3D SYSTEMS

3DXpert™

3DXpert™

Quick Guide

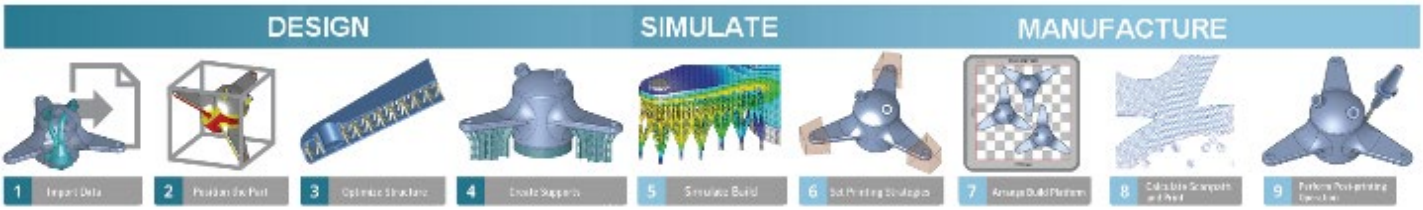
Tutorial_V9 - Updated: 3DXpert 16 Beta release

Contents

! Notice/ Remember		Left mouse button name is ***"pick"***
		Middle mouse button name is ***"Exit"***
		Right mouse button name is ***"Click"***

Introduction

3DXpert is the **All-in-One Software Solution** for **Metal Additive Manufacturing**.
It has all the tools to prepare your part for printing and send it to your printer.
The 3DXpert 3D Printing complete workflow goes from data import through design to post-printing operations.



This short exercise will guide you through 3DXpert's basic workflow.
You will create a new project, load a part and prepare it for printing.
In between, various tips on using the software are included.

General Guidelines

This guide will help you do your first step with 3DXpert, learn its interaction and understand the workflow. However, this is not a substitute for the complete training kit of 3DXpert. To understand what each parameter or option does, check the On-Line Help supplied with the product (press F1 to access) or the dedicated training materials.
This document is also not a guide for printing techniques. The information supplied here should only be used as a guide on how to work with 3DXpert.

Printer & Material Configuration Files

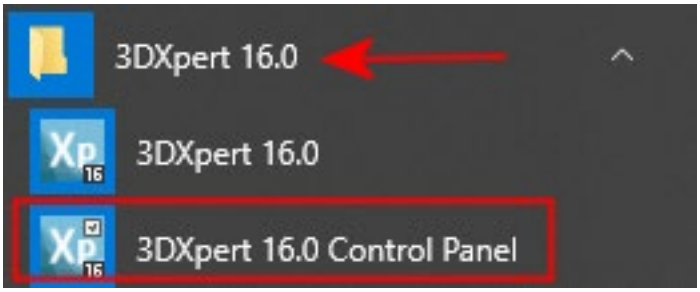
The topics discussed here are applicable to any 3D metal printer. Therefore, for the training purpose of this guide we will use a 'dummy' printer.
Although the name of a real printer will show on the tray, its parameters are not relevant to any current real printer and are not ready for actual printing.
The training printer & material configuration files are supplied with this guide.

Before starting, make sure your 3DXpert is installed and that you have a valid license.
For more information on this, see also the Getting Started document.

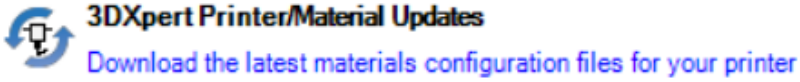
Note that in this exercise you will be working with a dedicated training printer. Therefore, there are no available updates to download from the server, as explained in the Getting Started document.

Install the contents of the file 'ProX DMP Training.rar' to the folder - C:*ProgramData**3D Systems**3DXpert**16.0**Data**3D_Printing**Technology_Folder* (copy the file to that path and extract it).

When dealing with a real printer actual 3D Systems validated printer & material files for your printer are available for download from the dedicated 3D Systems web server.
To download these configuration files, launch the **3DXpert Control Panel** from the Start menu.



From this Control Panel it is possible to launch the **3DXpert Printers & Materials Update** tool.



Select your printer and download the files (they are compressed in a zip file).
Extract the content of the material file into the printer folder of your installation (…*Technology_Folder)*.
For additional information on installing the material files, consult your 3D Systems technical support representative.

Disclaimer:
The technical parameters and the slicing parameters used in this guide are fictive and serve for training purposes only.
These should not be regarded as recommended settings for actual printing.

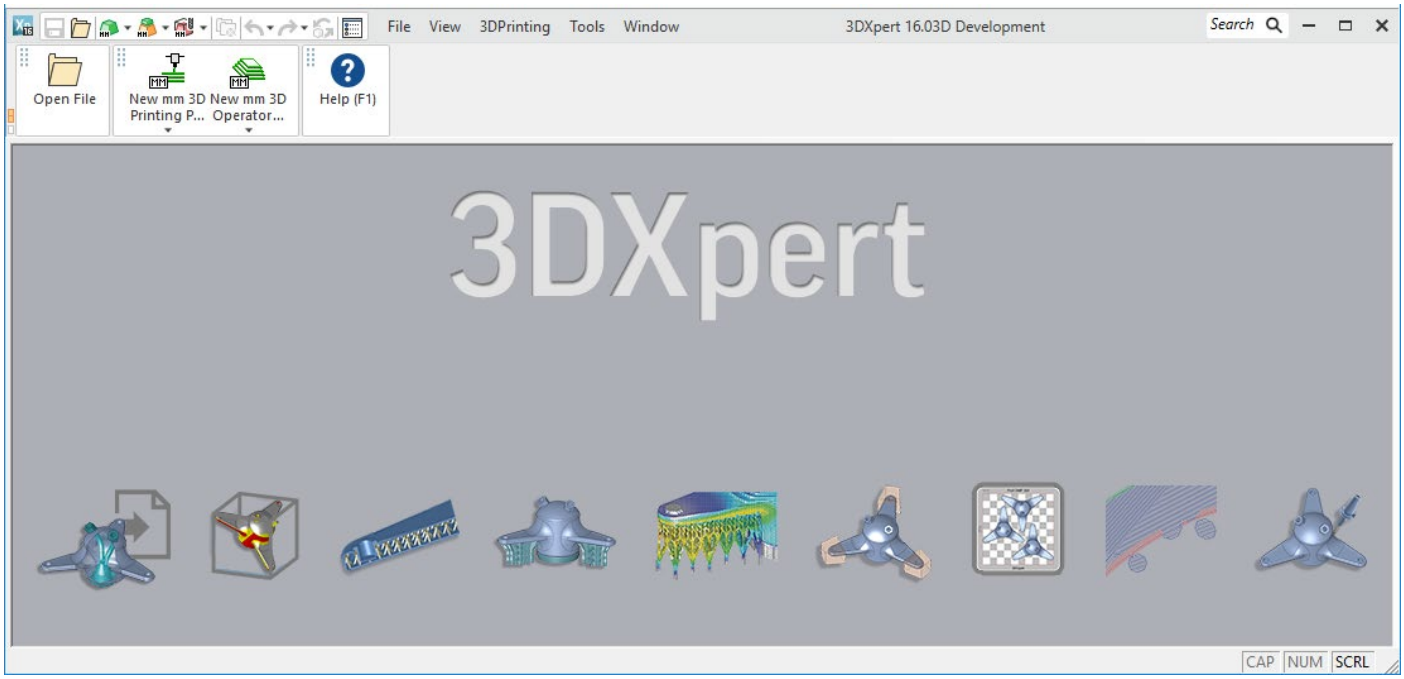
A. Create Project, Load Part and Analyze the Part

1. After the installation of 3DXpert, extract the contents of the file 3DXpert-Exercises-ProX DMP Training.zip to the folder **Technology_Folder,** so that the result would be**:**

   C:\ProgramData\3D Systems\3DXpert\16.0\Data\3D_Printing\Technology_Folder\ProX DMP Training

2. Launch 3DXpert using the shortcut created on your desktop or from the Windows Start menu.

   When 3DXpert is running and no files are open, the initial display is as shown below.
   The display of some of the elements that make up the system initial window depends on your 3DXpert license.



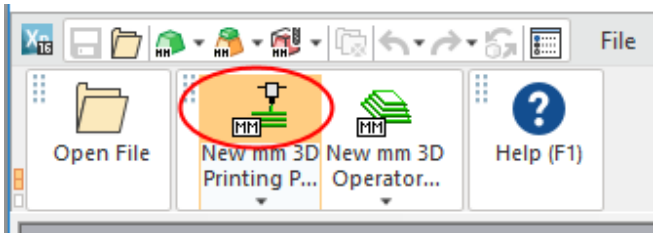
The buttons shown on the initial display are:

Initial Screen Toolbar		
Open File	Open File	Open an existing file - open 3DXpert Explorer.
New mm 3D Printing P...	New 3D Printing Project	Creating a New 3D Printing Project in MM or INCH.
New mm 3D Operator...	New 3D Operator Project	Creating a New 3D Operator Project in MM or INCH.
Help (F1)	Help	The 3DXpert Help.

3DXpert supports various mesh formats such as STL, OBJ,3MP & PLY and Solid/Surfaces (B-rep) formats.
B-rep formats can be SAT, IGES, STEP and others or direct formats such as Creo, Catia, NX, Solidworks and more…

The full list with supported versions of each products appears in the On-Line Help under '3DXpert 16.0 Import/Export Capabilities at a Glance'.
Since we are starting a new project now, we will create a new 3D Printing project.

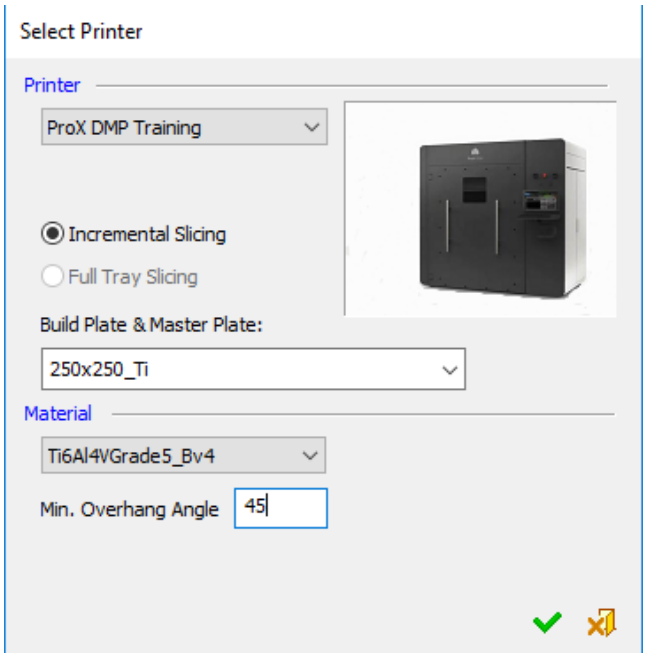
3. Press the 'New mm 3D Printing Project'



A new project opens up, showing the default printer (tray). If this is the first time 3DXpert is running after the installation, the default printer is '**My Printer**'. Otherwise this will be the last printer you have used on this PC.

4. From the Toolbar pick '**Select Printer**' and select the Printer Name from the list.

Select the printer '**ProX DMP Training**', the Build Plate size (optional) and the name of the Material (metal powder) you will be using:



The material name is mandatory and therefore, you will not be able to continue unless it is set.

