

Assembling 3D Structures

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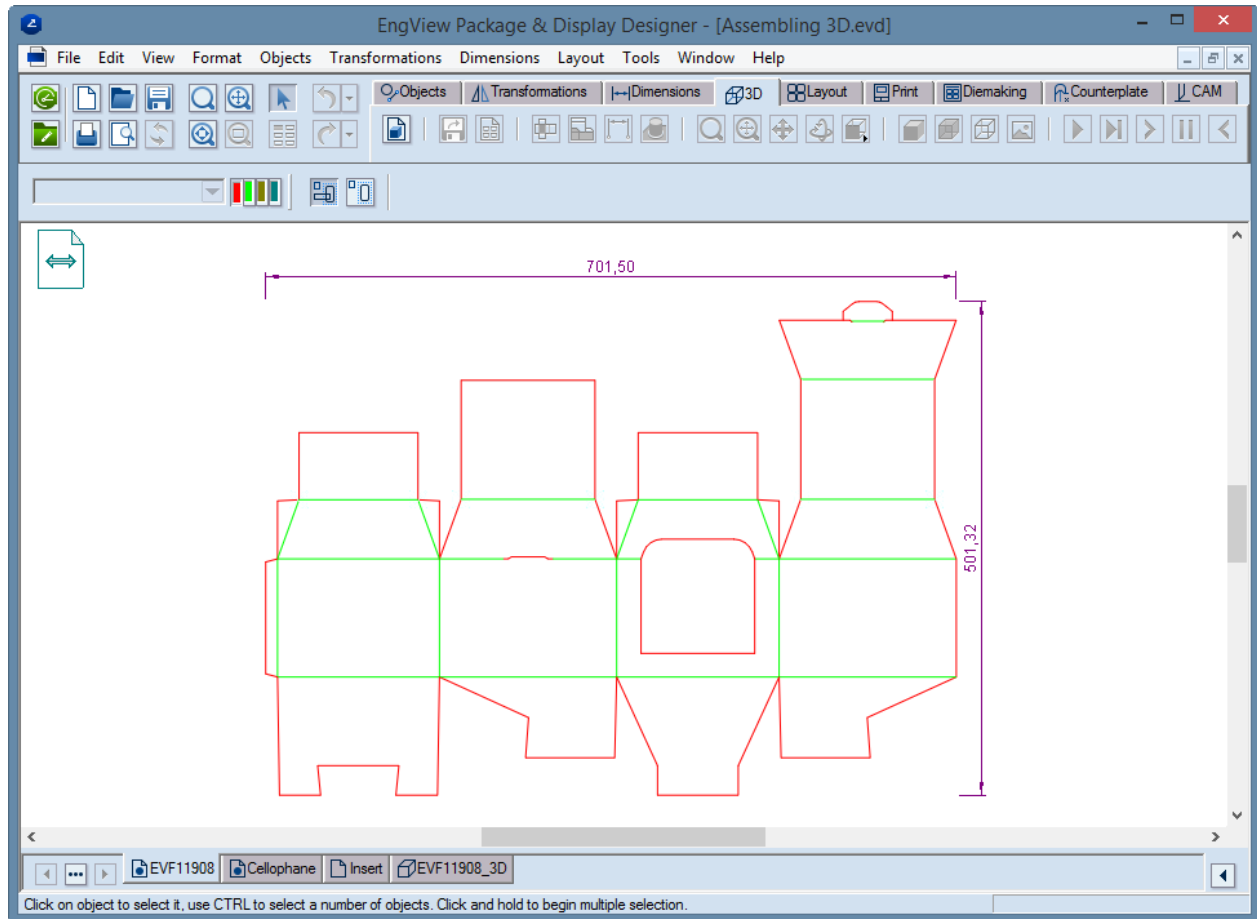
Task

In this exercise we will create a 3D representation of a multi-drawing project. During the task we will:

1. Set different materials for the drawings.
2. Assemble the individual 3D drawings of each 2D drawing.
3. Define the box's folding sequence.

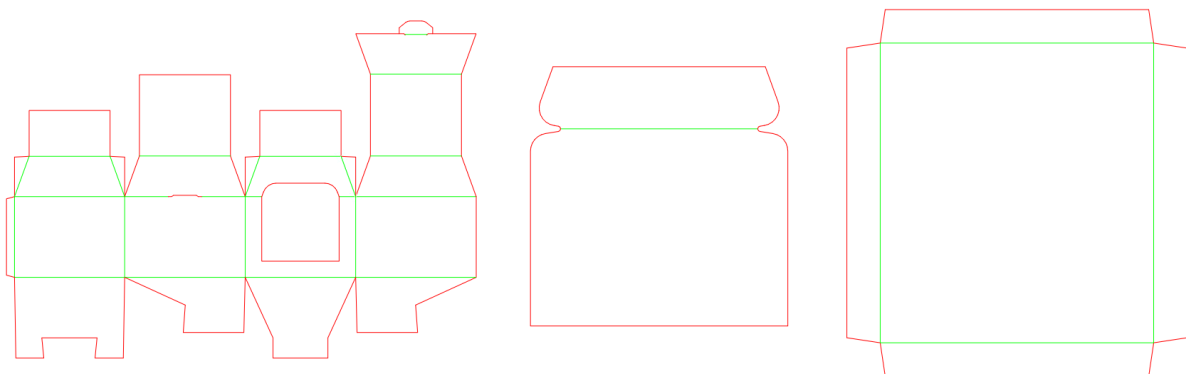
Exercise Description

1. From the folder C:\EngViewWork6\EngView Samples, open the file Assembling 3D.evd.



Pic. 1: View of the box's 2D drawing

The project consists of a box, a sheet of cellophane, and an insert.



Pic. 2: The 2D views of the structure's three components

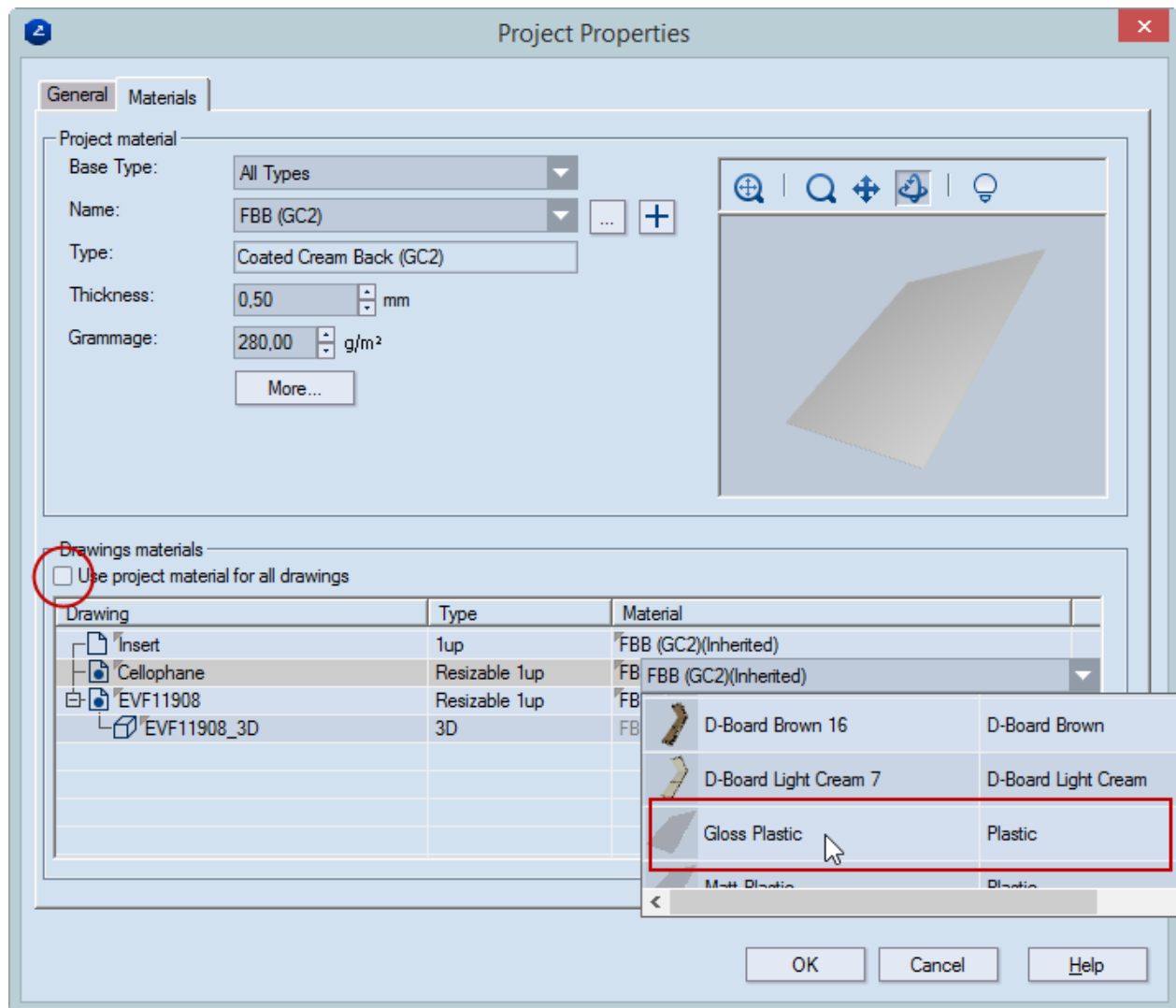
Changing the Material

By default, new drawings inherit the material used in the first drawing in a project. In our case this is a folding carton cardboard FBB(GC2). But here the material of the Cellophane drawing needs to be PVC. To apply different material to this drawing, which will reflect its visualization, we need to change the material of this drawing.

1. On the **File** menu, click **Properties**.

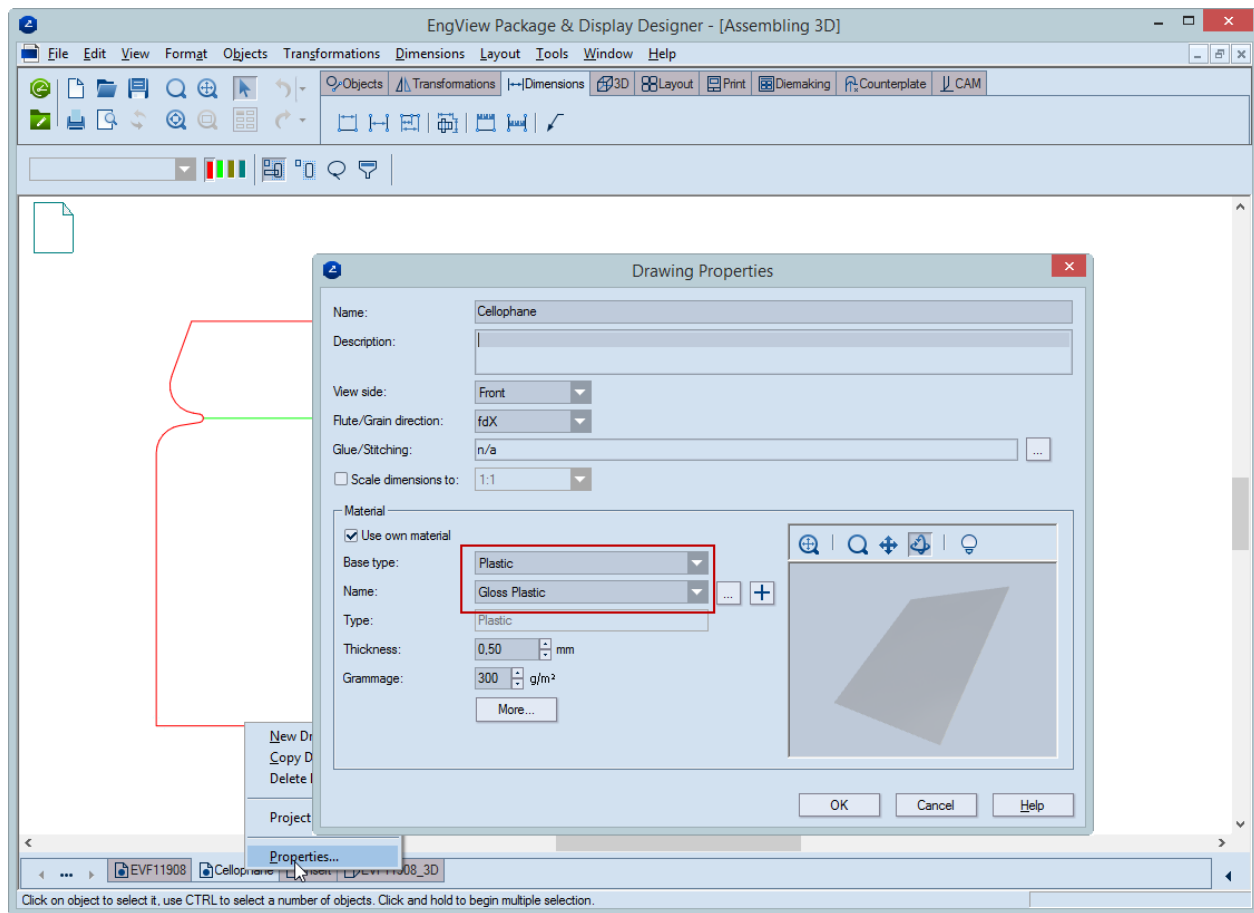
The **Project Properties** dialog box appears.

2. Click the **Materials** tab, and then clear the **Use project material for all drawings** check box and for the Cellophane drawing select the material Gloss Plastic.

