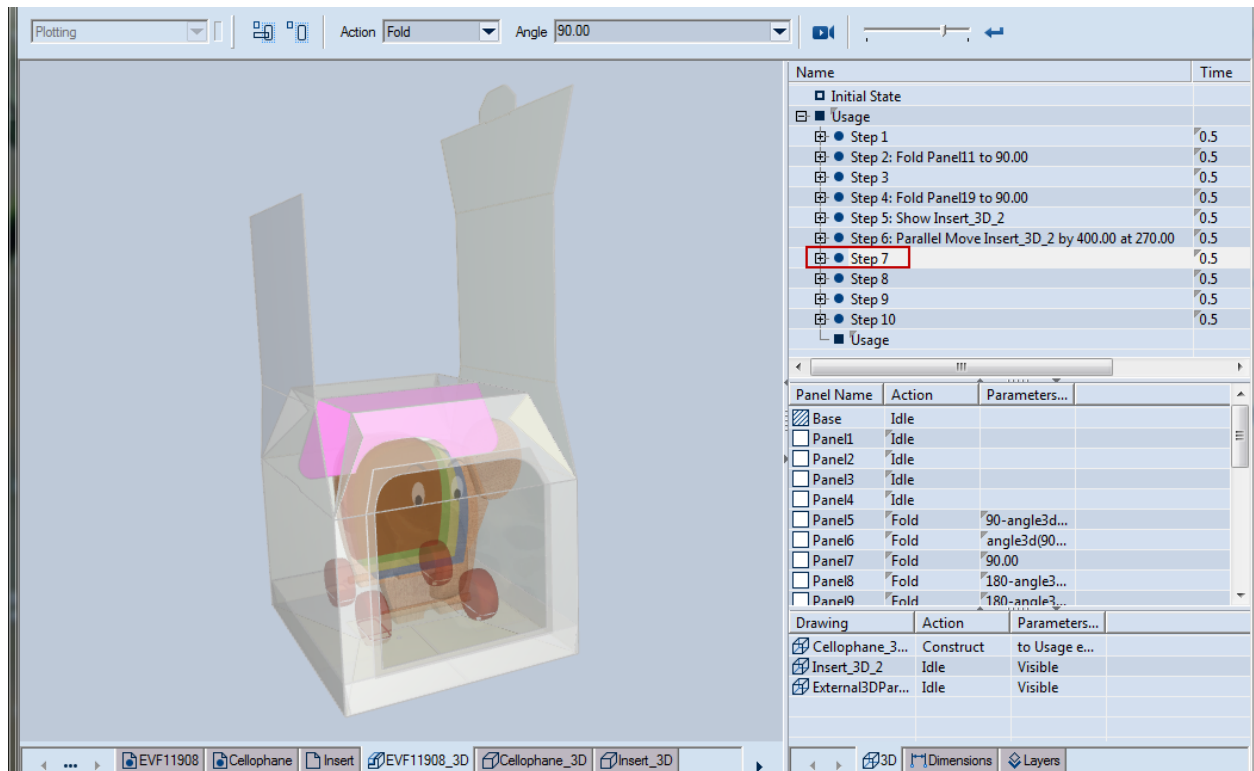
15. Go to the 3D drawing, and then click **Refresh**.

The new panel, which we need to fold, appears.

16. In the tabular table, click Initial State, and then select the panel.



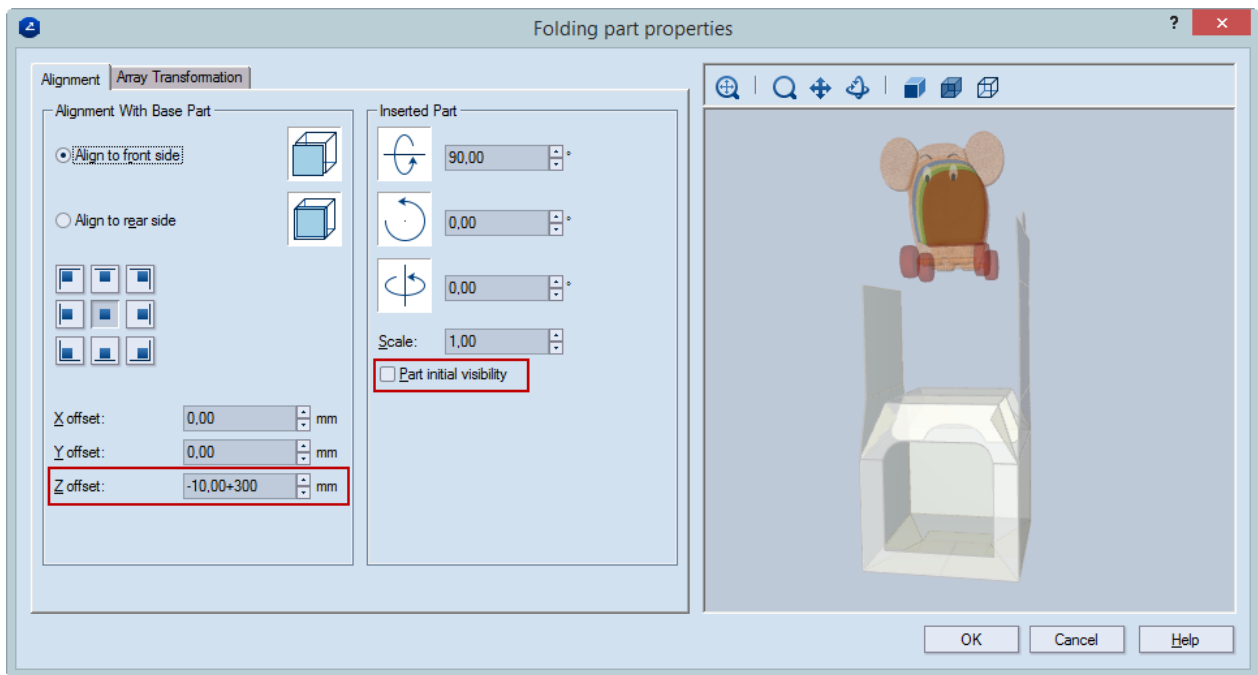
17. Select Step 7, and then fold the panel at 90 degrees.