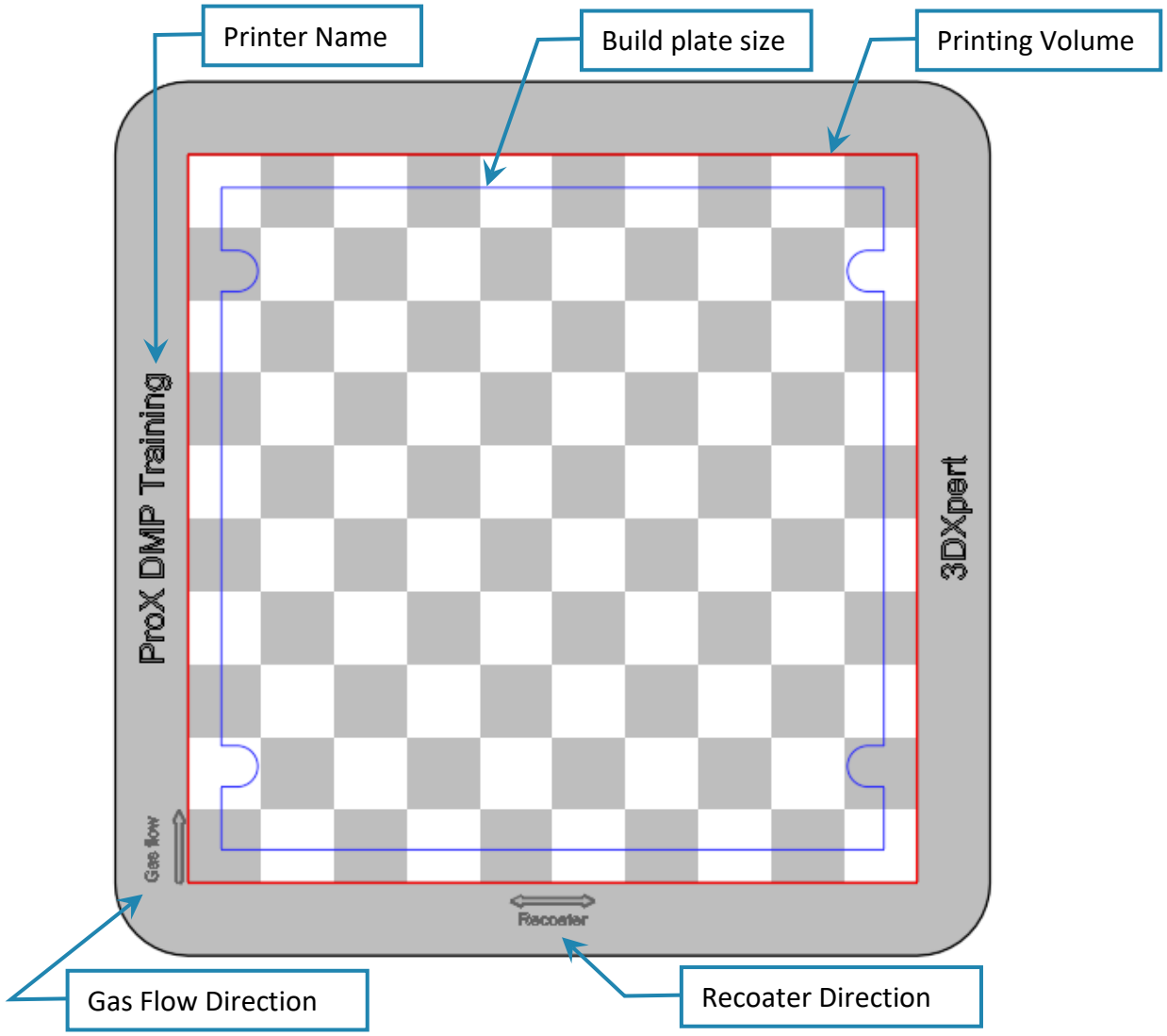
5. Set the **minimum overhang angle** as **45** degrees. Select **OK**.

This angle value serves the purpose of this exercise and in real projects needs to be set according to the printer and material in use.
The overhang angle, can also be modified later in various stages of work, either globally or for specific regions.
Every dimension we will be using or setting here is in millimeters.

Notice the various text and information showing on the tray:

- The Gas Flow and Recoater directions are oriented based on the printer definition.
- As you rotate the tray (see later), it becomes transparent once you look from below.

You can hide the tray or only the surrounding red wires, defining the printable volume.



The Toolbar:

Notice the tool bar at the top of the screen.
This tool bar contains most of the 3D Printing tools that you need.
The contents of this tool bar on your installation may differ and show less items, as this depends on your license for 3DXpert. Some items require an additional license.

This QuickGuide briefly discusses the following tools
(Click each tool to jump to the relevant step where that tool appears in this document):

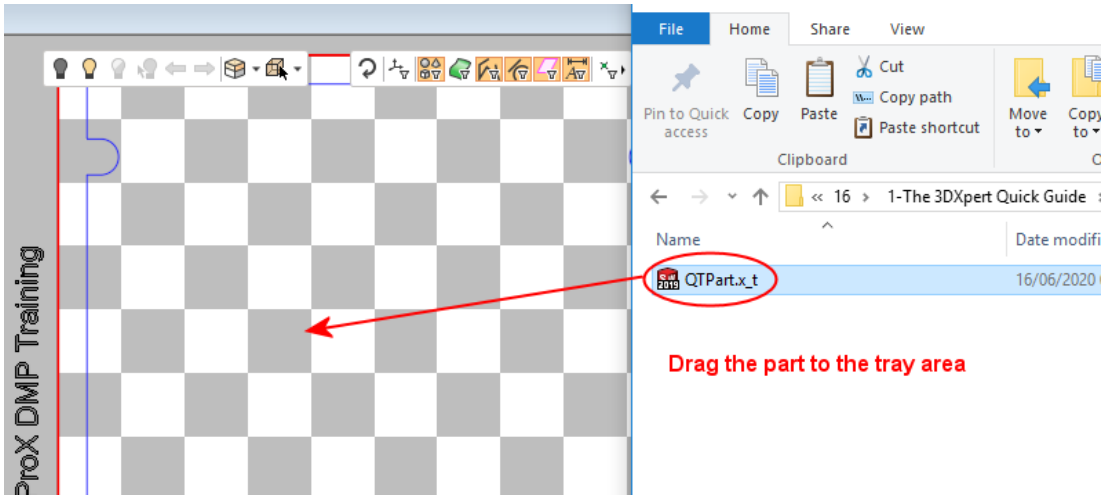
Add 3DP Component
Position Body
3DP Analysis-Printability Check
Support Manager
Calculate Slices
Slice Viewer
Print Estimation
Send to Print
Send to Operator
Copy Array

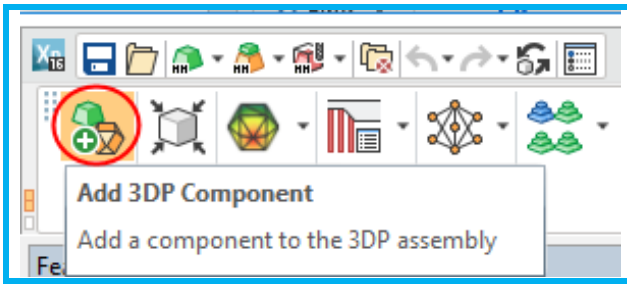
Step 20 discusses Merge, which is not showing on this Guide Bar.

6. The next step is to **load the model**. The part we use here is a solid model (note that the part we use in this guide is not a mesh based model) that was created by a different CAD system.

   To **add the part** to the project, open a **Windows browser** and browse to the folder where the file **QTPart.x_t** is located. (under the '**Start'** folder)

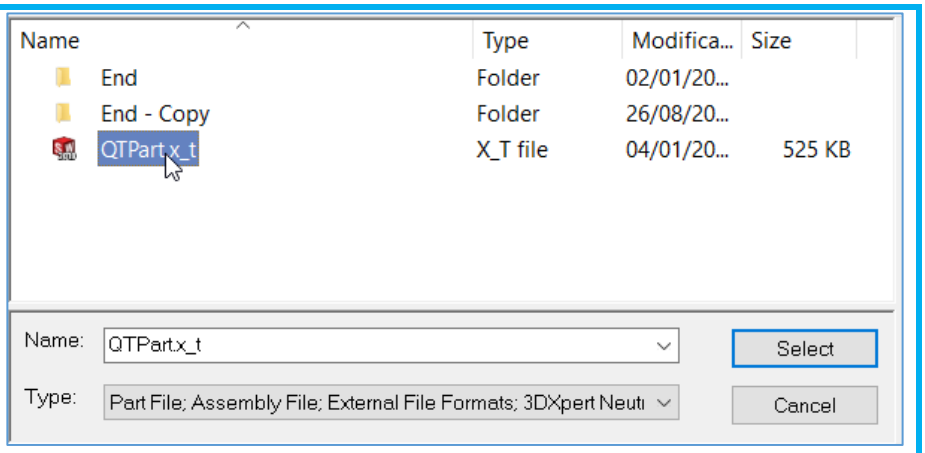
   Drag the part file to the tray and **Drop** it.





Add 3DP Component:

You can also add the part by clicking **Add 3DP Component** from the **Tool Bar**, browse to the folder and set Filter By 'External File Formats', then pick the same file:



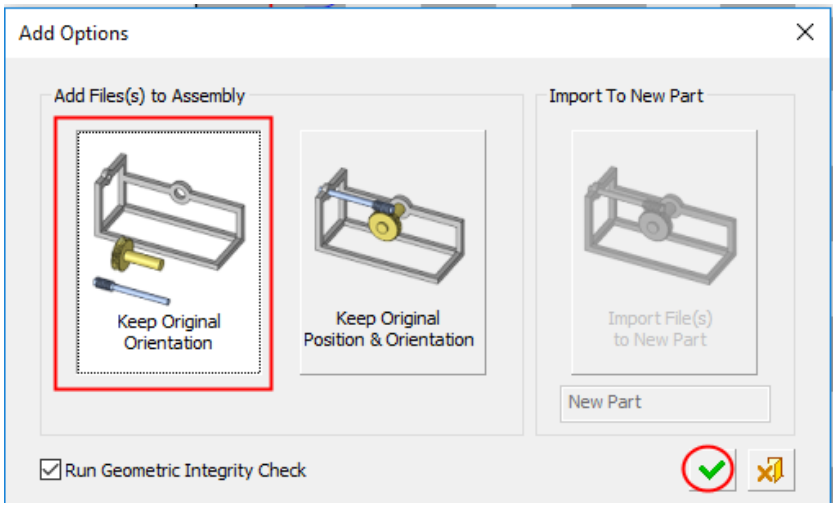
Note: Files from another software can also be imported separately into 3DXpert using the Import function ***File -> Import -> Import***
*(3DXpert files get the extension *.elt.)*

If you already imported the part used in this guide into 3DXpert separately, then the imported part will probably be called QTPart.elt.

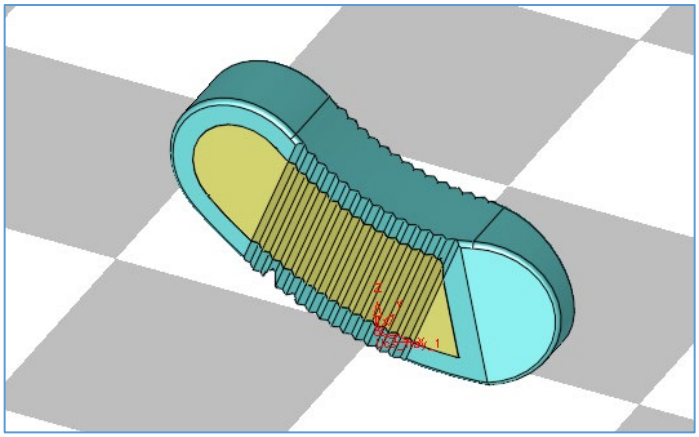
In this case. *pick* '**Add 3DP Component**' on the Toolbar and browse to the location where the file for this exercise is located, and then pick the part.

In either way, after the part has been picked, the following **Add Options dialog** pops up:

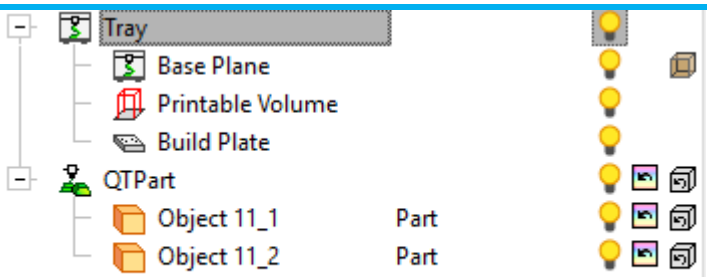
7. Select '**Keep Original Orientation**' and press the **OK** button.



The model has been added to the center of the tray:



The Objects Tree:
Take a look at the pane located to the left of the screen, with the opened tab, called 3DP Objects.
It shows the structure of the assembly.