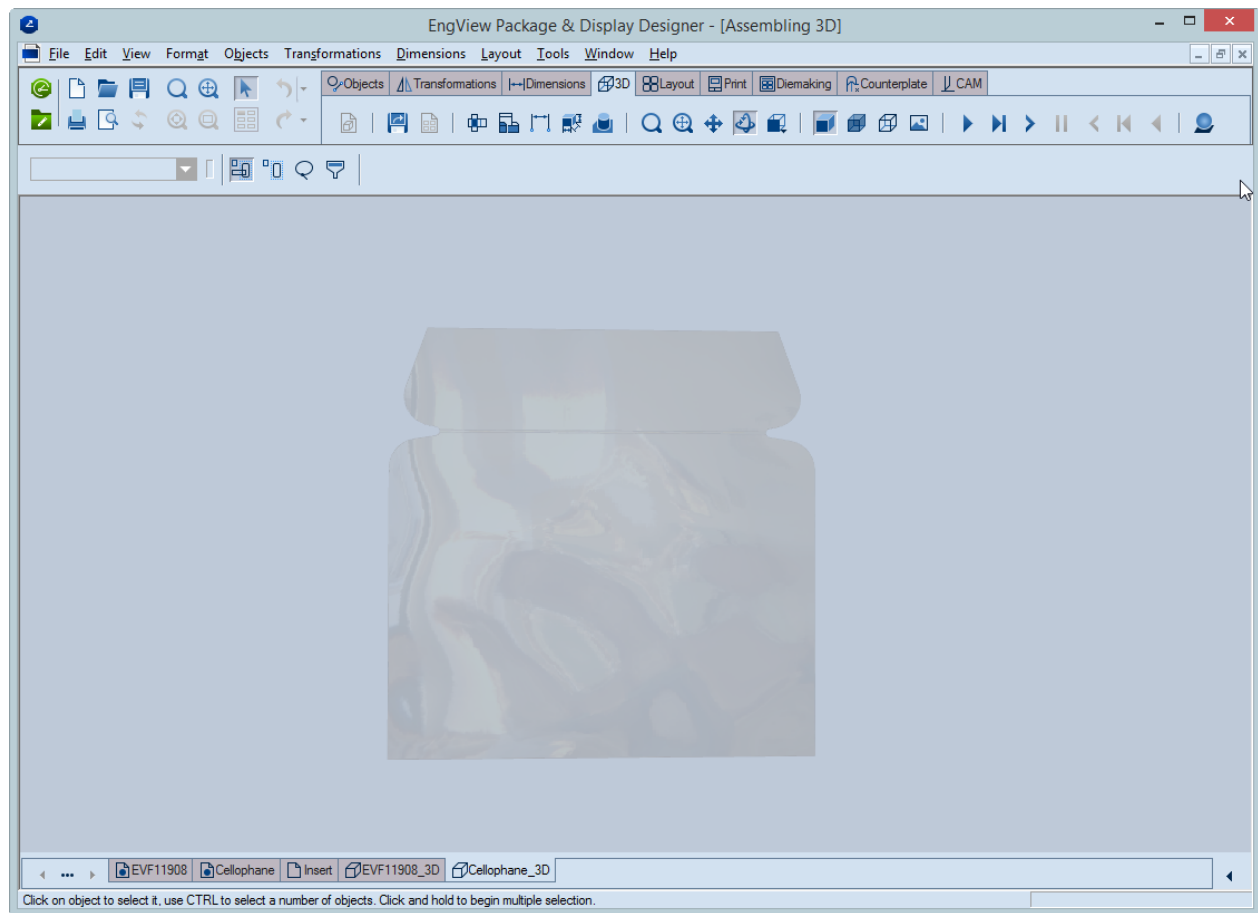


Pic. 3: Individual drawings can have their own materials.

From now on this drawing will have a material that's different from the material for the rest of the drawings. We can check this in the drawing's properties.



Pic. 4: Verifying the different material for the cellophane component




Pic. 5: The cellophane's appearance in 3D

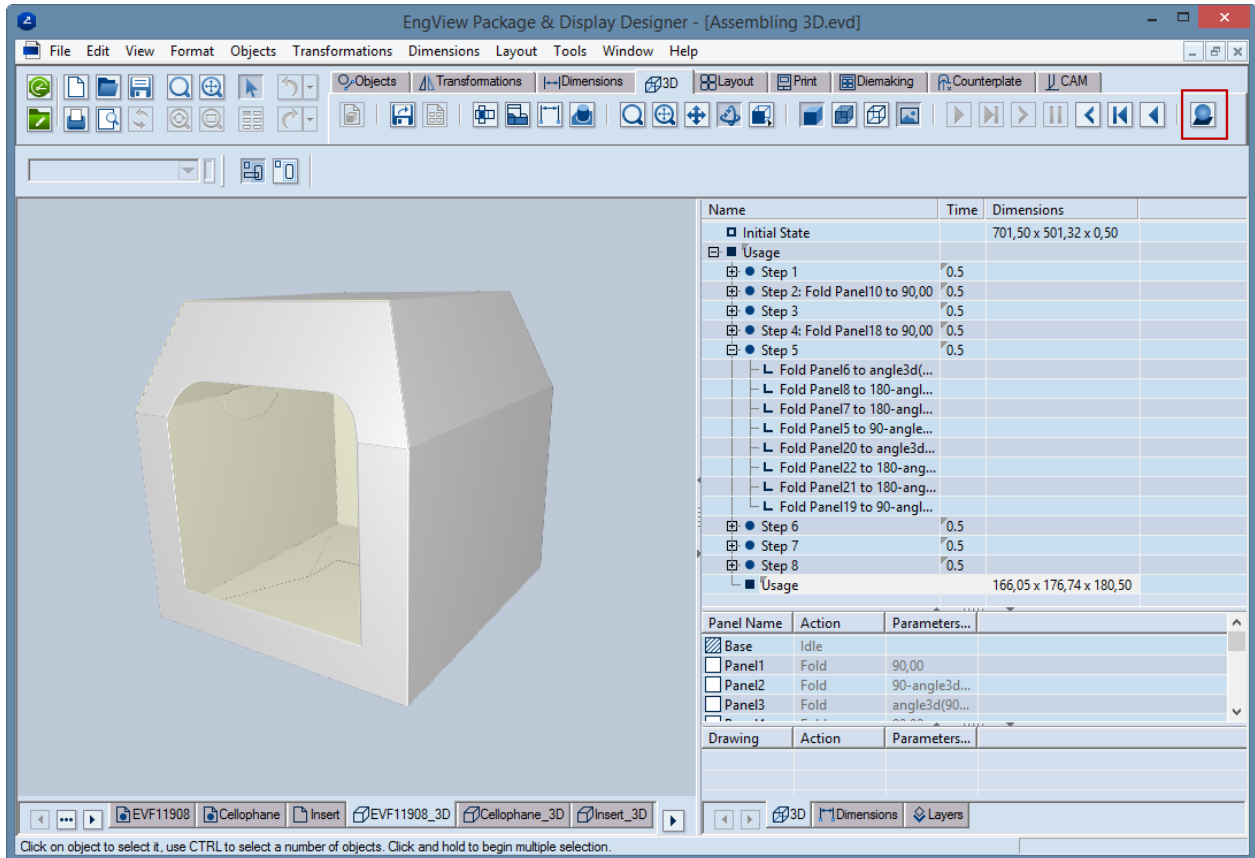
Creating an Assembled 3D Drawing

We are now going to assemble the three parts into one 3D drawing.

IMPORTANT: To do this, we need a separate 3D drawing for each 2D drawing.

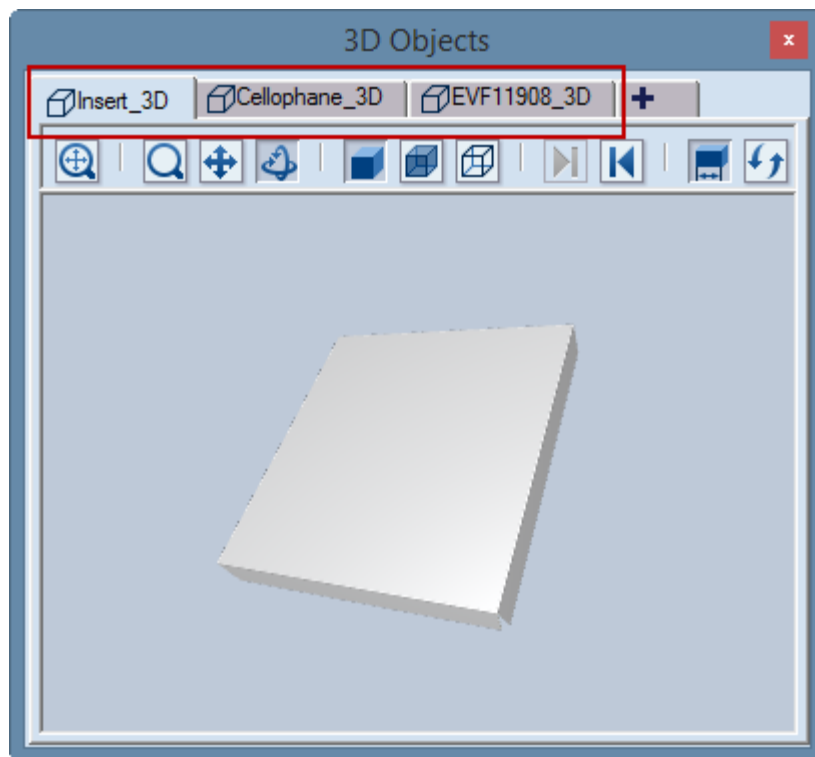
The 3D drawing of the box will be the main 3D drawing, which will contain all the box's components. We will call this drawing assembled 3D drawing.

1. Go to the box's 3D drawing, and then on the 3D toolbar click **3D Objects** .



Pic. 6: The box's 3D representation in its final state

A dialog box appears that lists all the 3D drawings in the project.



Pic. 7: A list of the available 3D drawings

Inserting the Cellophane

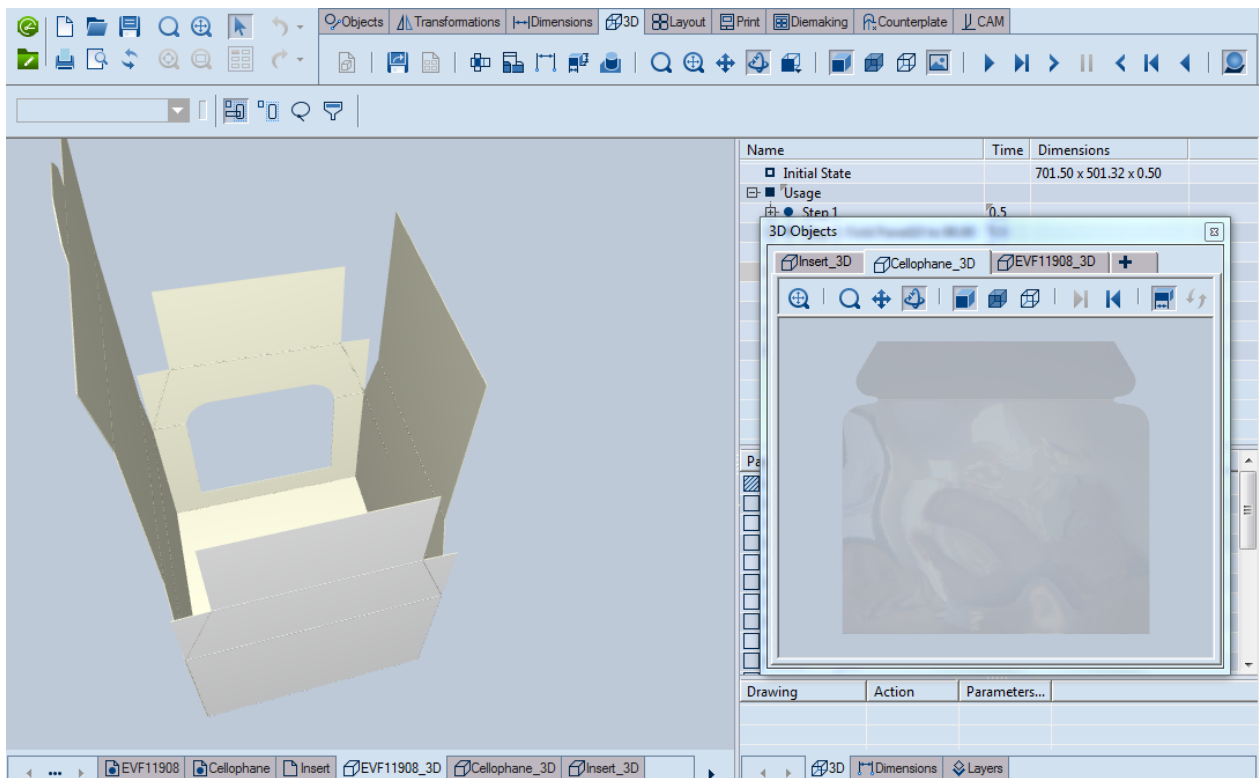
To insert the cellophane we will unfold the box to a state in which it is most propitious for attaching the cellophane.

1. In the tabular area, go to Step 4.
2. Turn the box so as to see the inner side of the panel that has the aperture.

NOTE: During the insertion of a part, the program takes account of:

- The side we clicked – front or rear – to drag the component we want to insert.
- The side we click while selecting the panel to which we want to attach the part that's being inserted.