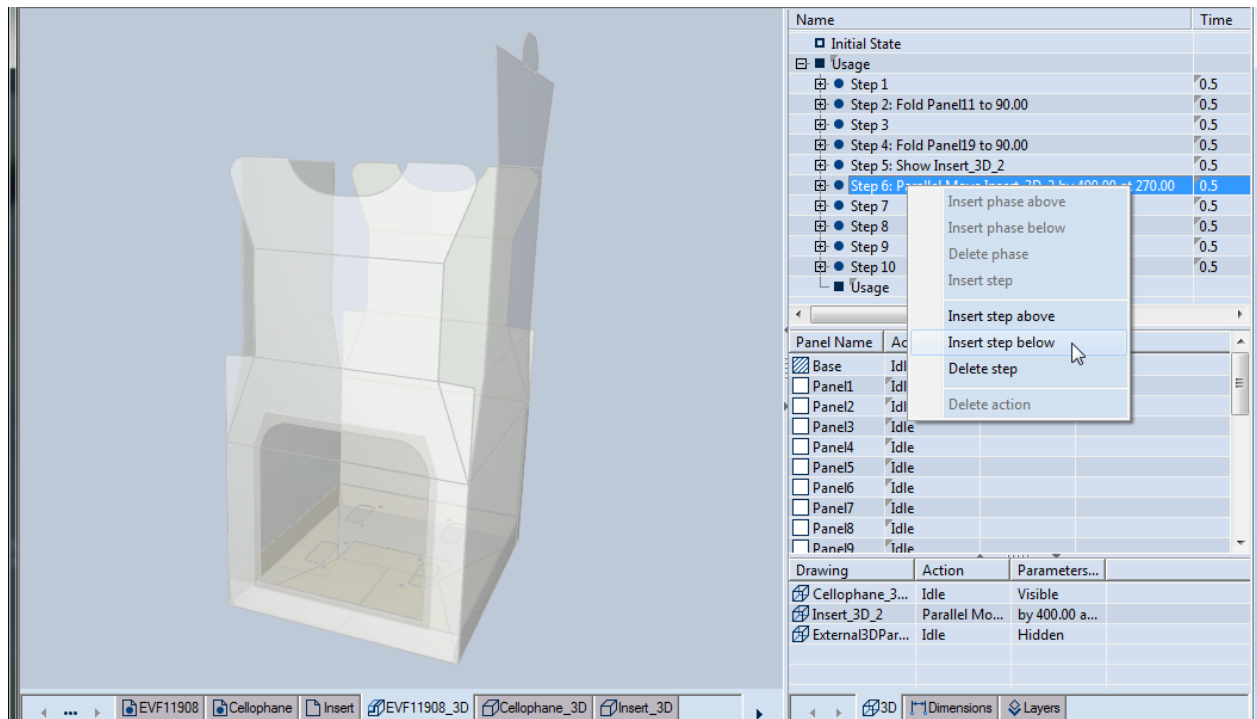
Hiding and Showing the External Object

Currently we can see the elephant throughout the 3D animation. In fact, we need it only after we have positioned the insert. We will show also how the elephant goes into the box.

1. In the tabular area, double-click the external object to open its properties.
2. In the Folding part properties dialog box that appears, leave the **Part initial visibility** check box empty; in **Z offset**, leave the earlier offset (−10) and type a new one: +300 (pictured).