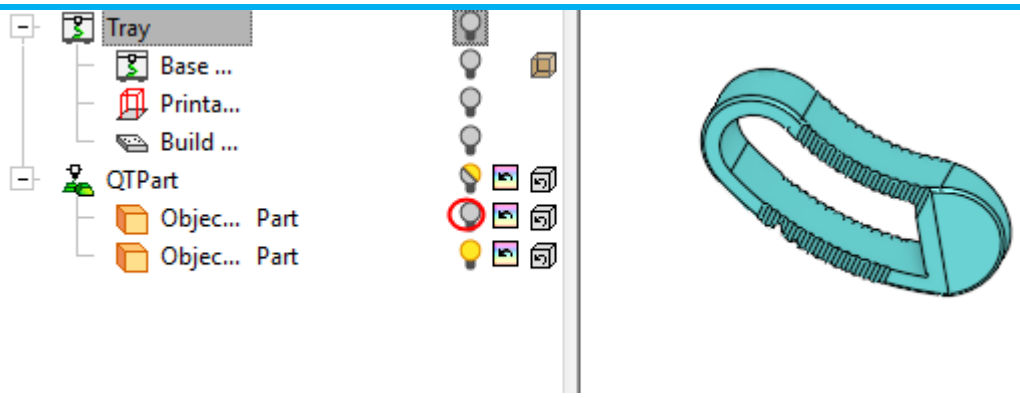
The upper leaf includes the Tray with the Printable Volume Build Plate underneath and the Base Plane.

Below them, the two objects show up. These objects were added along with the part we have just loaded on the tray.

The reason for the two objects (instead of one) is that this part is composed of two separate objects. A part can contain any number of objects.

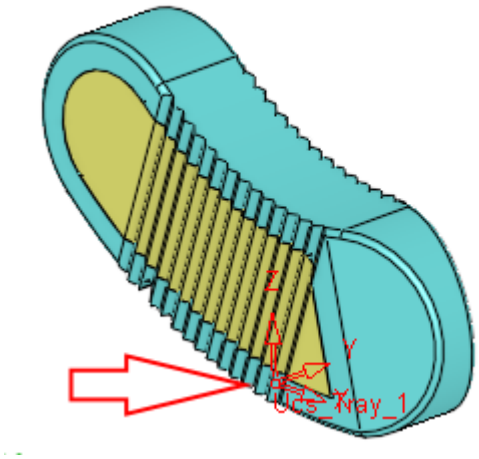
To view each of the objects separately, you can click the Hide/Show buttons either form the tree or from the floating bar

The following image shows one of the objects, once the other is hidden.



Before continuing, let's go through some general commands of the software.

First, you may notice that the part comes with predefined coordinate systems (**UCS's**).

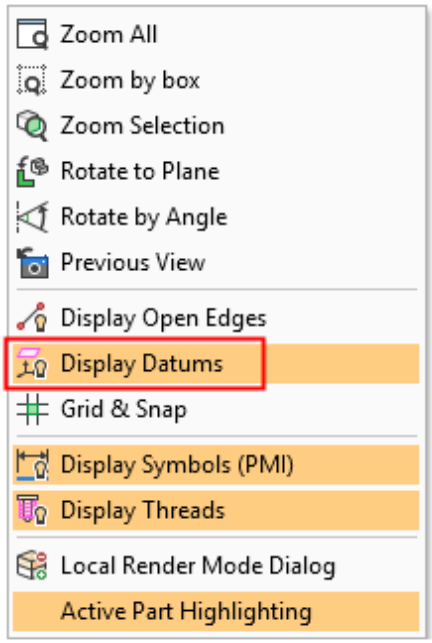


You can **hide** it in several ways. Let's see two of them.

8. Click both middle and right mouse buttons at the same time.
   This invokes the Display sub menu .
9. Notice that the option '**Display Datums'** is selected, *pick* it to turn it off and hide the **UCS's**.

   In this mode, UCS's and reference planes and axis's are not shown.

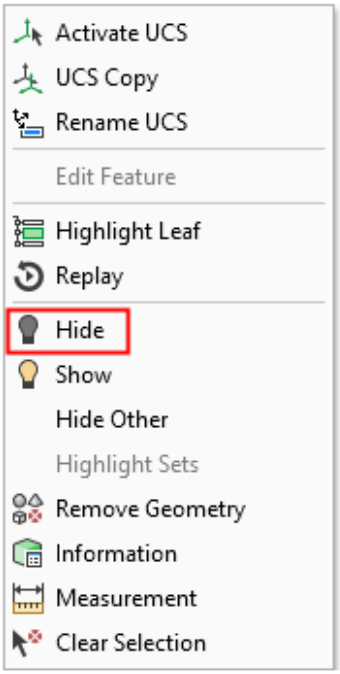
> ***Note*** that *use of the* ***display sub menu*** *(middle + right mouse buttons) allows you to activate display functions like* ***Zoom All*** *(fit the screen to all visible entities) or* ***Zoom by box*** *(to zoom to a specific area by box and enlarge it all over the screen).*



Another way to hide the UCS's is by the context sensitive sub-menu:

10. **Activate** the part (if we want to hide only the UCS within the part and not the whole project, we need to be in the part's environment).
11. Pick the UCS with the left mouse button and then right mouse click to open the sub context menu.

    The sub menu, which you see; is context sensitive, as the options that appear depend on the current situation or selection. Pick **Hide**.



To continue working on the assembly, there is no need to activate it back, as any function on the toolbar will activate it automatically.

*More on **Display Control**:*

Rotate\Pan\Zoom *(also known as **ZPR**):*

Let's do some basic display operations.

Rotate *- Hold the keyboard's <**Ctrl**> button, press your **left mouse** button and move the mouse to any direction – the part will **rotate**.*

Pan *- While the keyboard's <**Ctrl**> button is still pressed, press the **middle mouse** button and move the mouse, the part will PAN (move up and down, move left and right).*

Zoom *- While the keyboard's <**Ctrl**> button is still pressed, press the **right mouse** button and move mouse up and down, the part will **Zoom in or out**.*

*An additional way to **Zoom in/out** is to hold the <**Ctrl**> button and scroll the mouse wheel. With this method the Zoom in/out is from the curser location.*

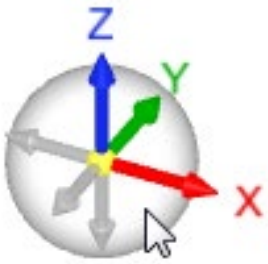
For more details of the Display Control, see the On Line Help - chapter: Zoom, Pan and Rotate (ZPR)

Now let's look at the Dynamic UCS located at the lower left of the display area.

As you Hover above the Dynamic UCS, a transparent bubble and transparent negative XYZ axis will show up on screen:

Pick (left mouse button) will rotate the display to Isometric view.

Click (right mouse button) will rotate the display to Isometric view and Fit to window.

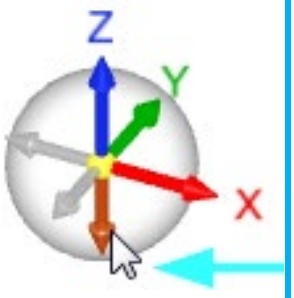


Pick somewhere on the bubble and move the mouse around. The view is rotated accordingly.

Hover above any axis, the axis will be highlighted.

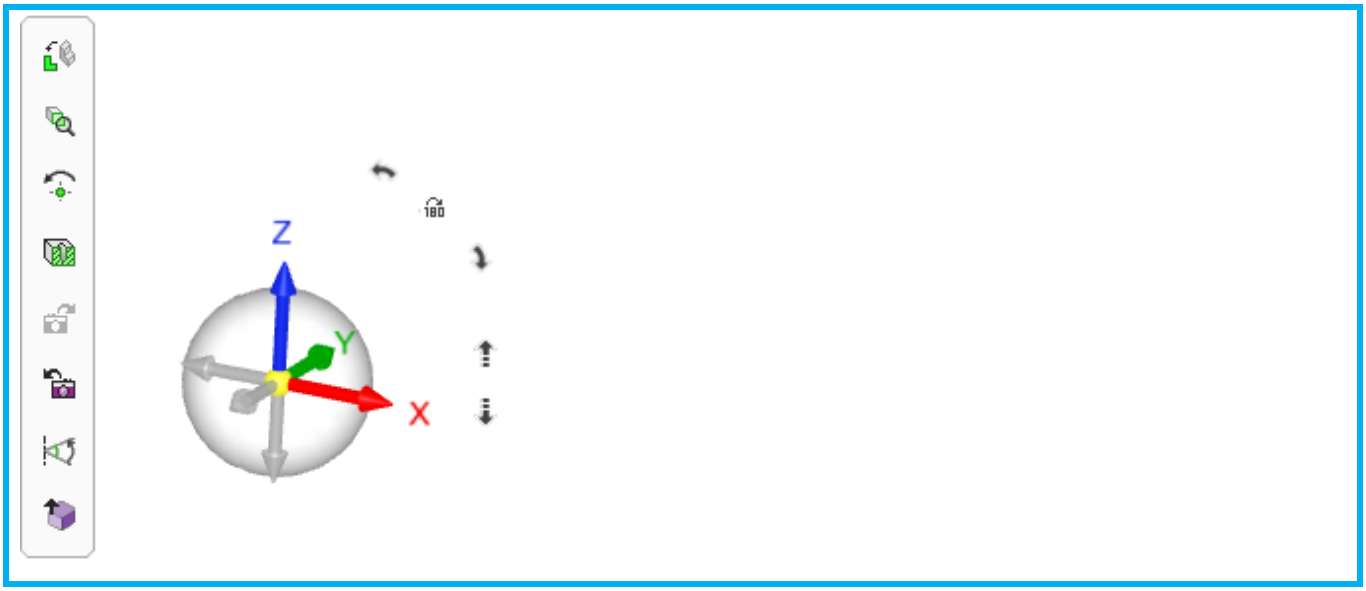
Pick (left mouse button) the axis will rotate the view so that the axis is perpendicular to the display.

Click (right mouse button) the axis will rotate the view so that the axis is perpendicular to the display and Fit to window.



As you hover over at the Bottom-Left area, additional guide and controls show up.

The controls to the right of the bubble enable pan\flip\rotate view operations and the guide to the left of the bubble contains shortcuts to special display controls.



The part is oriented on the tray according to its original design. However, most probably for the Printing process, the orientation may be a different one.

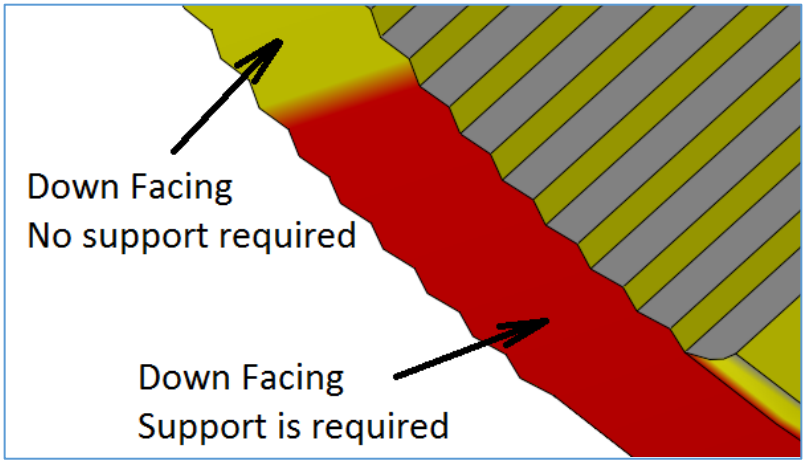
Position the Part for Printing

12. *Pick* **Position Body** 

from **The 3D Printing Tool Bar**.