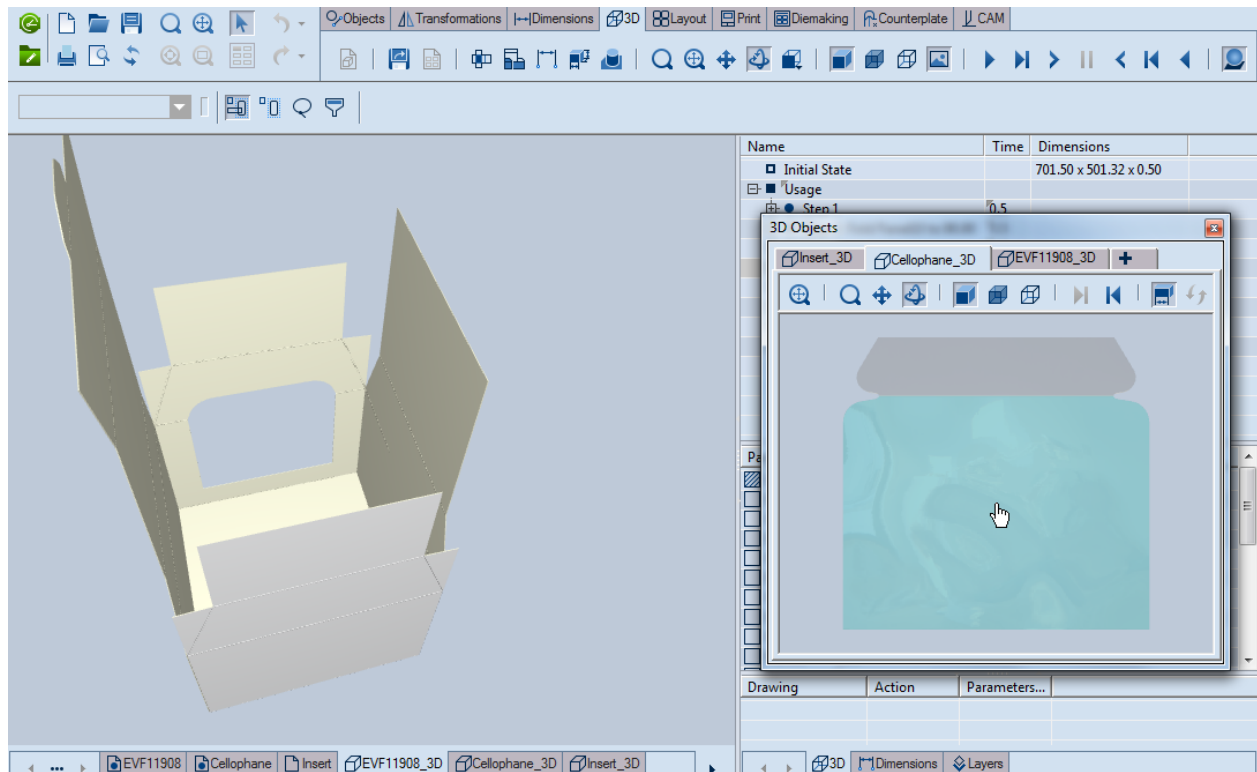
3. In the **3D Objects** window, select the **Cellophane_3D** tab.



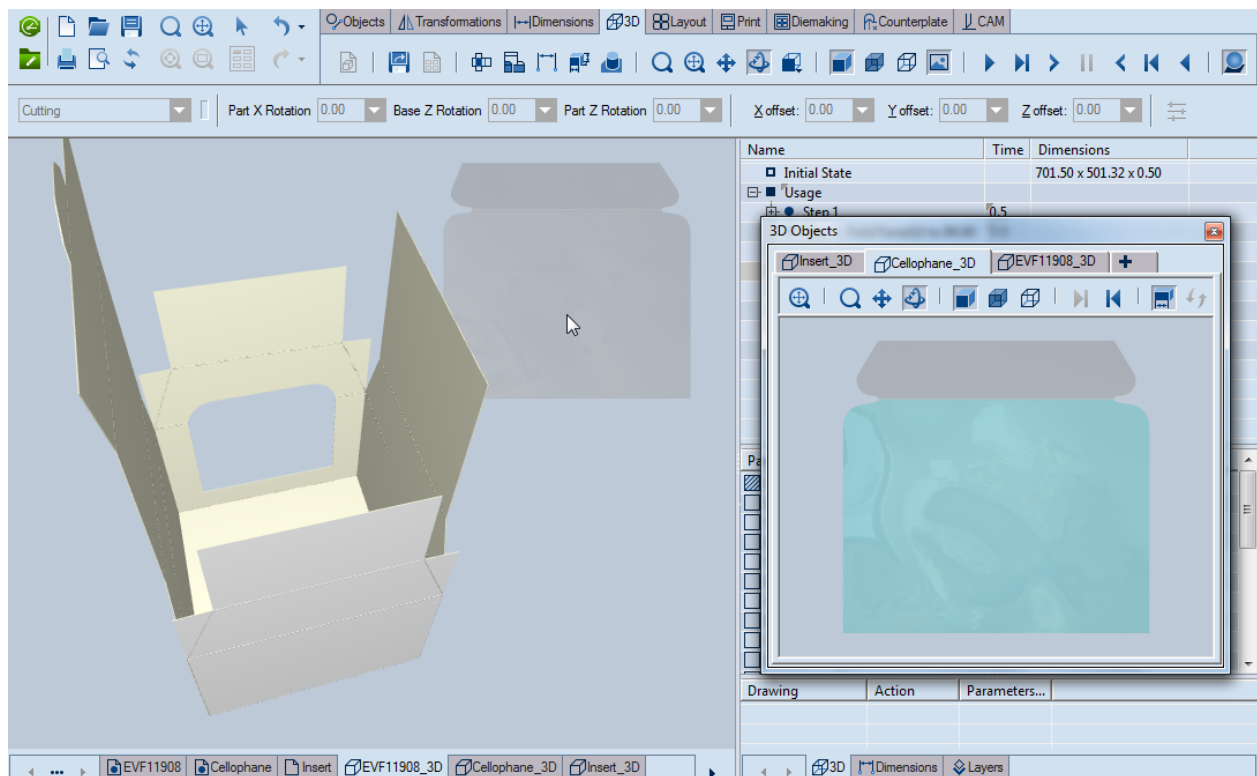
Pic. 8: The cellophane sheet is ready to be inserted.

We need to glue the cellophane's front surface to the aperture-holding panel's rear surface.

4. Turn the part so as to the material's front can be seen.
5. Click the cellophane's rectangular surface and begin dragging into the 3D work area.

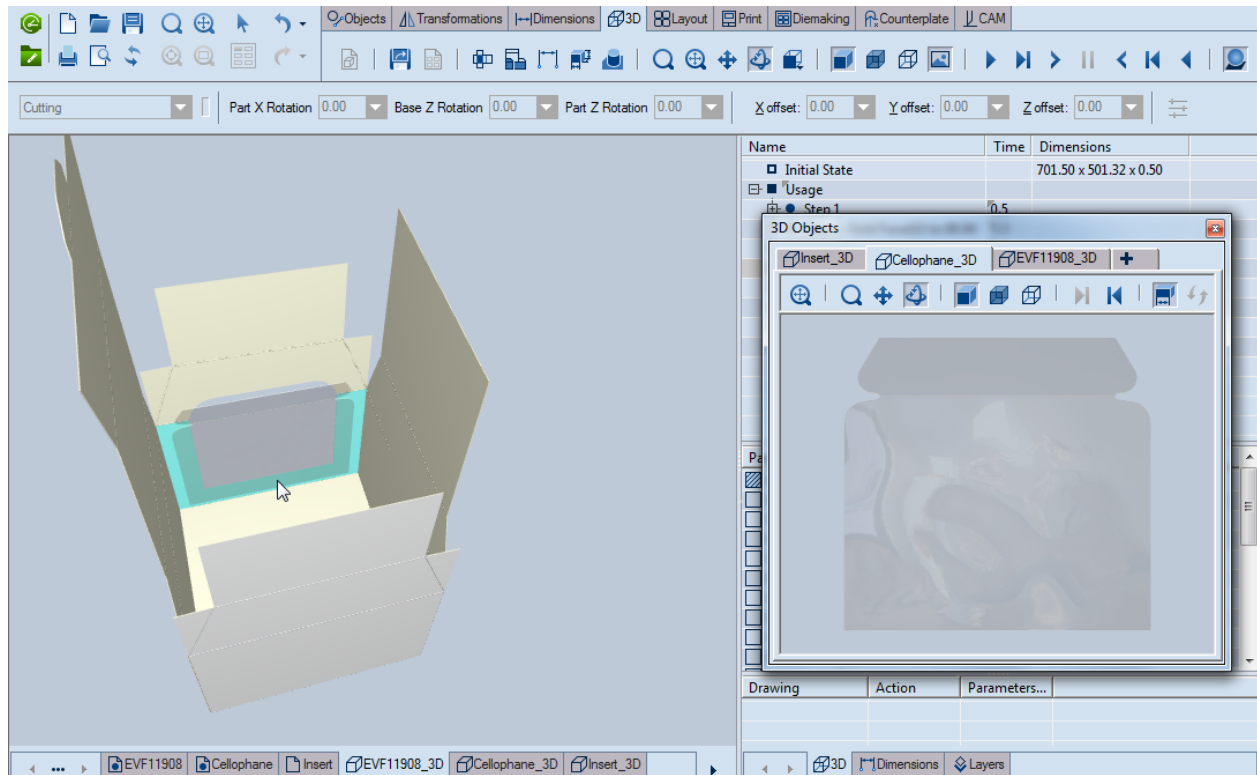


Pic. 9: In the 3D Objects dialog box, click the surface of the cellophane sheet that you want to use for the attachment. Then begin dragging it into the work area.



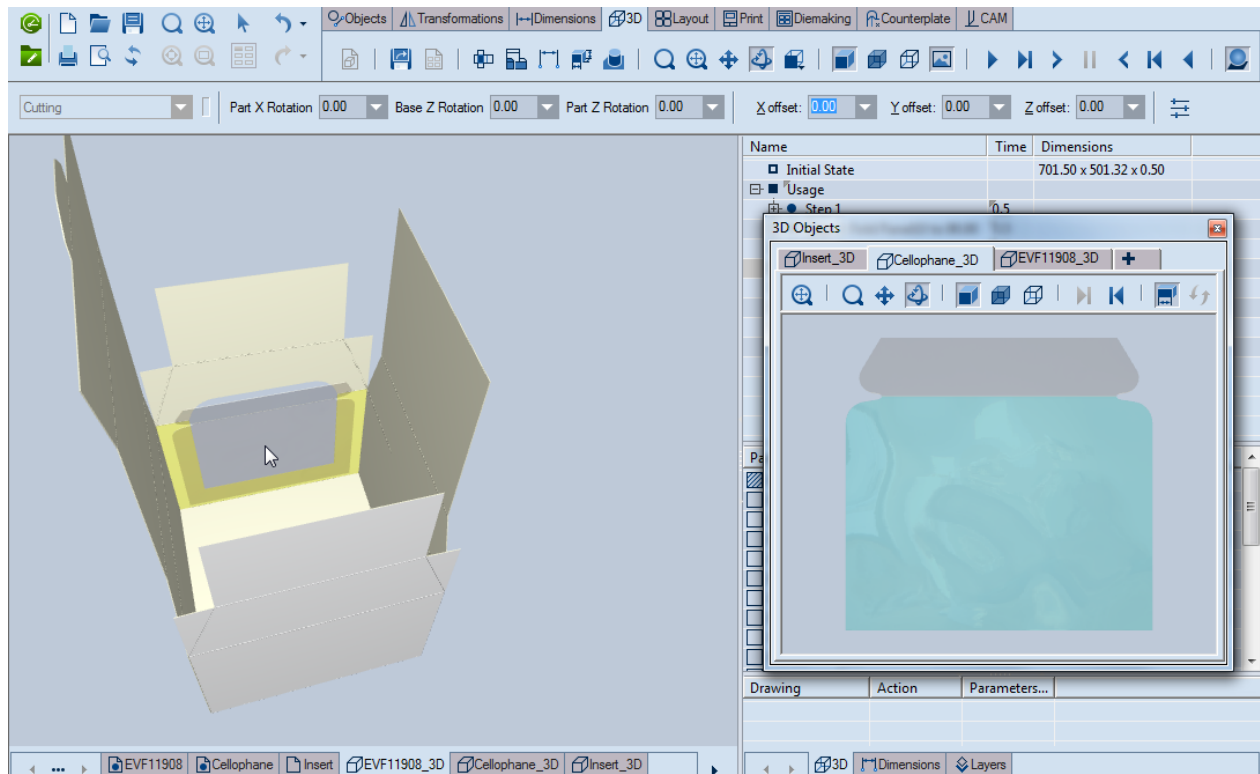
Pic. 10: Dragging the cellophane sheet into the 3D work area

When the aperture panel is highlighted, click. In this way we point the panel to which the inserted part will be attached. Note also that the program recognizes that we have pointed to the panel's rear surface.