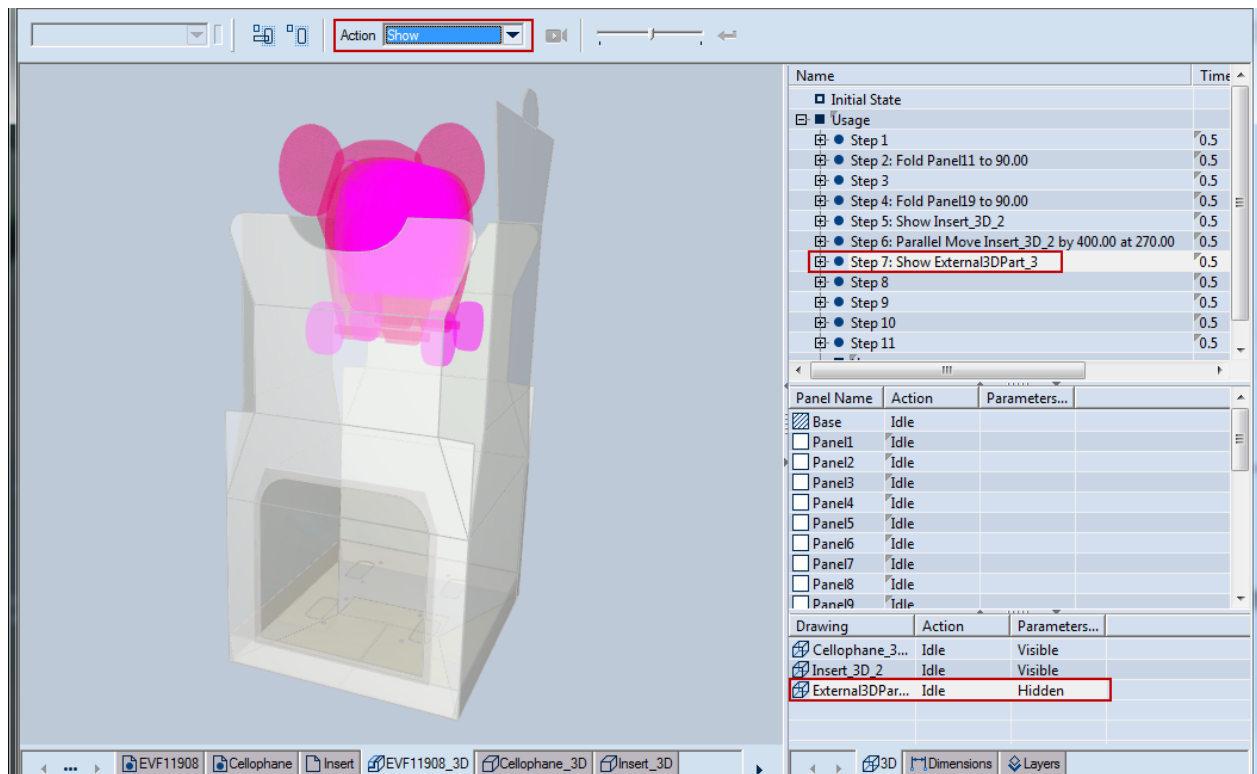
3. To apply the changes, click **OK**.
4. Click Step 6, and then insert a new step below.