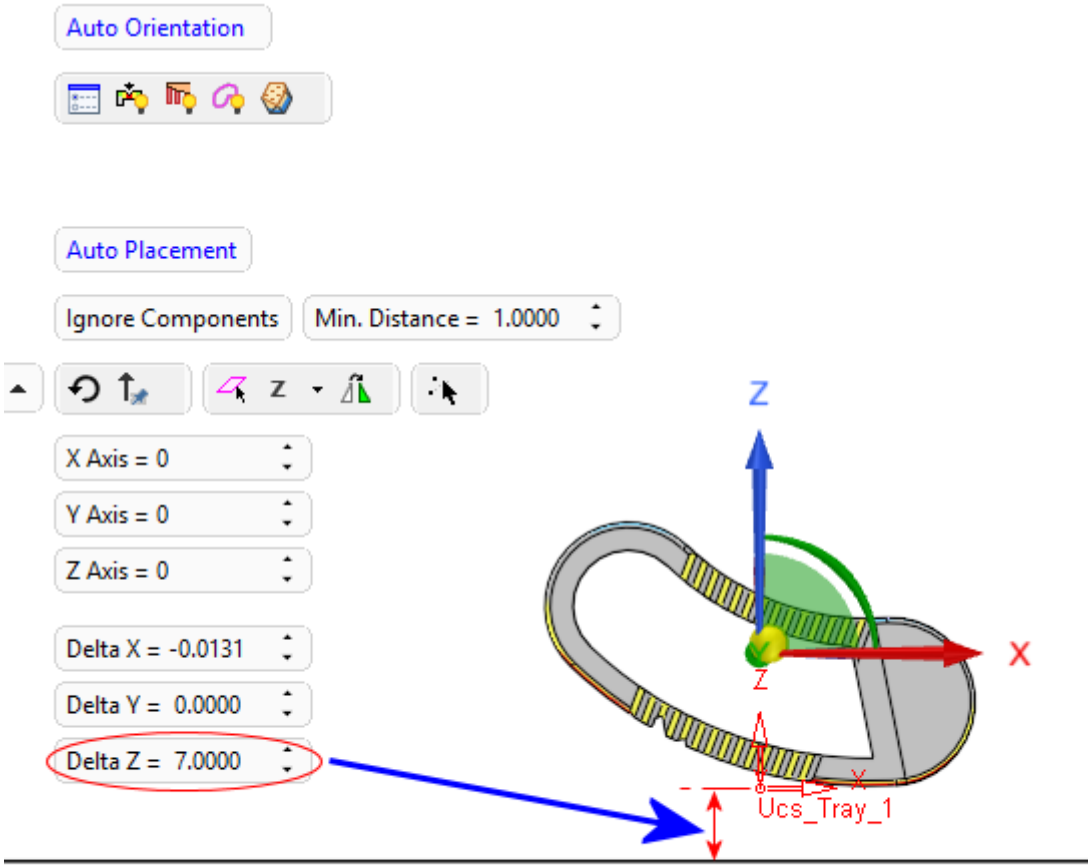
Notice the bounding box around the part. You can dynamically drag and rotate the box by picking any of its edges and moving the mouse.

As you drag and rotate the part, notice that the down facing areas are colored in yellow and that the areas requiring supports (depending on the overhang angle) are marked in red.



Let's first set the height of the part above the tray.

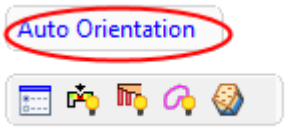
13. Set **Delta Z = 7mm.** The Delta positions of the part is with respect to the tray UCS. This makes sure that part will not go below this height.



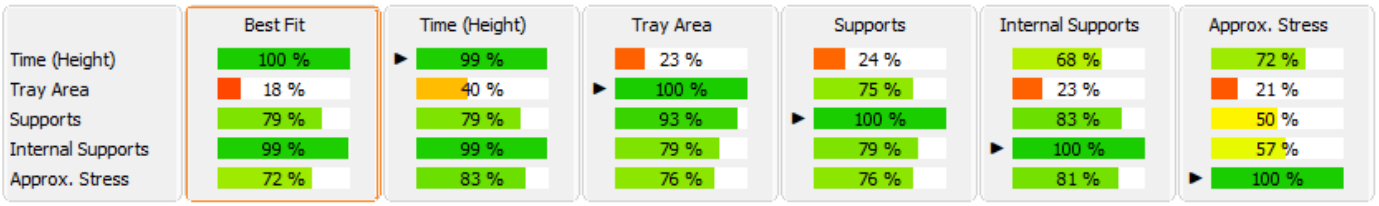
Next, let's set a different orientation for the part.

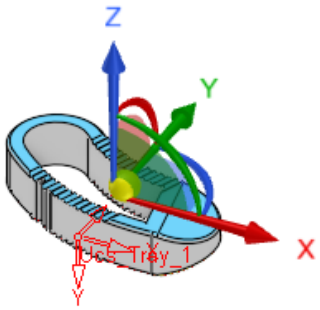
The system can help you find the optimized orientation based on several rules such as smallest height value, Minimum tray area, etc.

14. *Pick* the **Auto Orientation** button.



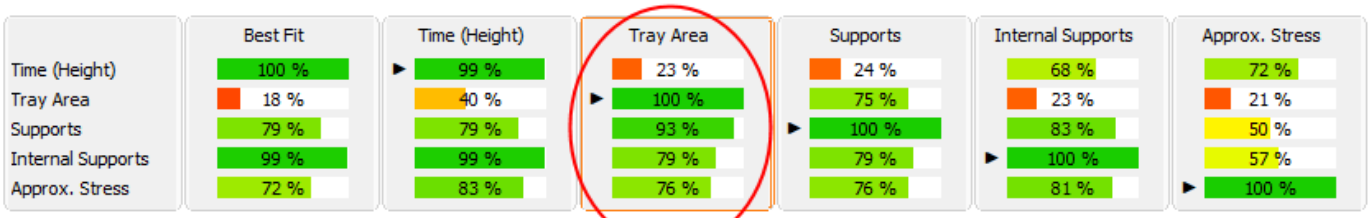
By default, the system displays an optimized orientation that Best Fits all the analysis criteria, based on the weight importance given to each of criteria in the Orientation Settings dialog, or the default weight values defined in the **Best Fit** Positioning Preferences.

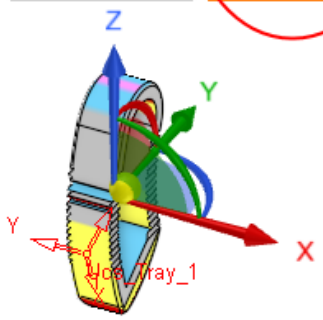




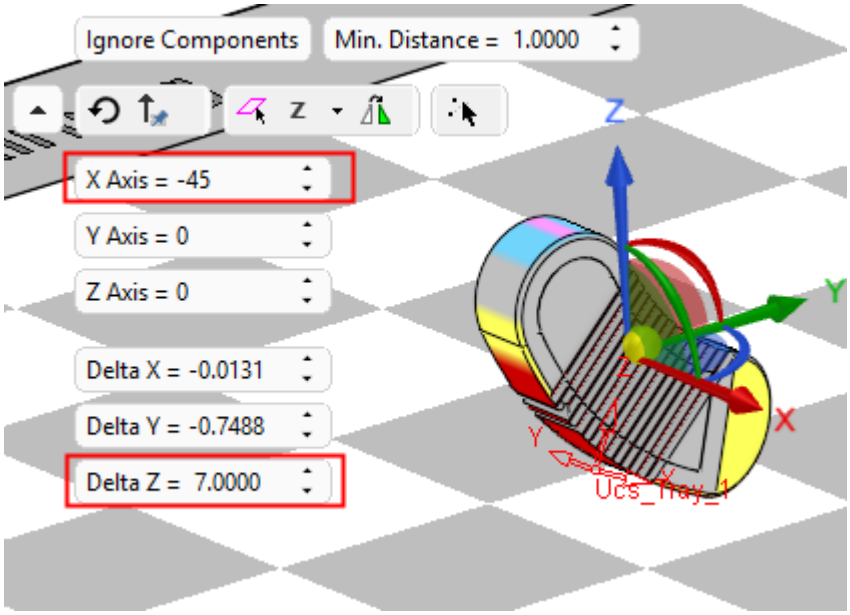
Within each calculated analysis criteria in the panel, the best possible fit for a specific parameter is indicated by an arrow, a percentage value and a color coded marking, where the darkest green indicates the best fit. These indications provide easy comparison between the different offered options.

15. Set the orientation method to '**Minimize Tray Area'** by clicking the **Tray Area** option.



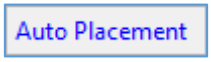


16. Set the rotation along the **X Axis = -45** degrees and set **Delta Z = 7mm** again.



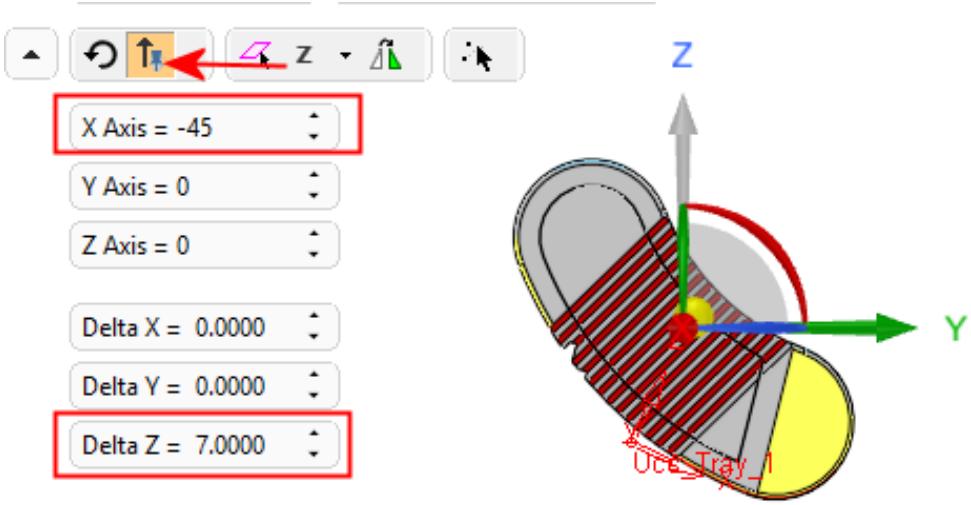
Note that you may also move the objects from Point to Point by selecting the Move from Point to Point icon. 

The objects will move from a selected origin point to a selected target point.

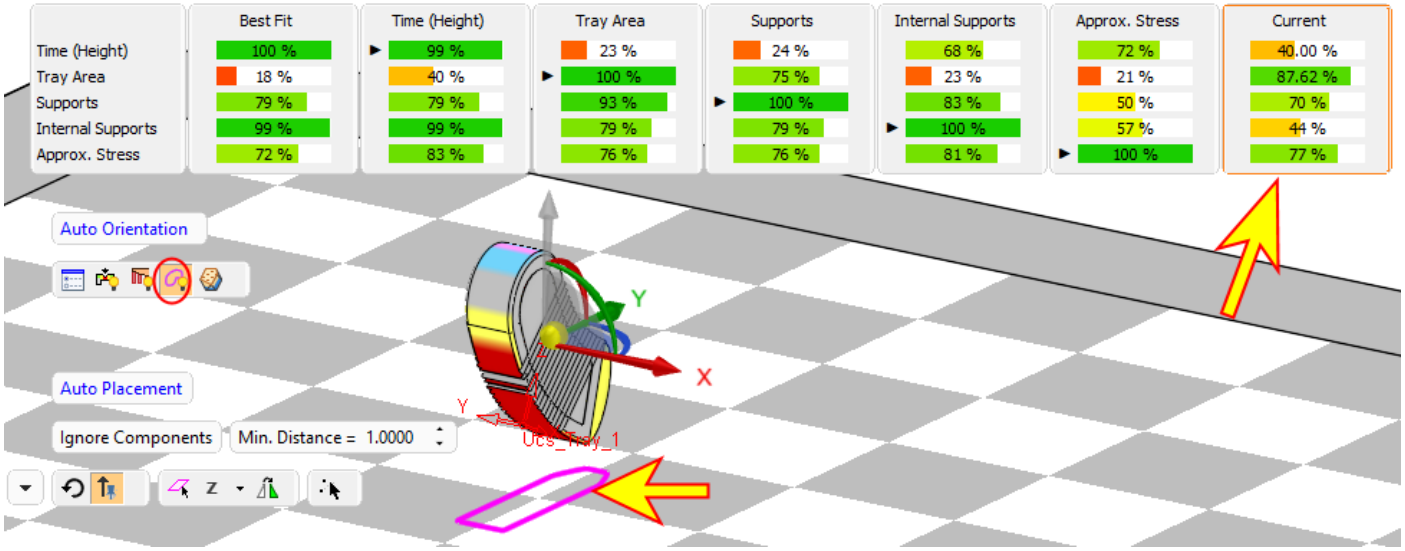
Pick 

to set the part to **Delta X=0** and **Delta Y=0**.
The 'Auto Placement' positions the part (in the current orientation) in the center of the tray/mini pallet at the lowest point (as long as there is no interference with other parts). The Delta X,Y and Z values are displayed as zero.

To lock the setting of **Delta Z = 7mm** for manual movement and/or rotation, *Pick* the arrow.
Note the change in the pin near the arrow.



17. *Pick* the Show Silhouette button to show the Silhouette curve.



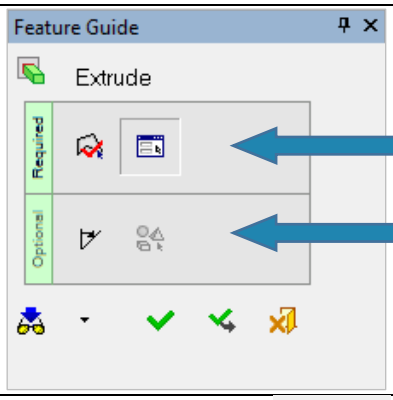
Note that after the manual settings, the Position Analysis changed from **Tray Area** to **Current**.