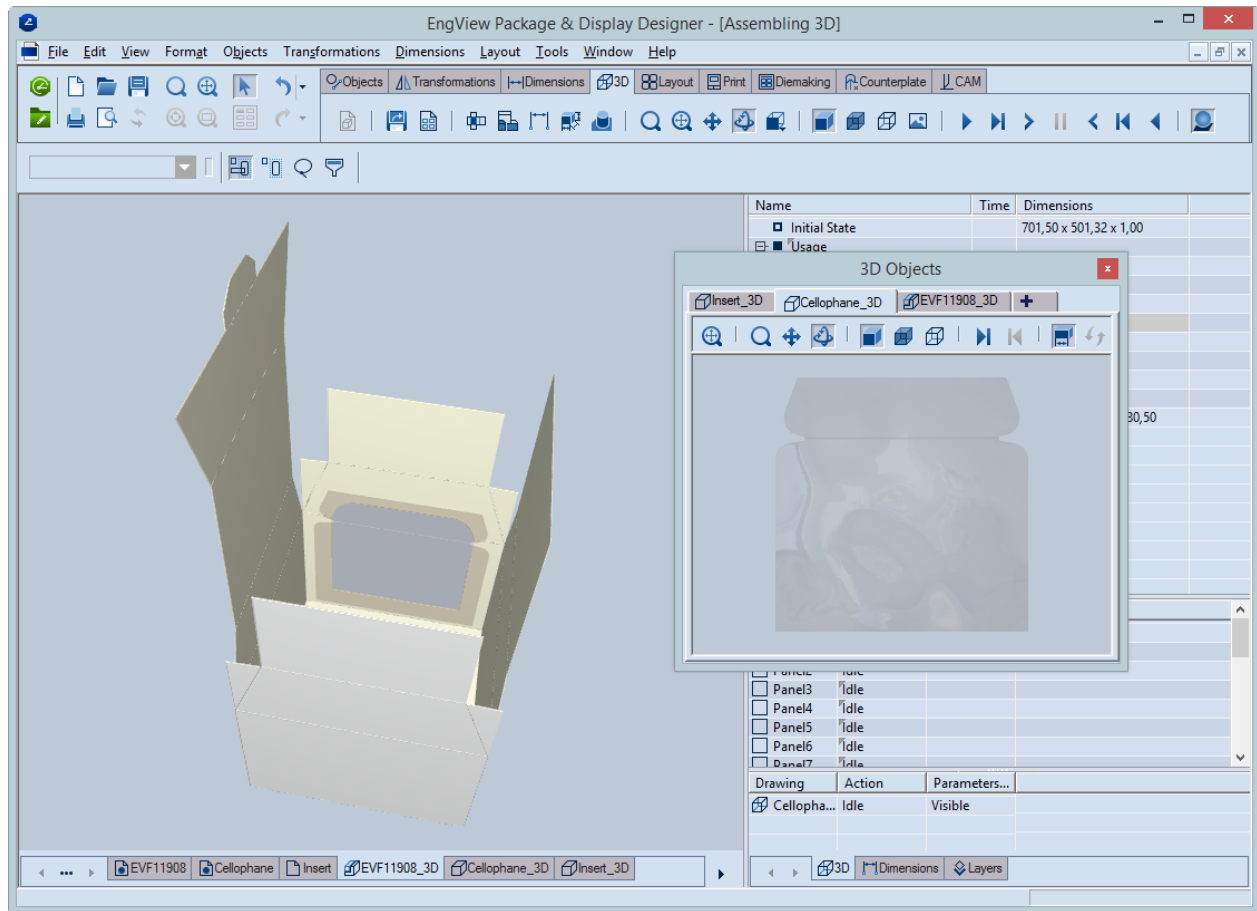
Pic. 11: Selecting the panel that'll host the cellophane sheet

The selected panel is highlighted in yellow – that is, we are now in an alignment mode.



Pic. 12: Adjusting the cellophane sheet onto the hosting panel

10. Using the mouse, align the part upper-center, and then click.



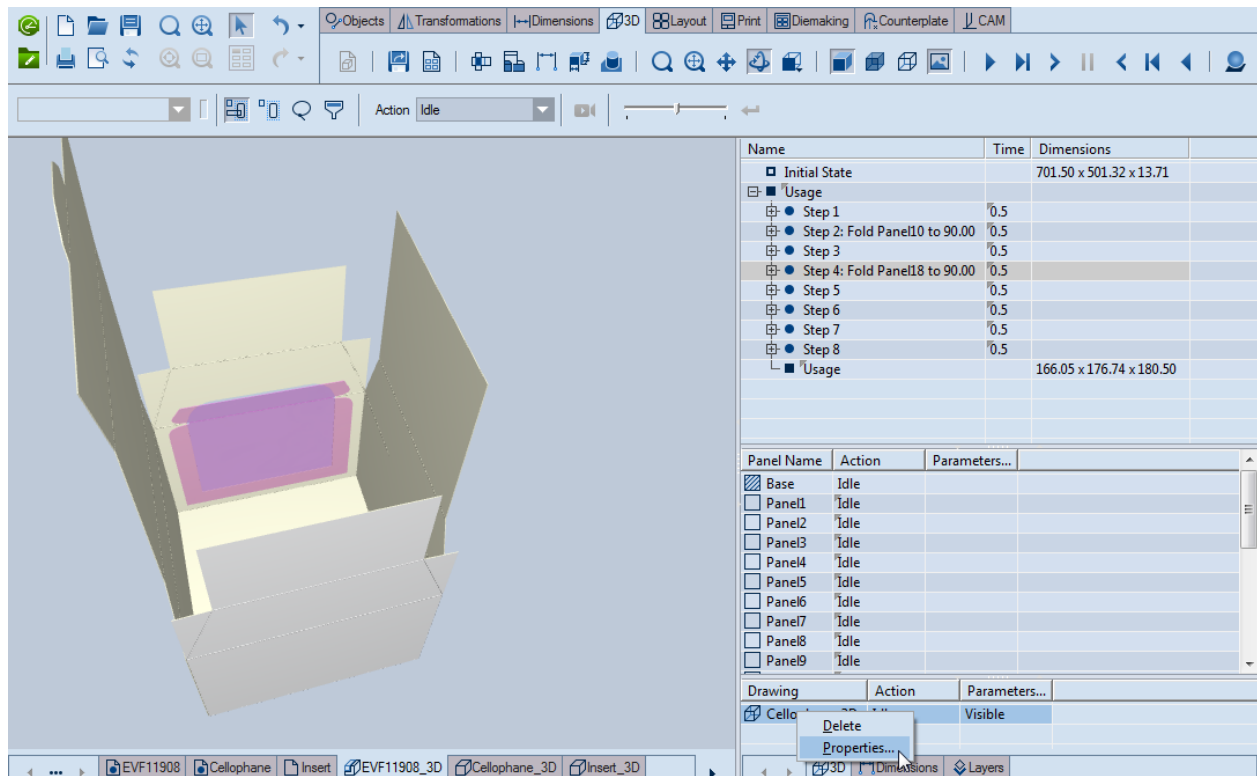
Pic. 13: Final adjustment of the cellophane sheet

The part is now attached and is in the final state of its folding sequence.

NOTE: The inserted part can be seen also in the tabular area – in the lower section where the inserted parts are listed.

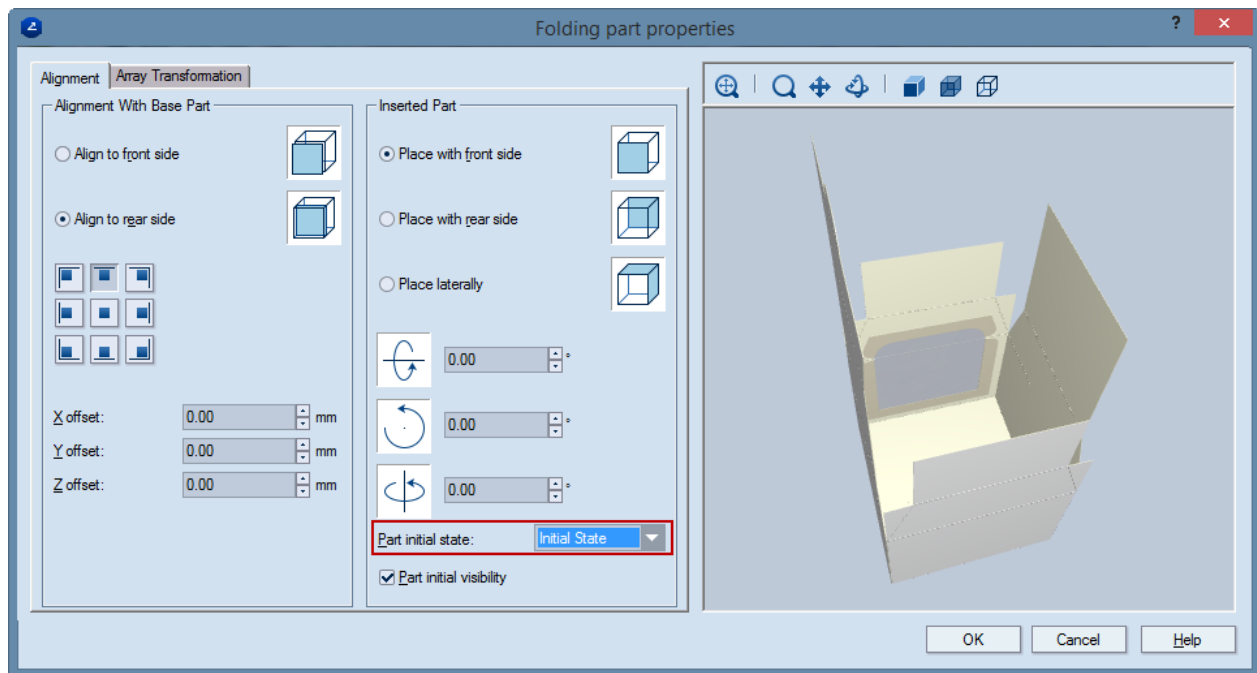
At this stage of the box (Step4) it needs to be flat, which corresponds to its folding sequence's Initial State phase.

That is why we will edit the properties of the inserted part.



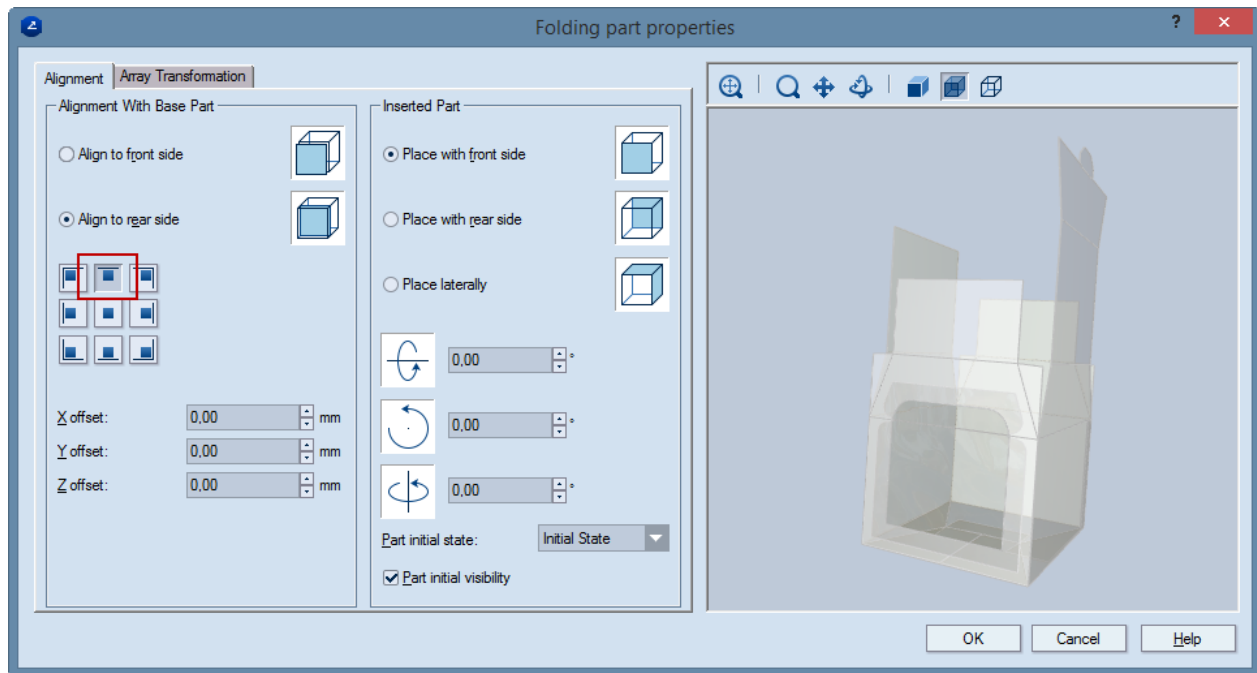
Pic. 14: Opening the properties of the inserted part

6. Set the inserted part's initial state to be Initial State.



Pic. 15: Setting the initial state of the inserted part in the assembled 3D drawing

NOTE: In this dialog box, we can fine-tune the inserted part's alignment if you did not do it during the attachment (when the hosting panel was highlighted in yellow, see Step 9).