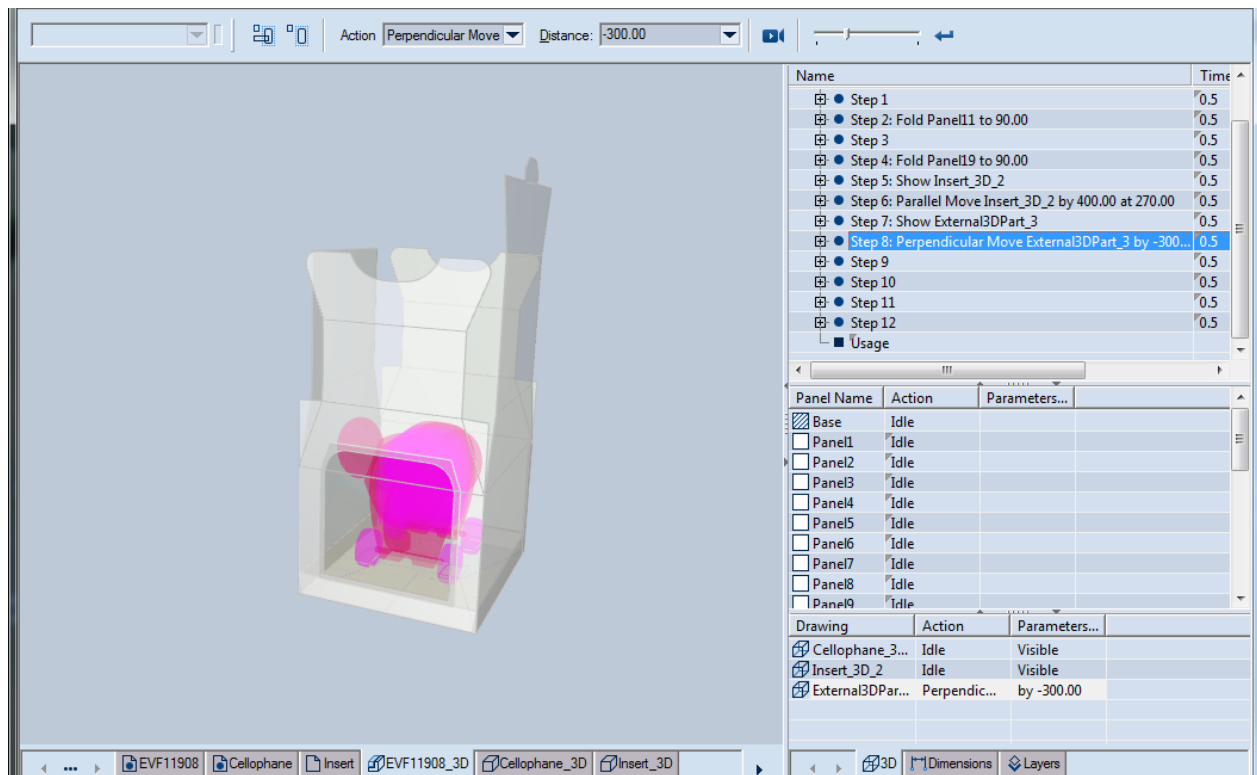
We will make the elephant visible in the newly created step.

5. In the tabular area, select the external object.

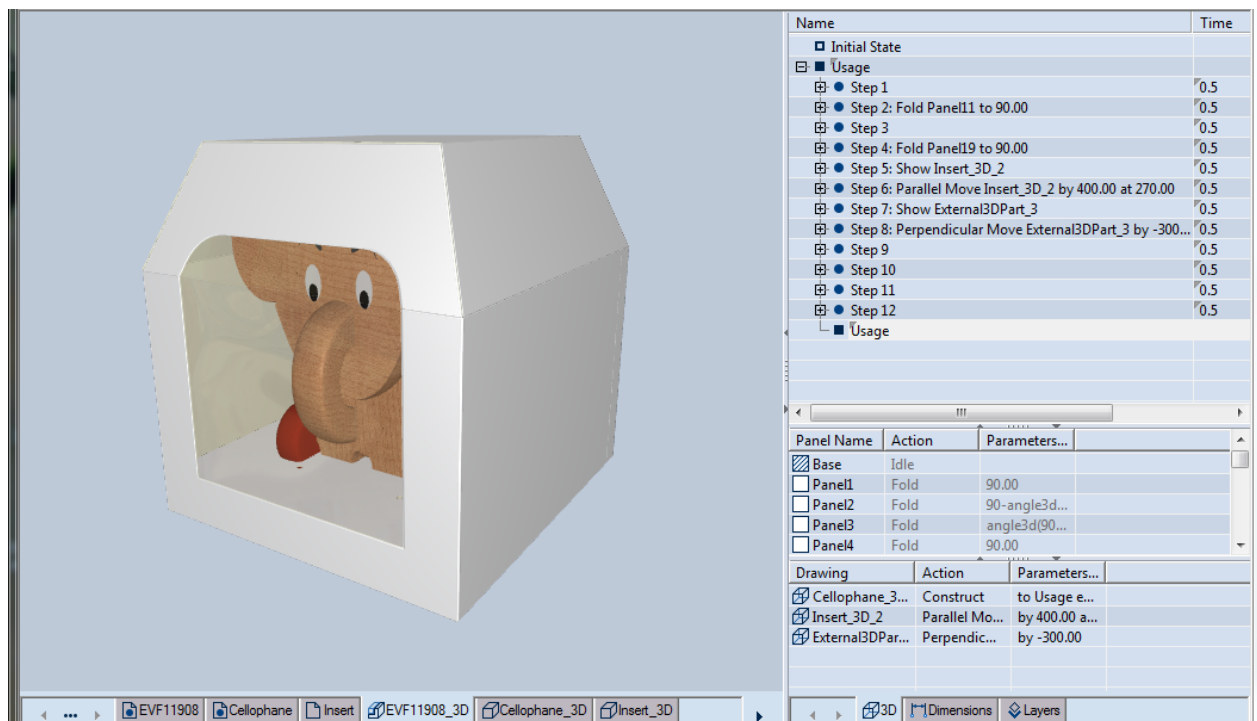
In the contextual edit bar that appears, in **Action**, select Show.



6. Insert a new step below Step 7, and then in **Action** select Perpendicular Move; in **Distance** type –300.



The 3D animation is complete.



7. Save the file.