18. To confirm this position and orientation, Right mouse *click* and press the **OK** button

More on 3DXpert's ***Feature Guide***:

Most 3DXpert Standard functions are implemented by a series of steps. These steps can include selecting geometry, defining parameters, defining direction, etc. To simplify the process of each function, a ***Feature Guide*** is provided to walk you through the required and optional steps of each function.

The Feature Guide has the following appearance:

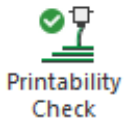
<table>
<tr><td rowspan="3"> 
</td><td>Command icon and name</td></tr>
<tr><td>Required Steps – one after the other.</td></tr>
<tr><td>Optional steps – if needed, The order of selection does not matter.</td></tr>
<tr><td></td><td>***"Preview"*** the result without executing</td></tr>
<tr><td></td><td>To approve and finish use the ***"OK"***</td></tr>
<tr><td></td><td>To approve and continue use the ***"Apply"***.</td></tr>
<tr><td></td><td>***"Cancel"*** – exit the comand without keep changes</td></tr>
</table>

From one step to the next:
Some functions will move to the next step automaticly as a selection is done.
Some functions wait until a selecting/defining data to be finished in one step; to proceed to the next step press the middle mouse button .

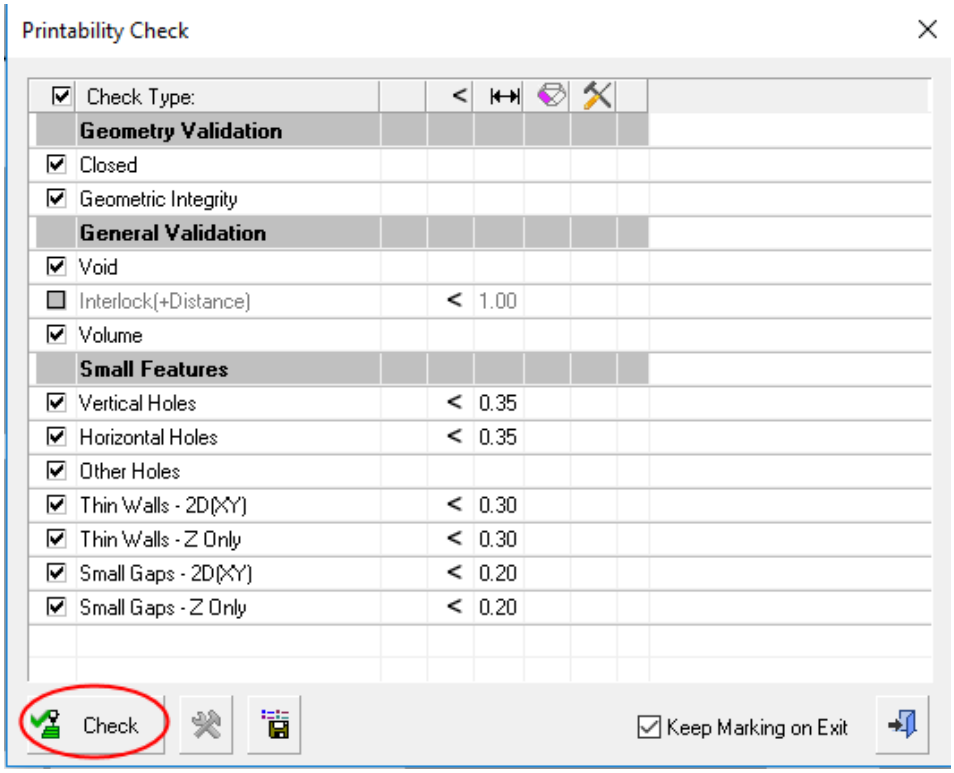
Launching the ***Feature Guide***
When a Feature (Function) is launched, the ***Feature Guide*** *will appear on the top left corner of the screen.*
At any time, ***Right Mouse Click*** *anywhere on on the working screen will* ***popup the Feature Guide****.*

Printability Check

Let's perform a **Printability Check**, to ensure that the part is ready for printing. This 'check' is actually a collection of several analysis tools, verifying that the model is topologically ready for slicing.

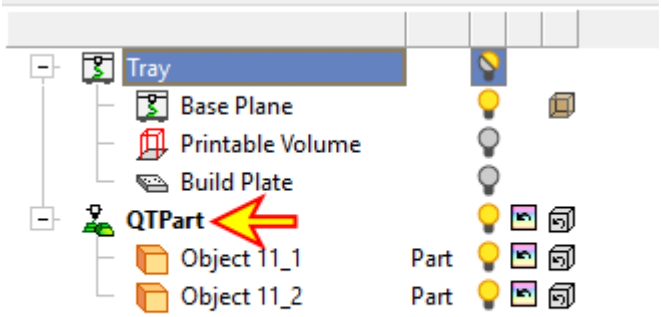
19. From the **Toolbar**, click the **Printability Check** option. 

.
20. Press the **Check** button at the bottom of the dialog.



Note that all objects are picked automatically. If you wish to unselect any of the objects just pick it – second pick is unpick.
Here are the results: **The part is OK**.;

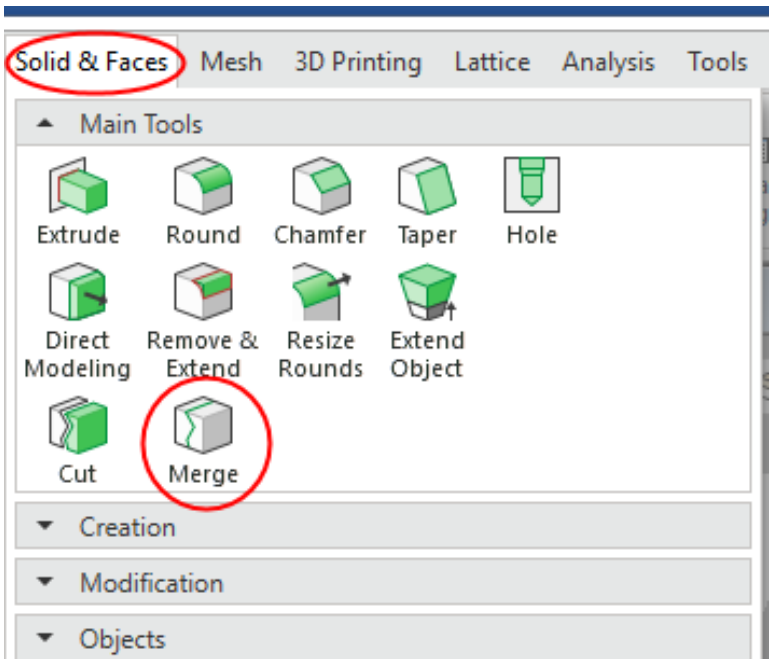
21. Close the Printability Check dialog.
    However, remember that this part consisted of two separate objects. We would like to **consolidate them into a single object**. We will merge these objects into one object.
22. The **Merge** operation is done within the **Part environment**, so to activate the part, double *pick* on the part name or any of the object names on the tree.



Note that **active part name** is displayed in **bold font**.

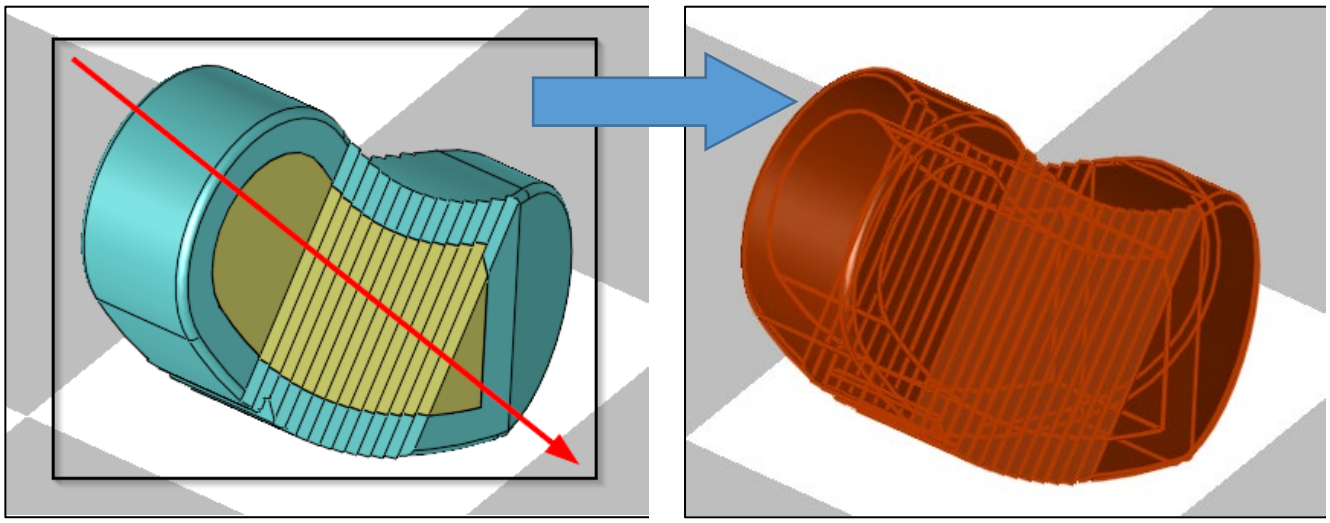
(To activate the 3DP work again double *pick* on the **Tray** in the list).

23. From the **Dropdown Menu** select ***Solid*** & Faces–> ***Main Tools*** -> ***Merge***:

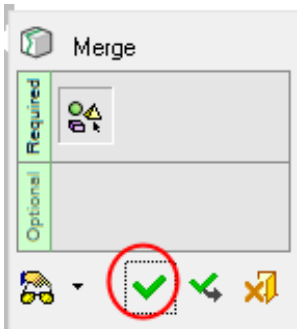


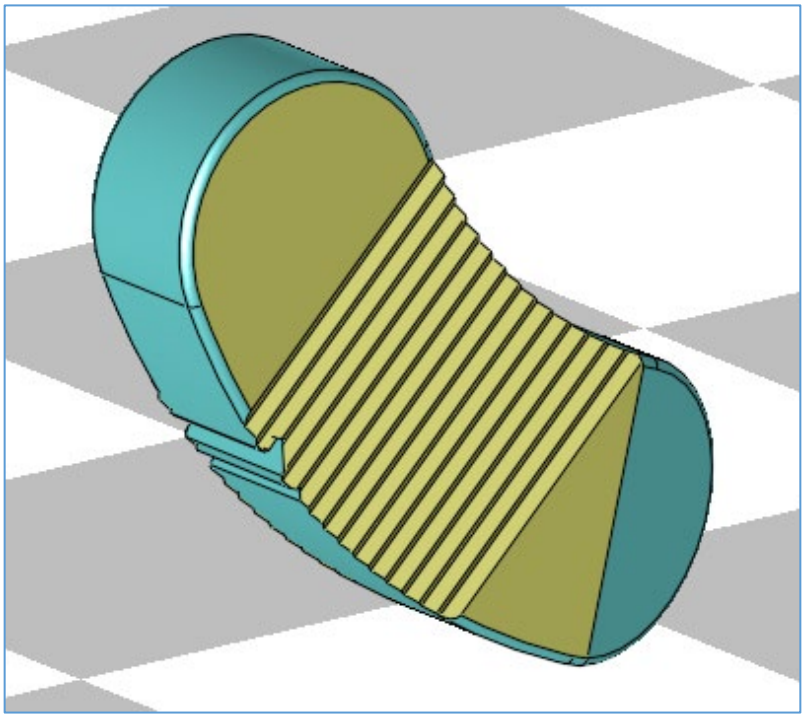
24. *Pick* the Left Mouse Button and drag to **Select By Box** the two objects.

    Select the box as shown in the picture (Top Left to Right Bottom) - the selected objects are highlighted in red:



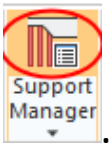
25. Right mouse *click* anywhere on screen, and the Feature Guide pops up - *pick* the **OK** Button.