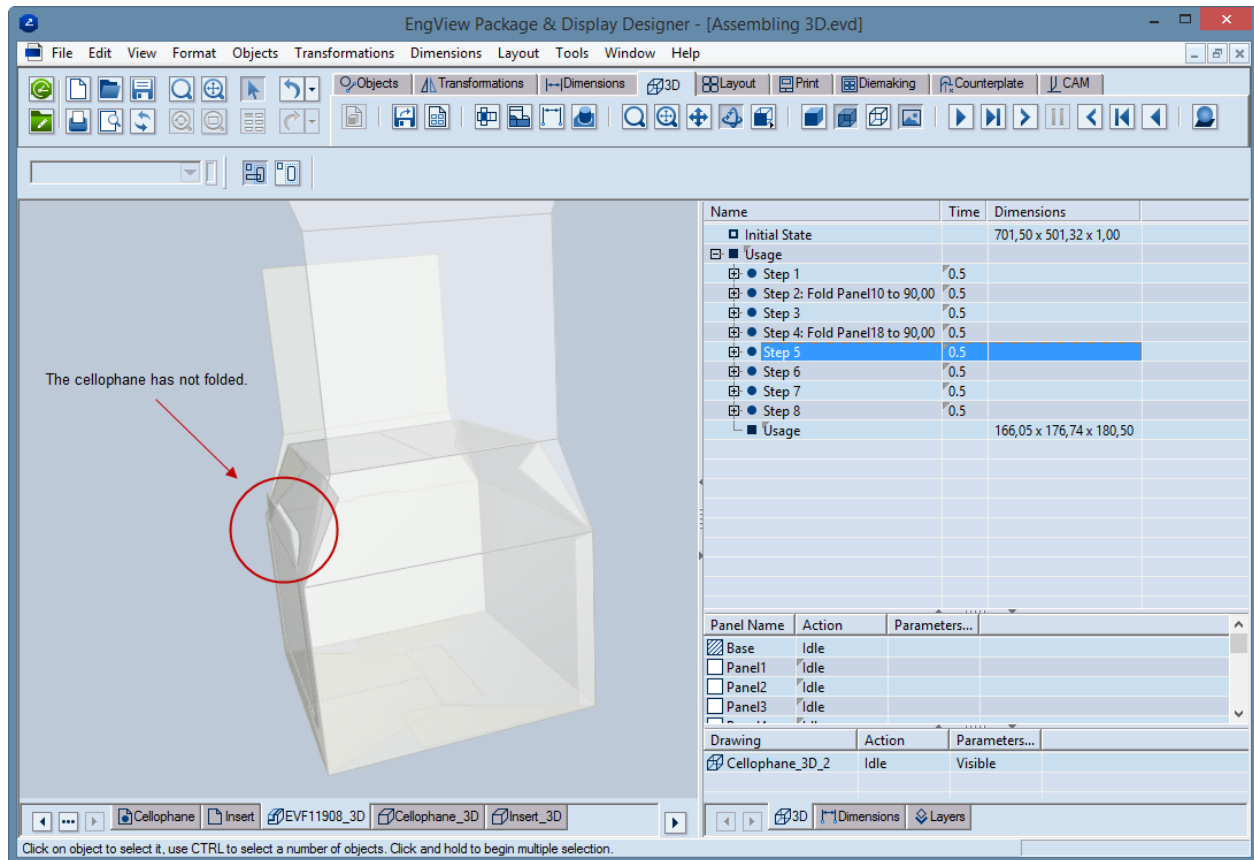


Pic. 16: Setting the cellophane relative to the hosting panel

7. After you have made the necessary adjustments, click **OK** to close the dialog box.

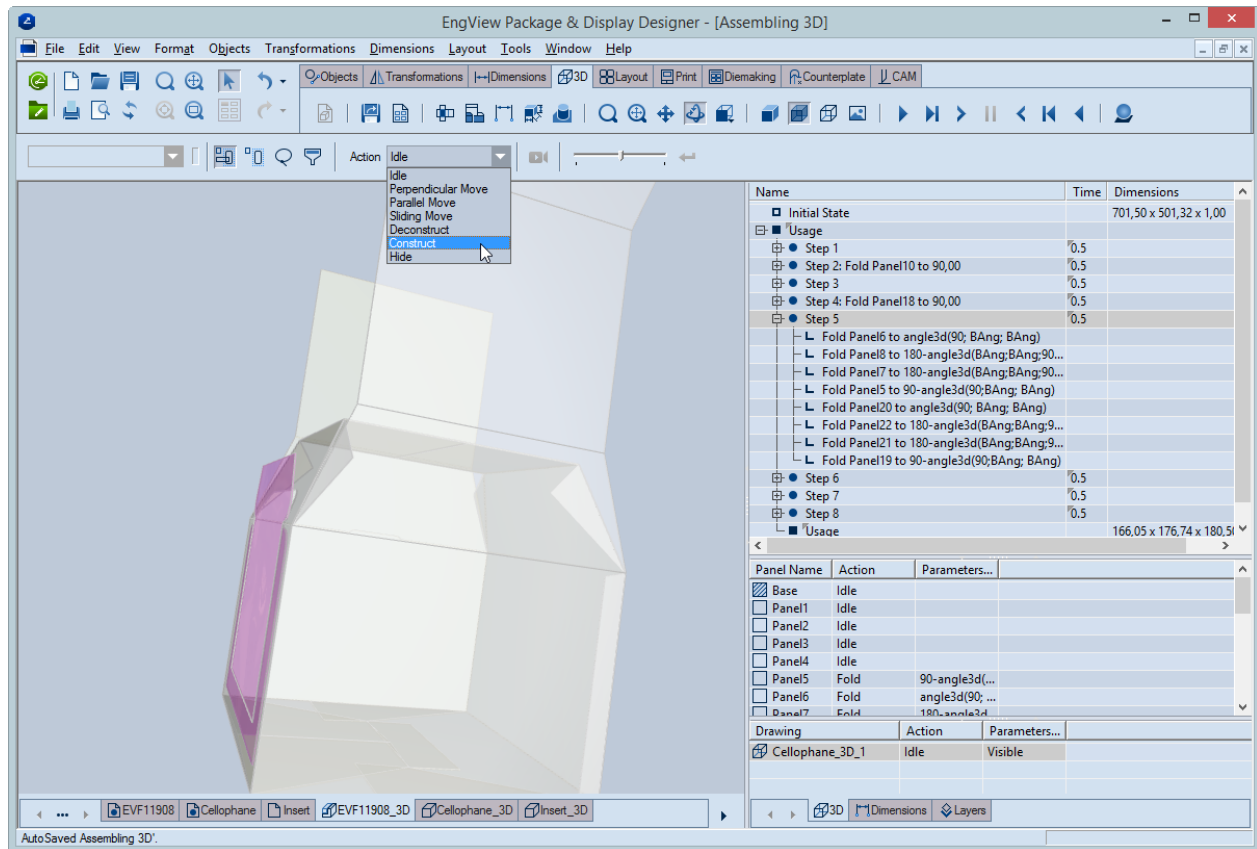
Now we will continue with the box's folding sequence.

8. In the tabular area, click Step 5. Note that the panel is folded, but the cellophane is not.

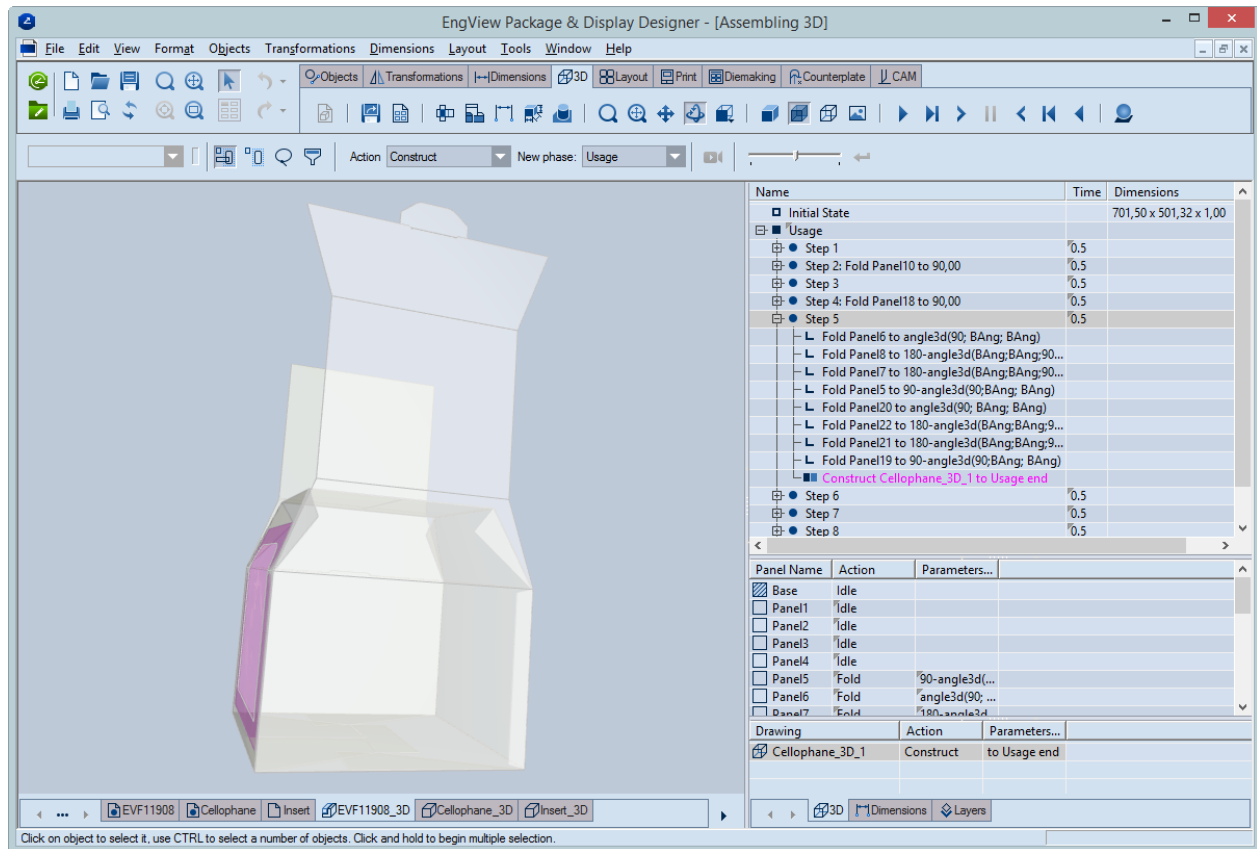


Pic. 17: A flap is in need of an additional adjustment.

9. Select the cellophane, and then, in the contextual edit bar that appears above the work area, in **Action**, select Construct; in **New phase** select Usage.



Pic. 18: Setting the Construct action for the flap



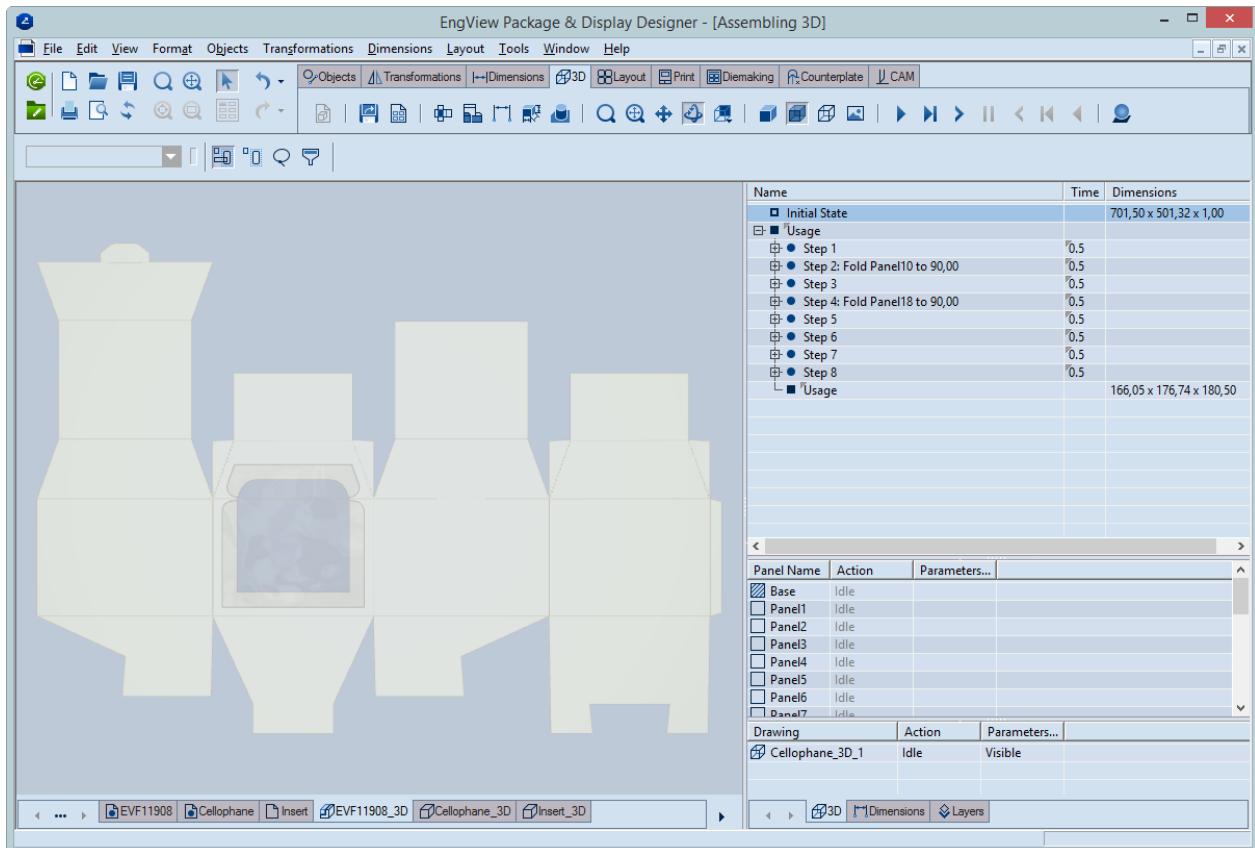
Pic. 19: A new action has appeared in Step 5.