B. Create Region & Supports

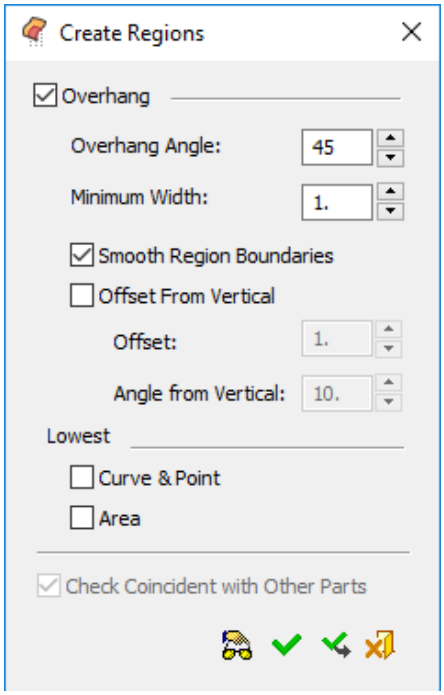
Support Manager

26. From **The 3D Printing Toolbar**, *pick* the **Support Manager** 

.

27. Keep the overhang angle value (45) but set the Minimum Width for regions as 1mm.
28. Uncheck the two Lowest options (keeping these options will result in additional regions).

Note: Lowest options are not checked.



Preview  *allows you to check the regions to come from the current parameter settings.*
If necessary, the user can change the settings and to preview them again.

29. Select OK.

The Support Manager

*The **Support Manager** shows all the regions and includes all functionality needed to edit the regions and create supports on them.*

Each support region can be edited and various kinds of supports can be created.

The result of the analysis is presented on the table and, in addition, the regions are drawn on the model itself (with yellow contours).

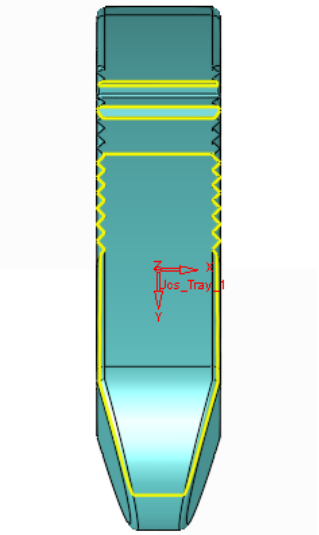
Looking from the bottom *(the tray become transparent automatically):*

The system has created 3 closed regions. (See zone No.1 in the dialog as shown in the picture of the dialog below).

These are the support regions created based on the overhang angle and the minimum width.

You can decide if you want to build supports on any region or not. It is also possible to modify them or to create your own support regions.

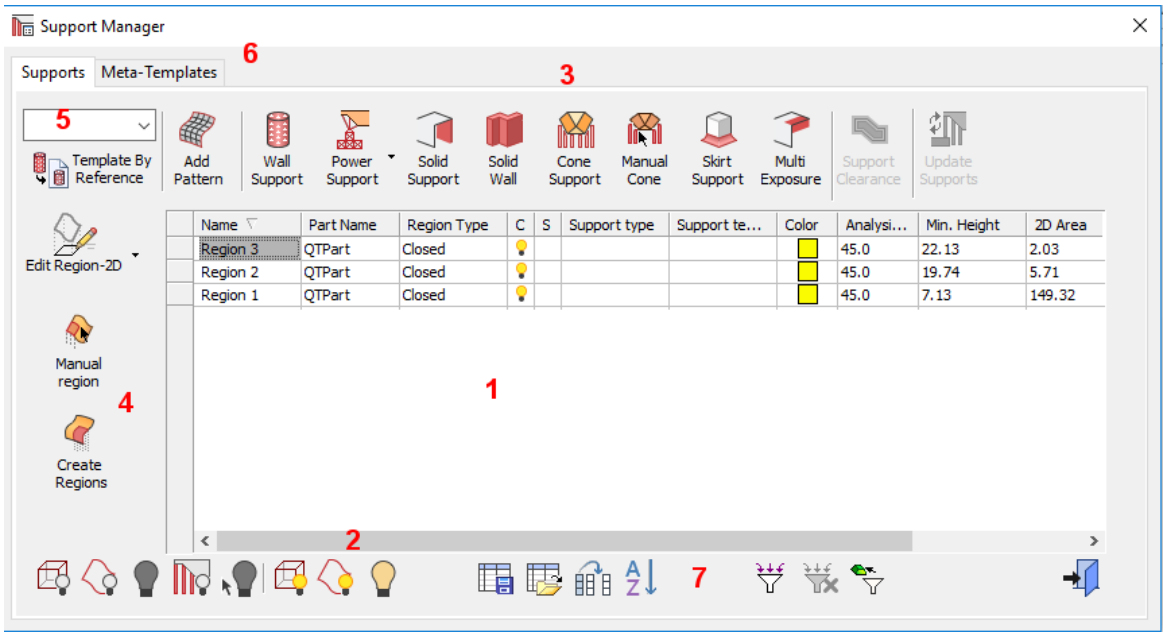
If you kept the Lowest options checked, additional open regions will populate the Support Manager. You can delete them or simply disregard them and continue to the next step.



More on the Support Manager:

The Support Manager dialog is composed of the following zones:

1. *Table of regions created on this part. Every line is a different region with its parameters and supports.*
2. *Visibility buttons for regions and supports*
3. *Support creation tools*
4. *Tools for creating and editing support regions*
5. *Apply Template & Template by Reference*
6. *Meta Templates*
7. *Dialog Settings*



Regions highlight:

Pick some regions on the screen and see that the relevant rows are highlighted. This works vice versa too.

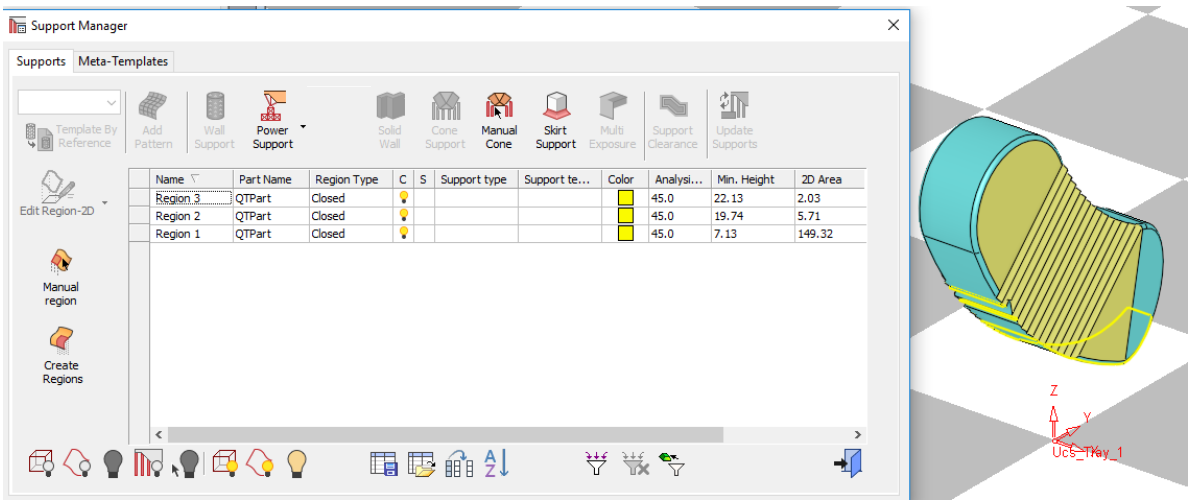
3DXpert offers a rich set of support generation tools:

- *Wall and solid wall Support*
- *Power Support*
- *Solid Support*
- *Cone Support and Manual Cone*
- *Skirt Support*

In addition, you can define a region as Multi Exposure (self-supporting volume within the part).

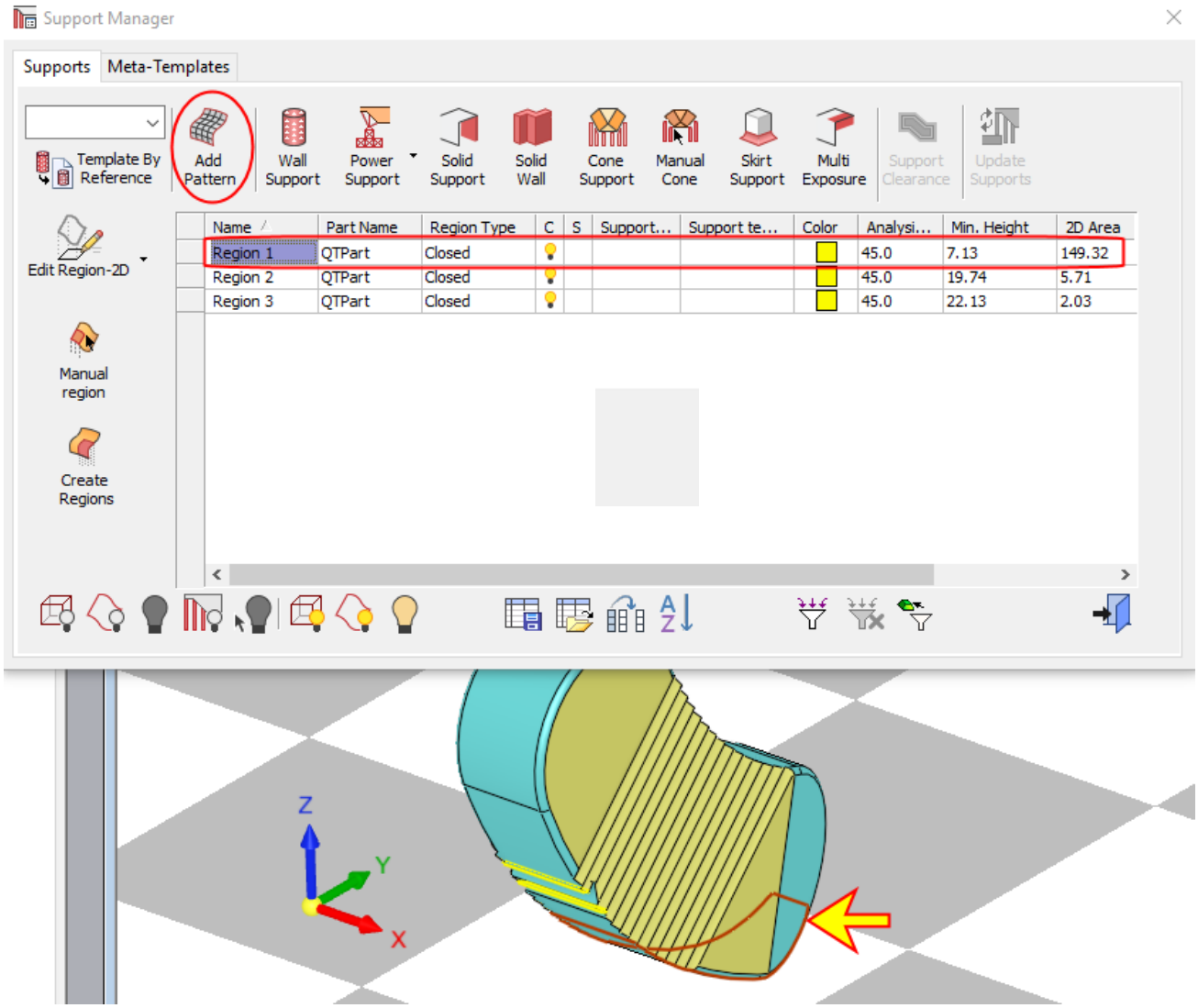
In this Quick Guide, you will create **Wall Supports**.
To learn more about support creation tools, refer for the 3DXpert training kit.

Notice the 3 rows on the table and the 3 yellow contours on the model. Each one is a **Support Region**.
We will create supports on the 3 regions created by the system.



30. Creating Supports – **Wall Supports**. *Pick* the largest region from screen.

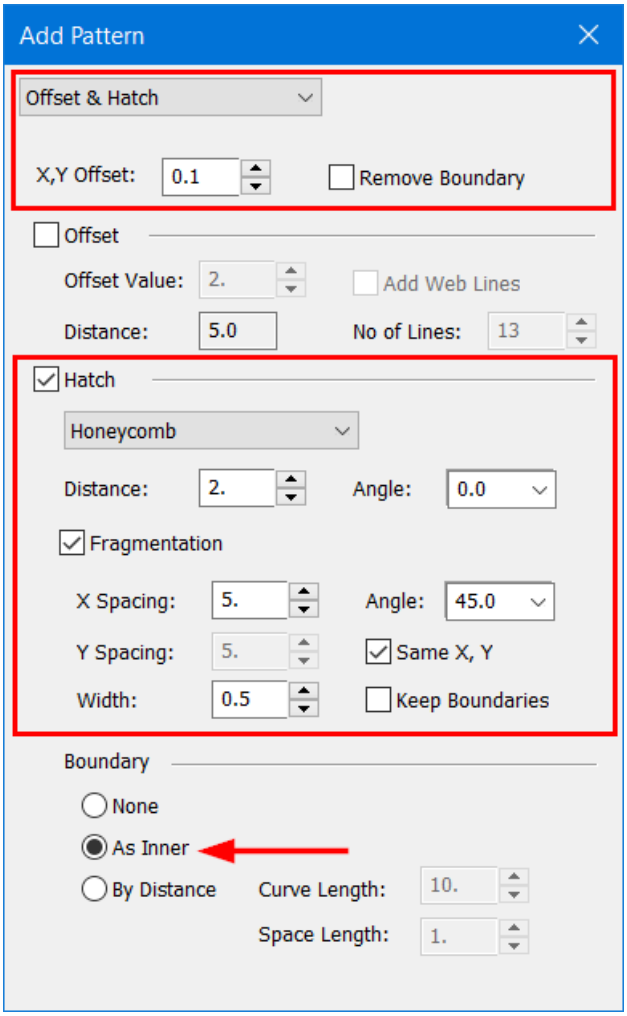
    Notice that the relevant row for this region is also marked on the Support Manager.



31. From the Support Manager menu *pick* **Add Pattern**.

    The pattern that you have selected is projected onto the tray.

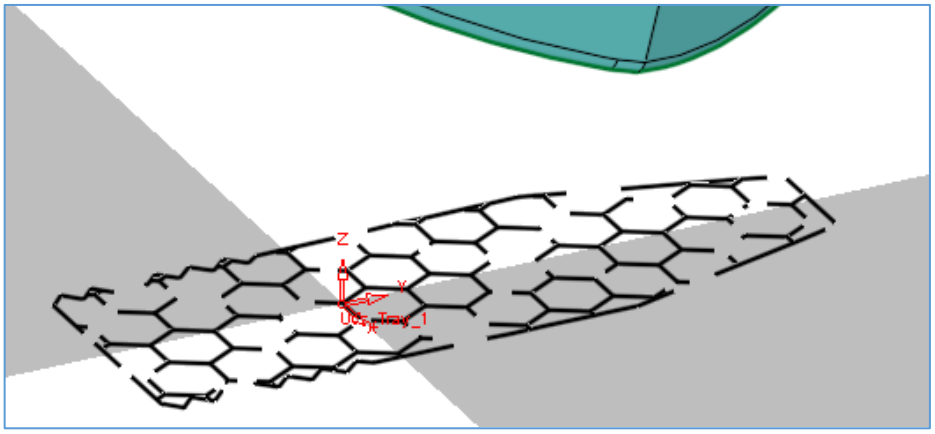
32. From the Pattern list:
    - Set **Offset & Hatch** -> **X,Y Offset=0.1**



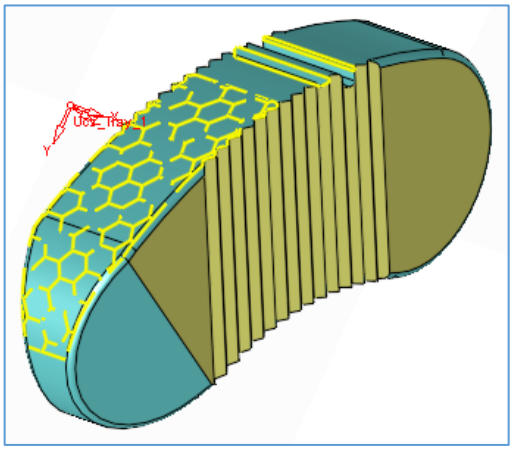
33. Check the **Hatch**
    - Select a Honeycomb hatch pattern.
    - Add fragmentation.
    - Set parameters as shown.

34. Set **Boundary** -> **As Inner**

The pattern is now projected and previewed on the tray:



35. Right mouse *click* on the display and *pick* **OK** on the Feature Guide.
Looking from the bottom, the pattern is now 3D projected back on the model:



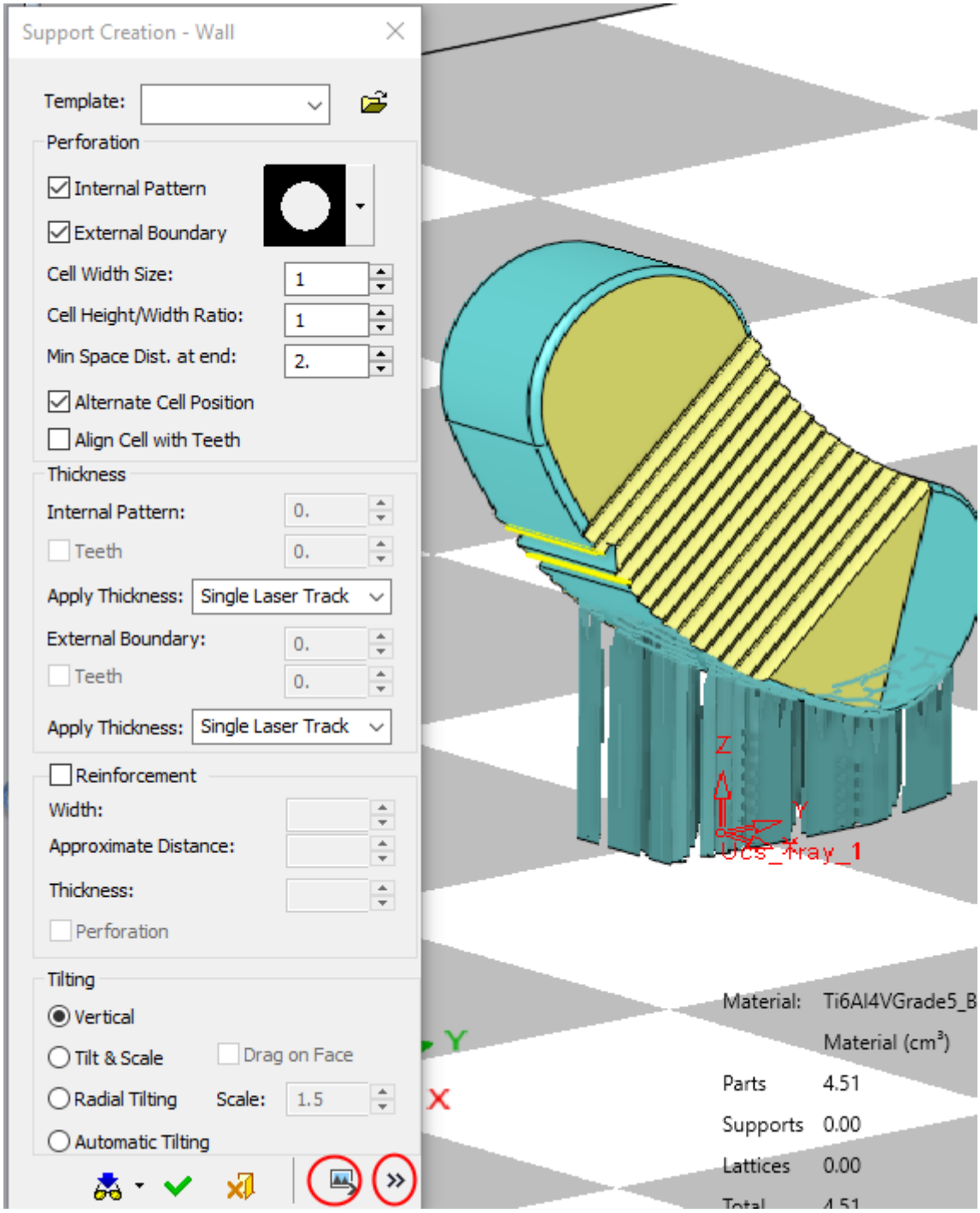
36. You are now back to the **Support Manager**.

    Click the same region and *pick* the **Wall Support** button. 

    There are many parameters for Wall Supports. We will focus here only on a few of them.

37. Use a wall with texture, keep the default texture.

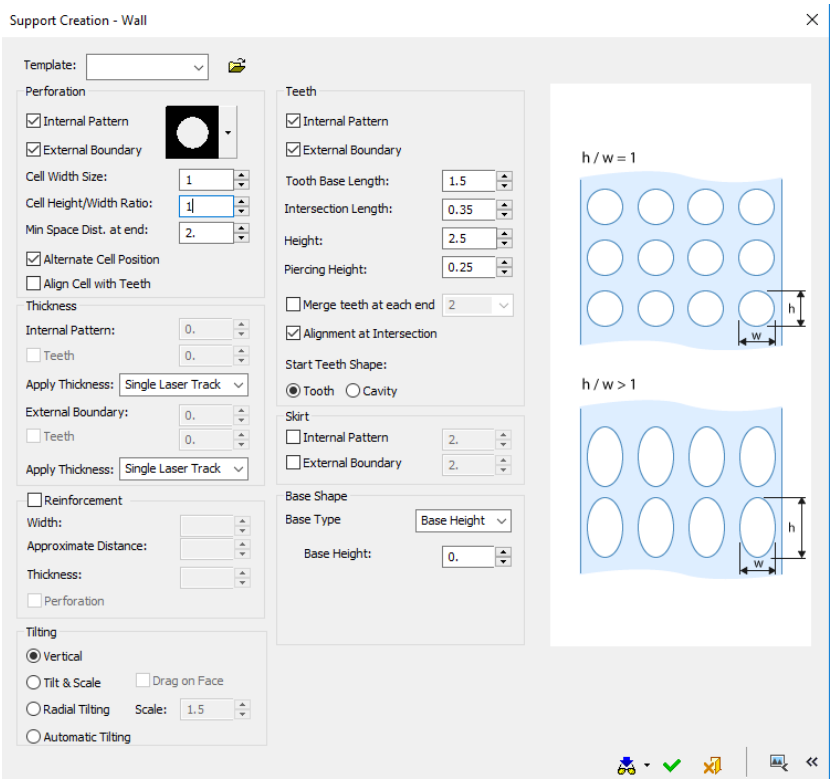
    Set the following parameters:



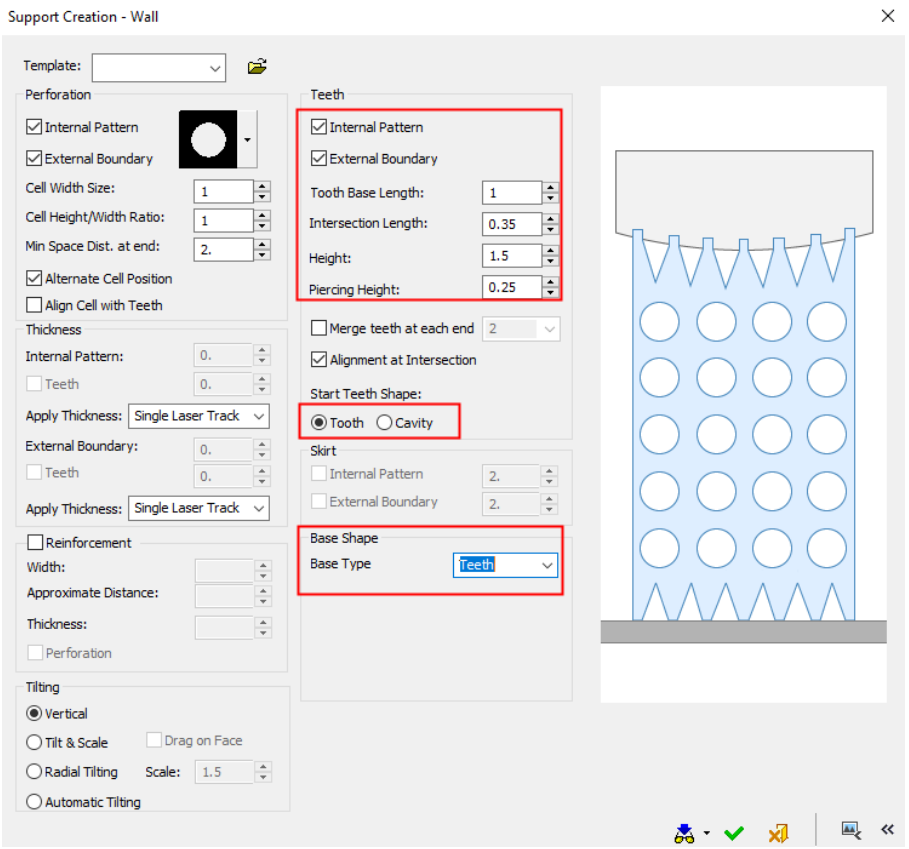
38. *Pick* the **Display description image** and the **Display advanced settings** buttons to expand the dialog.