Adding an Insert


To insert a part, we can use the same approach that we used for attaching the cellophane. We need access to the inside of the box, where we will need to adjust the inserted part as we need it.

But note also that we can attach the panel even if the box is in its Initial State.

1. In the tabular area, click Initial State, and then rotate it so you can see the inside of the box.



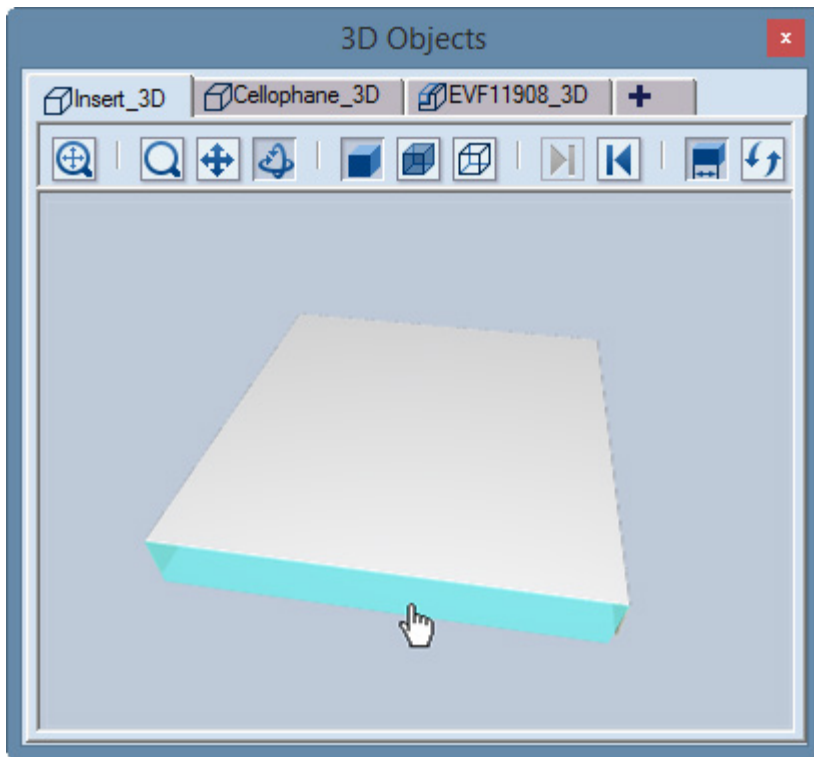
Pic. 20: Before attaching the insert, returning the box to its initial state

2. On the 3D toolbar, click **3D Objects** .

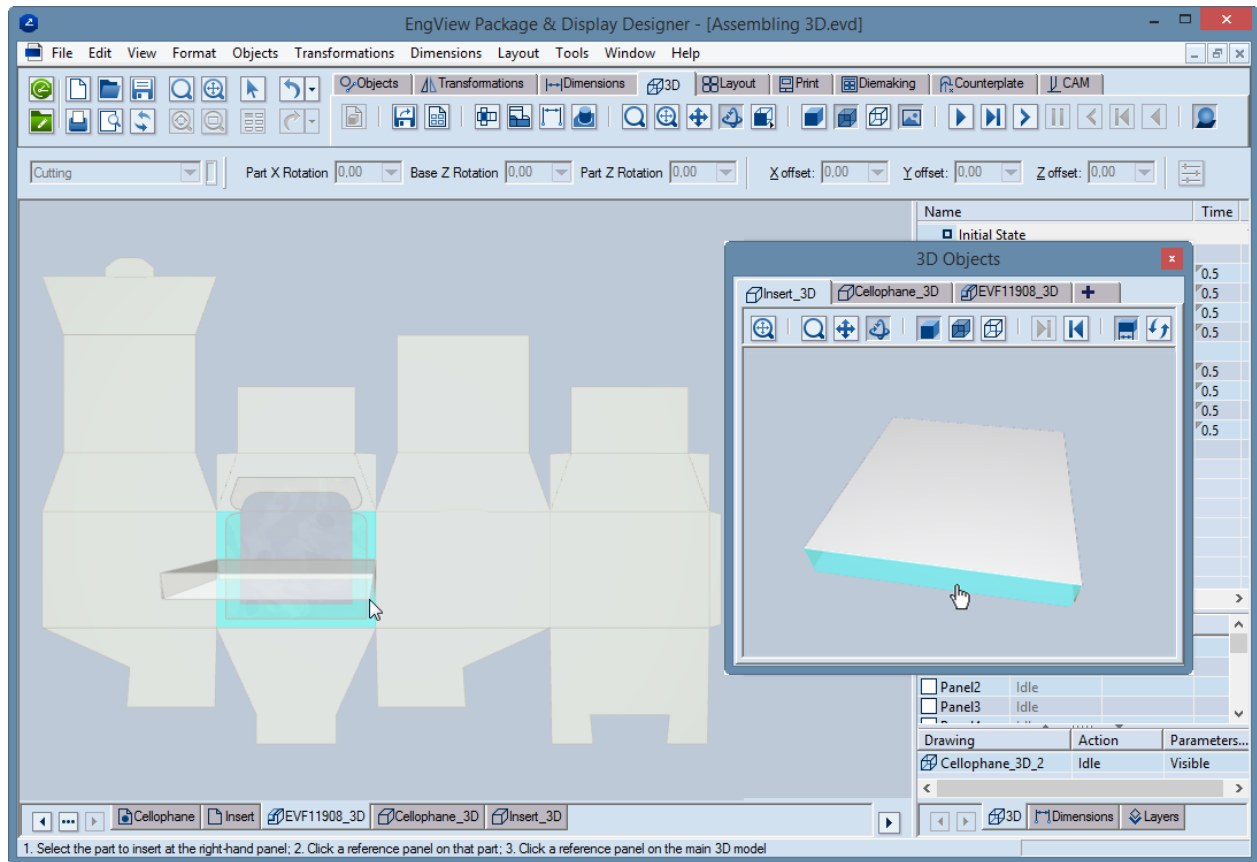
The **3D Objects** dialog box appears.

16. Click the **Insert_3D** tab.

In the window, click the panel as shown on the following picture. This is the along which the attachment will take place.

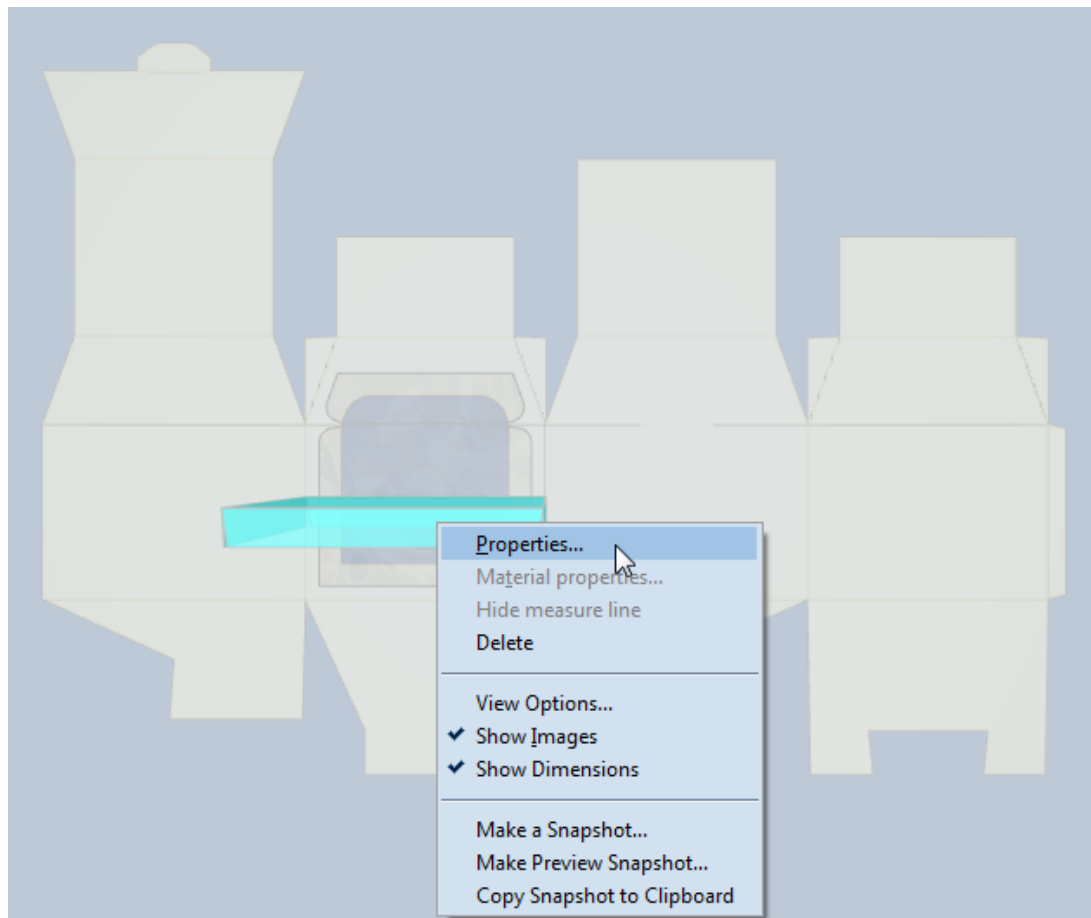


Pic. 21: In the 3D Objects dialog box, selecting the panel along which the attachment will take place
17. Drag the panel into the 3D work area, and attach it to the panel that holds the aperture.

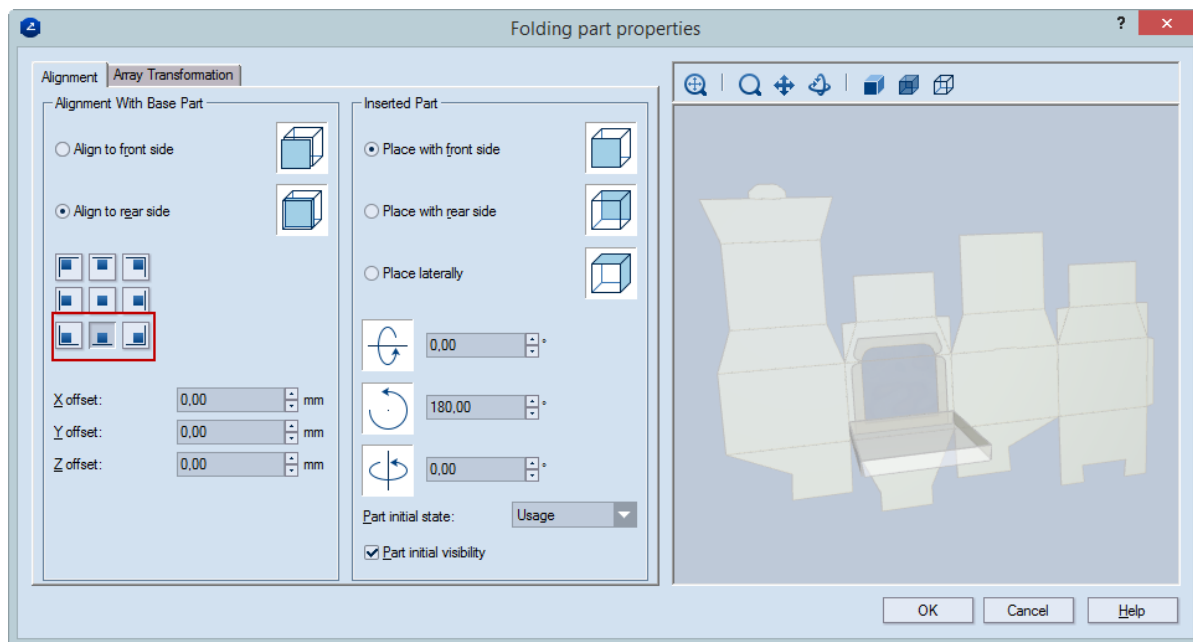


Pic. 22: Attaching the insert to the 3D work area.

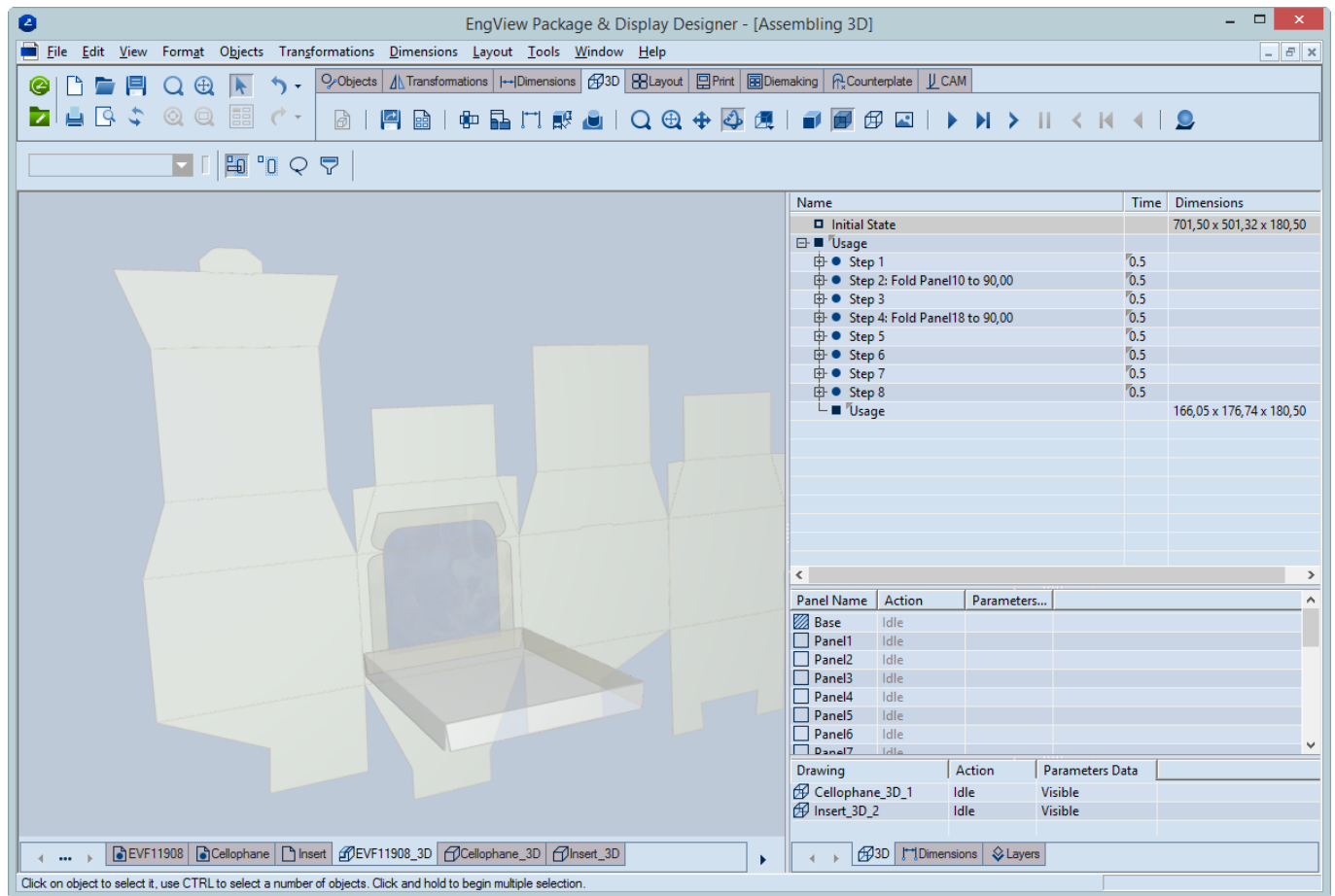
18. Right-click the part, and then, in the dialog box that appears, align it lower-center (pictured).



Pic. 23: About to edit the properties of the insert



Pic. 24: Positioning the insert in the lower central area

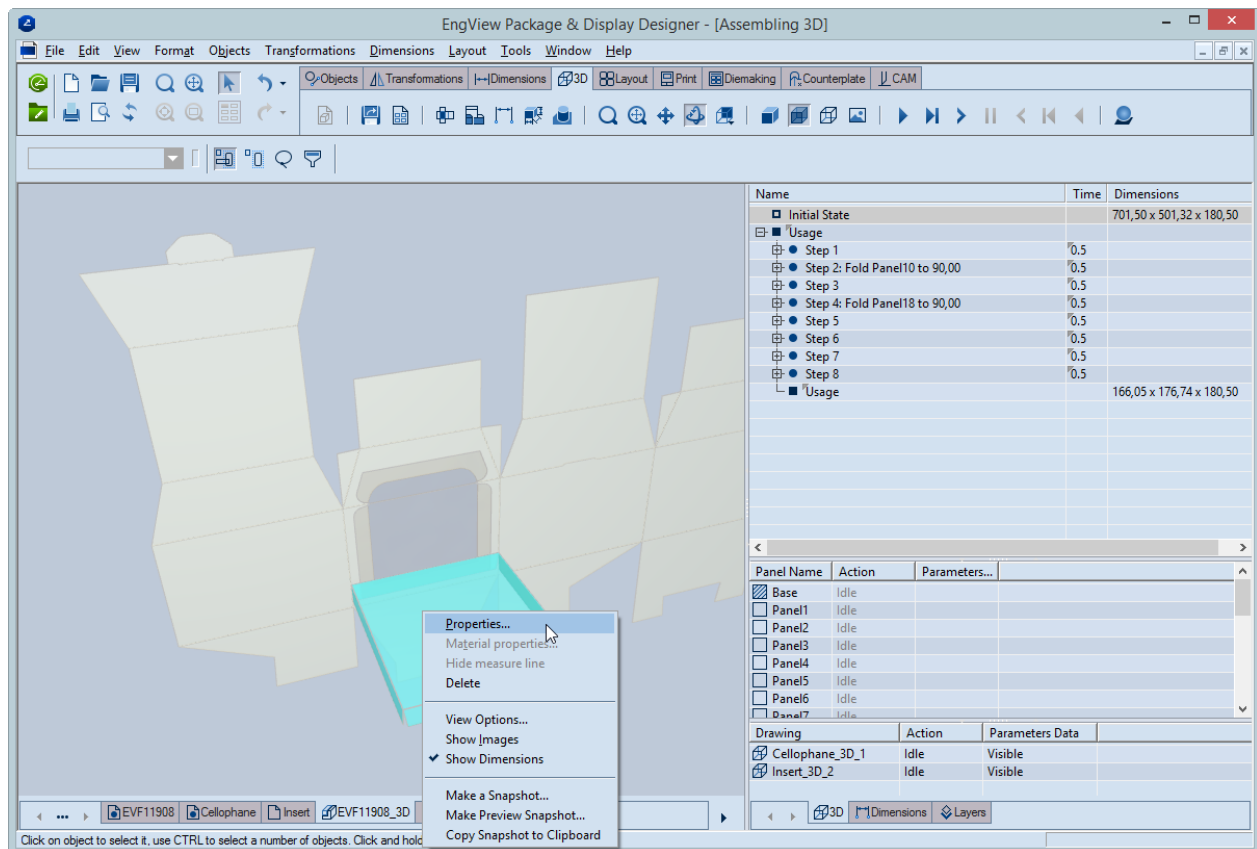


Pic. 25: The insert is aligned to the bottom.

Moving the Inserted Part

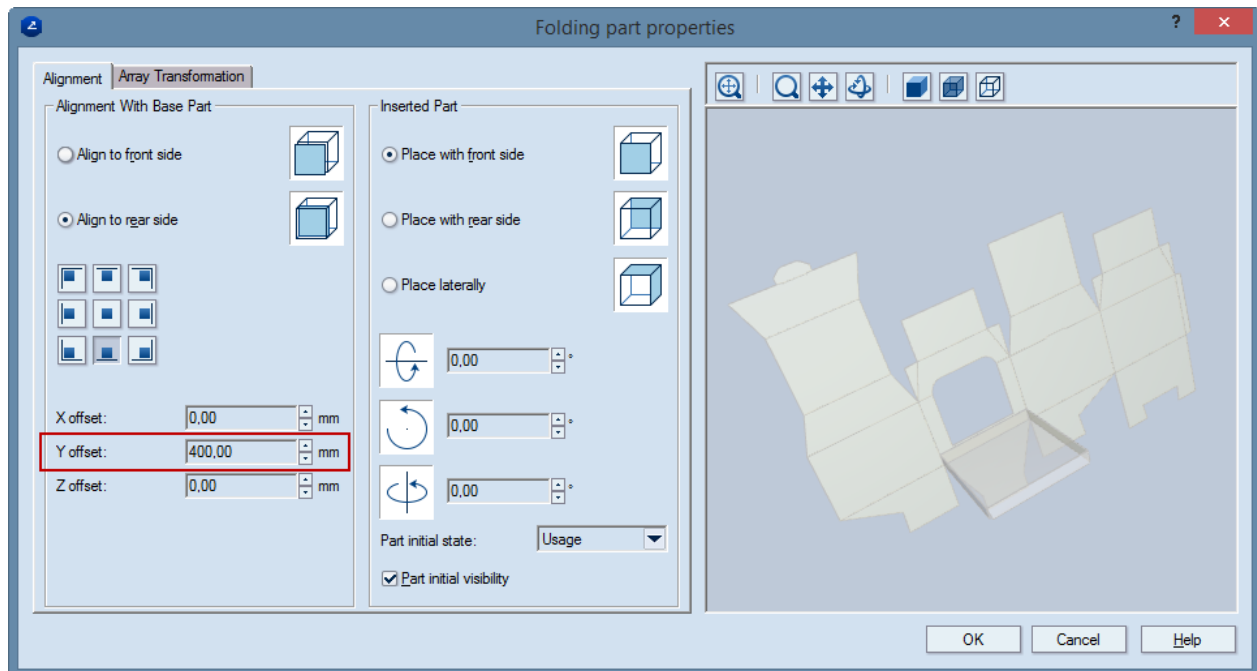
We will use animation to show how the insert moves into the box. To do this, the insert needs to be outside the box.

1. Select the insert, and then click **Properties** on the context menu.



Pic. 26: About to edit the properties of the insert

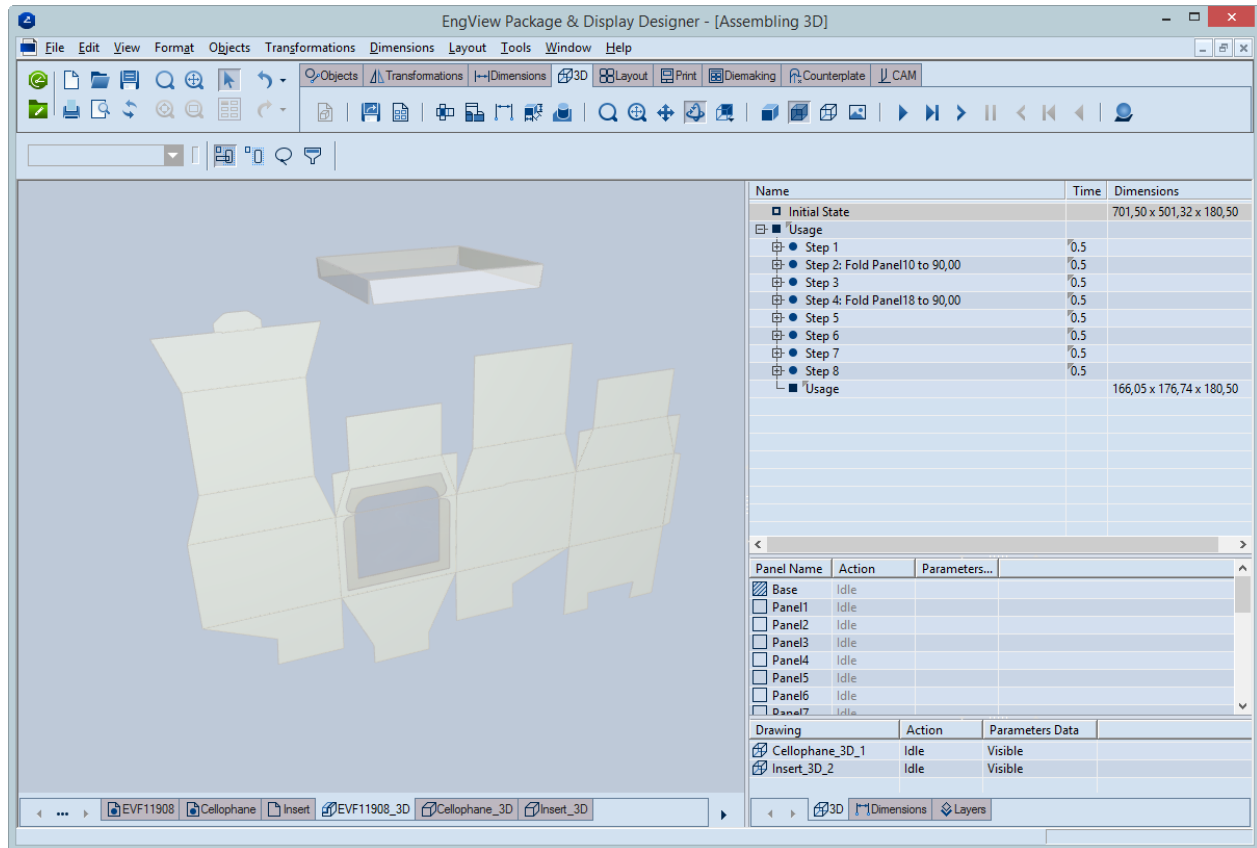
2. In the **Folding Part Properties** dialog box, in **Y offset** enter 400.



Pic. 27: The insert will be moved at 400 mm vertically.

3. Click **OK**.

The insert is now removed from the box.

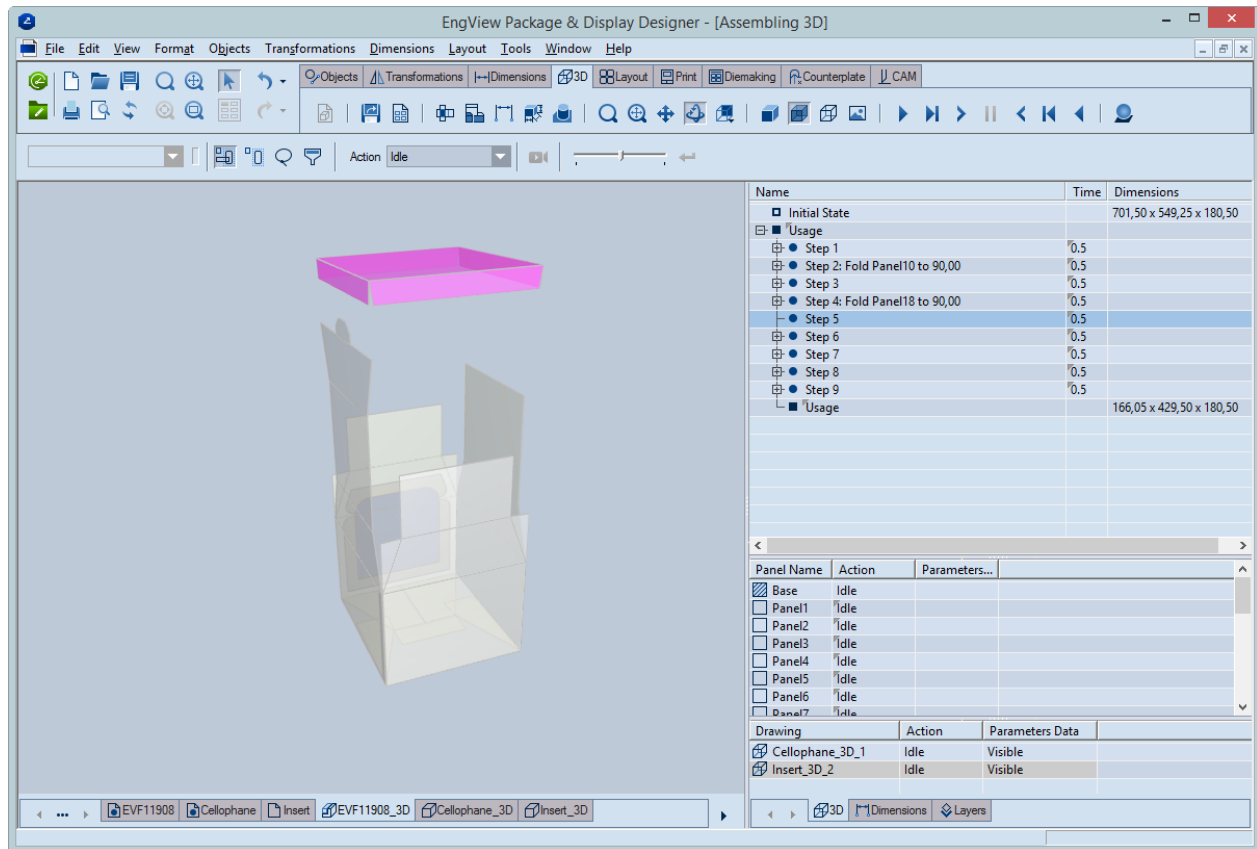


Pic. 28: The insert has moved in accordance with the edited properties.

The insert needs to go into the box once the bottom is closed. That is why go to Step 4 and will insert a new step, in which the movement of the insert will be set.

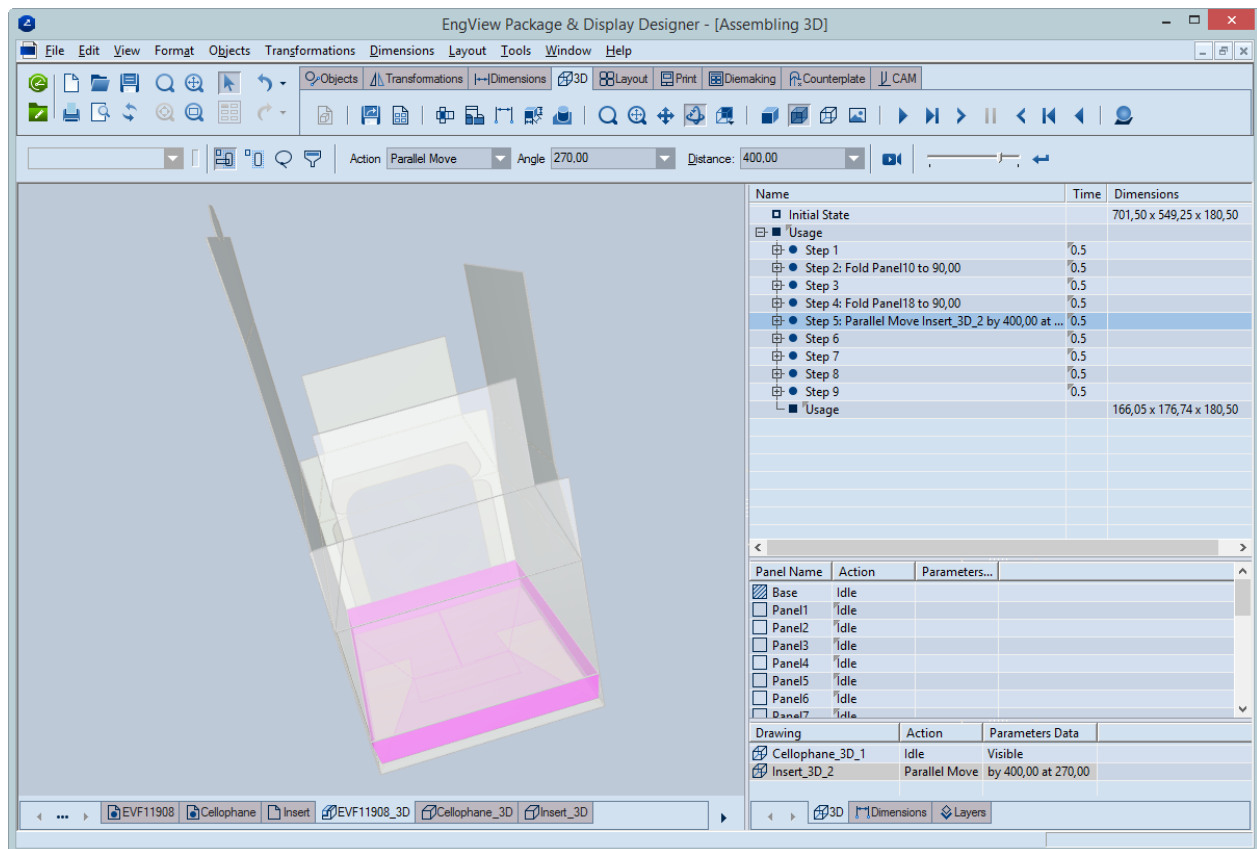
4. In the tabular area, right-click Step 4, and then click **Insert step below** on the context menu.

5. In the 3D work area, select the insert.



Pic. 29: A separate step is needed for the insert's movement toward the bottom.

6. In the contextual edit bar, in **Action** select Parallel Move, and then, in **Angle**, type 270 (this ensures the downward movement); in **Distance**, type 400, and then press ENTER.



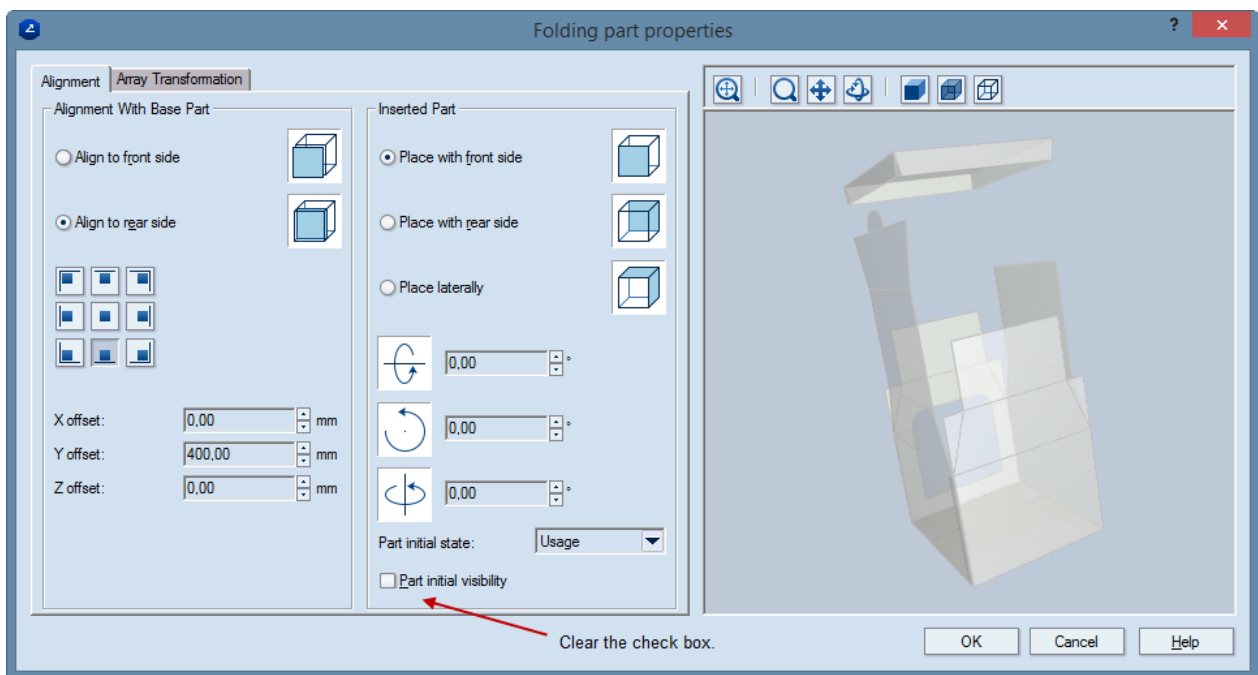
Pic. 30: After the insert's downward parallel move

Hiding and Showing the Insert

While animating the folding sequence, we can see that the insert is always there, which is not the case in a real-life situation. The insert gets attached after the box's bottom has been closed – that is, after Step 4 – and it is good practice that it is not seen until the sequence has reached this stage of the folding. In other words, in Initial State of the box the insert needs to be hidden and to appear right before it is to be inserted – that is, before Step 5.

Hiding the insert at the start of the folding sequence of the assembled 3D drawing

1. In the tabular area, right-click the insert, and then click **Properties**.
2. In the dialog box that appears, clear the **Part initial visibility** check box.

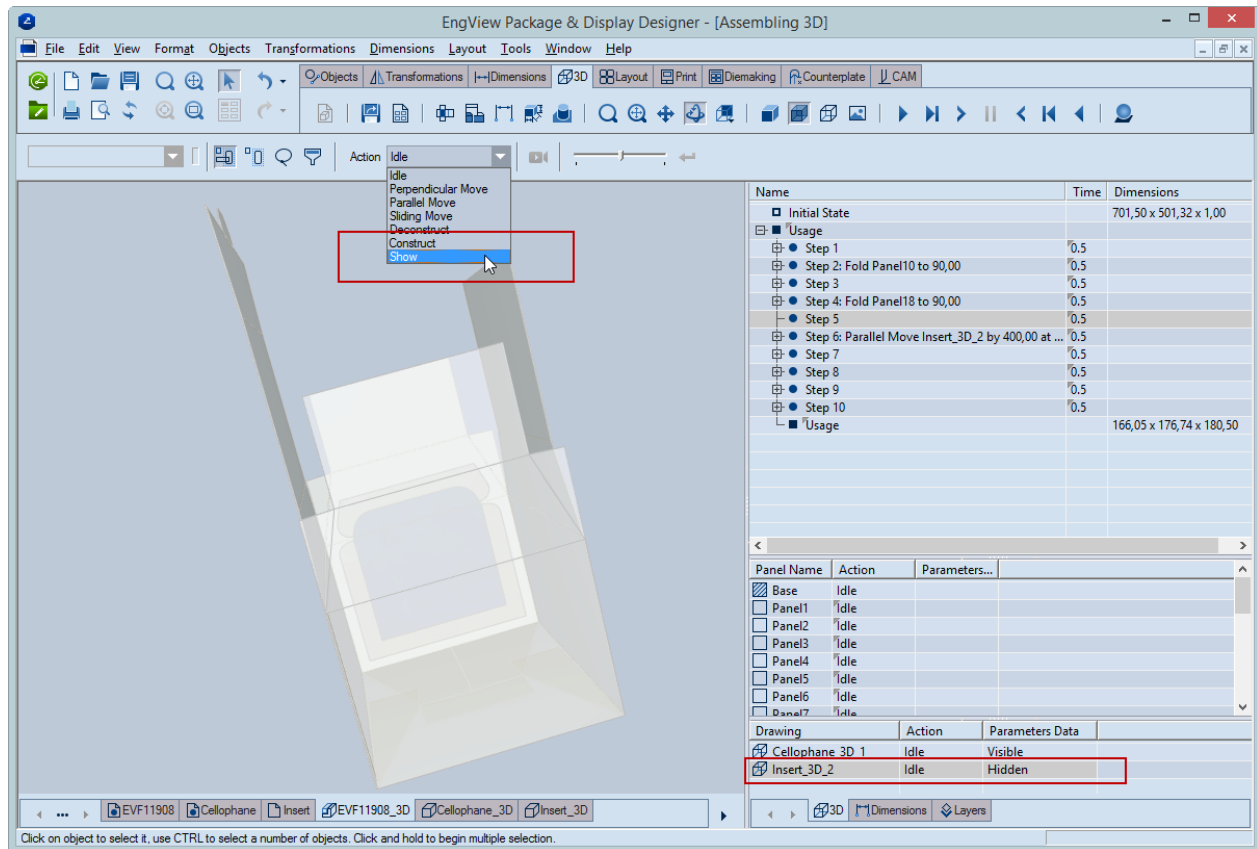


3. Click **OK**.

The insert is no longer visible in the assembled 3D drawing.

About to be positioned, the insert will become visible in a special step.

4. In the tabular area, create a step above Step 5 (pictured).



Pic. 32: Setting the Show action

We created two steps (Steps 5 and 6) in connection with the inserted object. In Step 5 we show the external object; in Step 6 we placed it into the box.

7. Save the file.