Each parameter has an explanation in the **Display description image**.

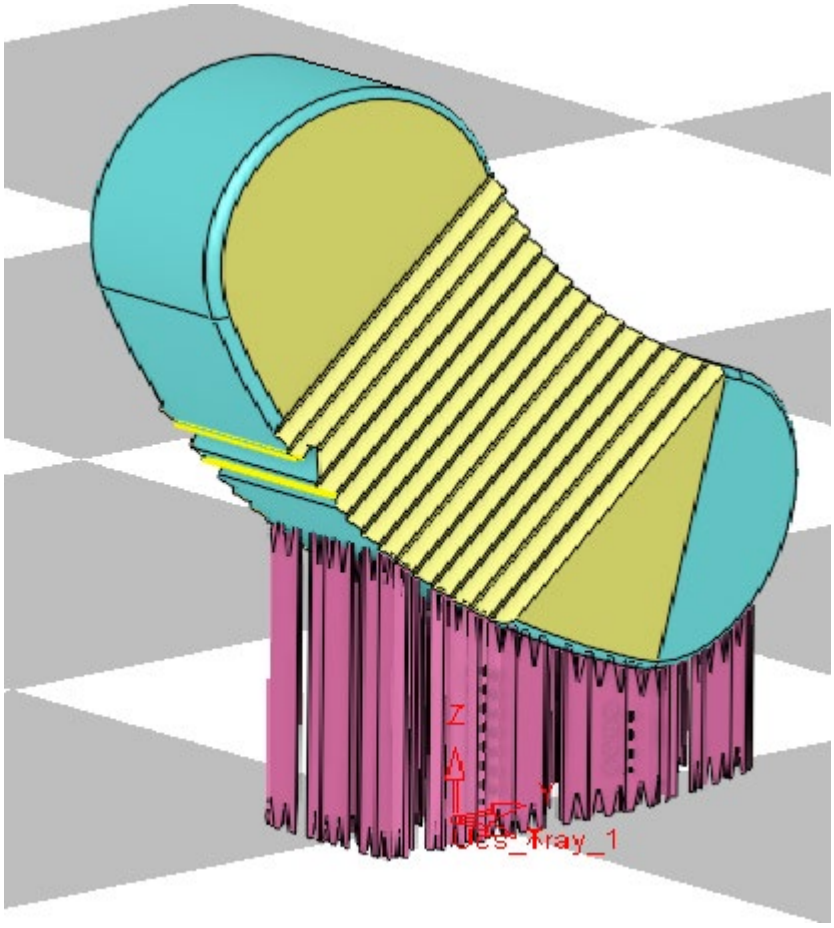
In the **advanced settings,** there are parameters, which are not often used.



Set the **advanced settings** for the **Wall Support**:



To approve the creation of the wall support, right mouse *click* and *pick* the OK button.

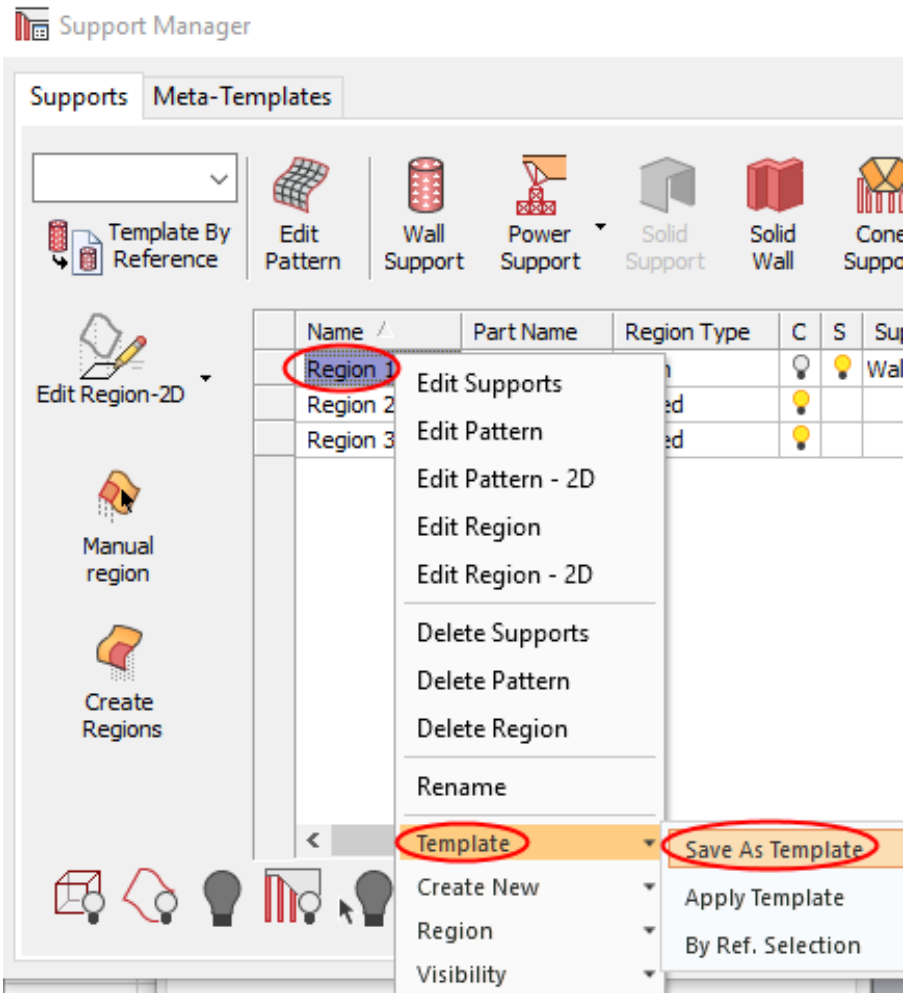


You have now created a support on one of the three regions.

In the same way you can create supports on the remaining two regions.

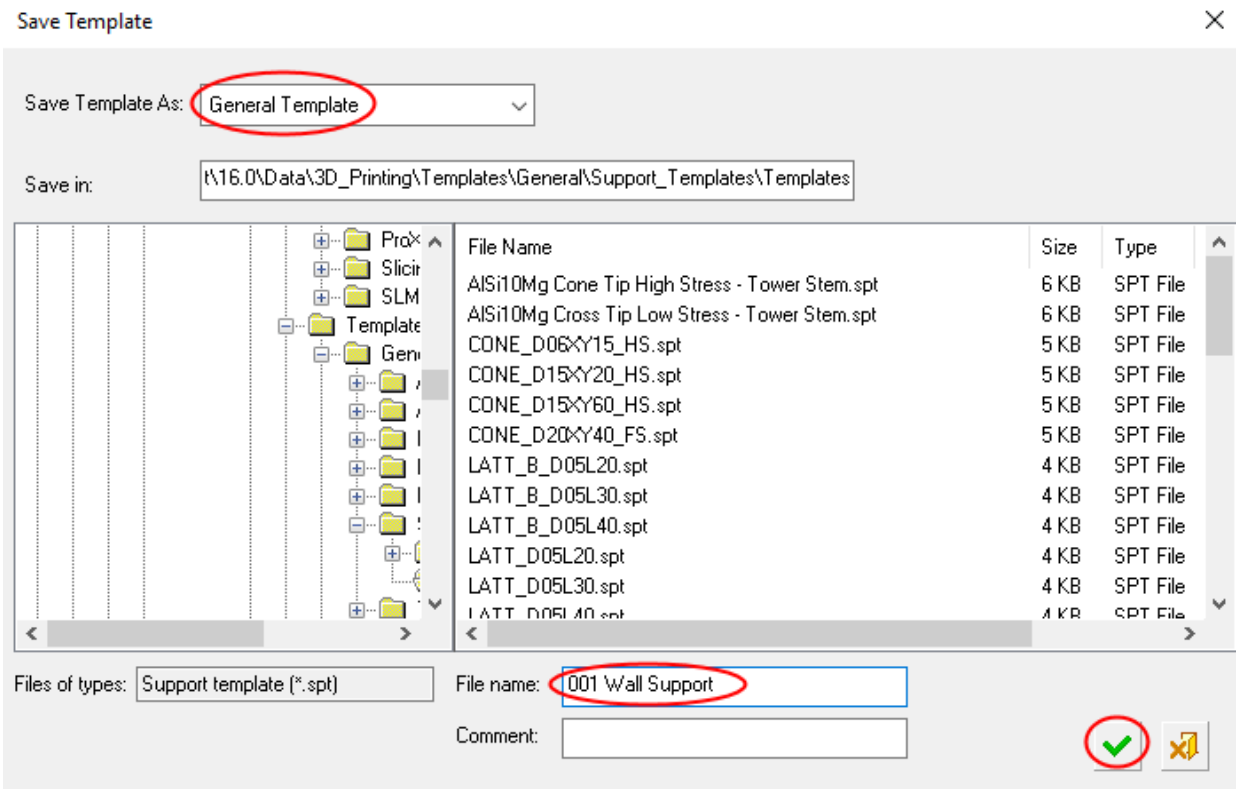
However, with 3DXpert you can create supports faster by using templates.
We will now save the rules to create the Pattern and Supports of this region into a Support Template.

39. Right mouse *click* the region with the support, and select ***Template*** -> ***Save As Template*** from the sub-menu:



40. Enter the name *001 Wall Support* for the template.

Define the type of template to be saved by selecting from the dropdown list and select the General template option. (General templates that are either visible for all technology types, or they can be saved for a specific technology or material.) Press the OK button.

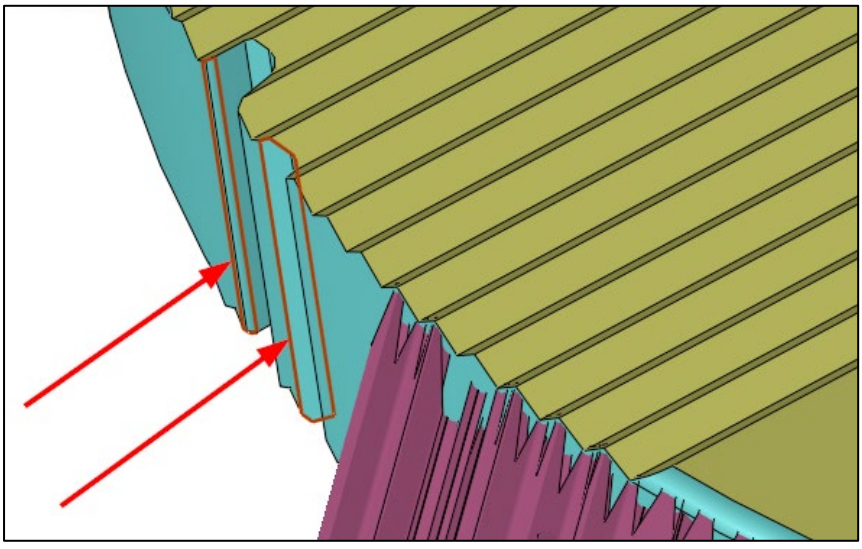


Usually, the default pass for saving Supports templates is C:\ProgramData\3D Systems\3DXpert\16.0\Data\3D_Printing\Templates\General\Support_Templates\Templates

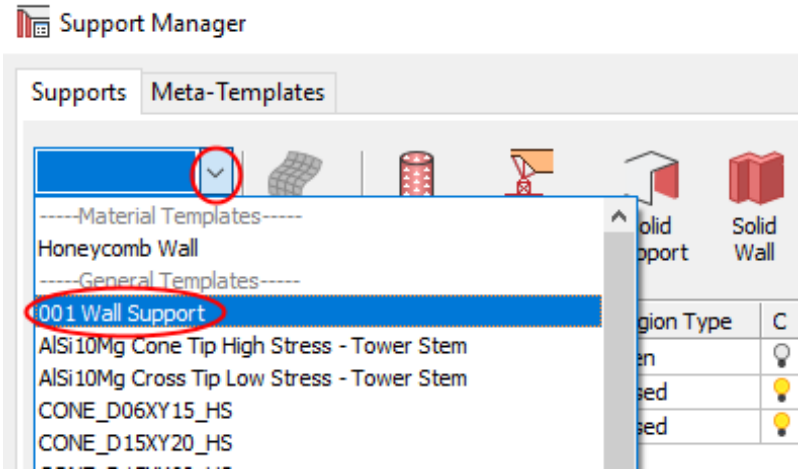
Applying the template.

41. *Pick* the other two regions.

The regions can be picked directly from the screen (*pick*ing one of the yellow edges of each region) or from the table by pressing the <CTRL> key.



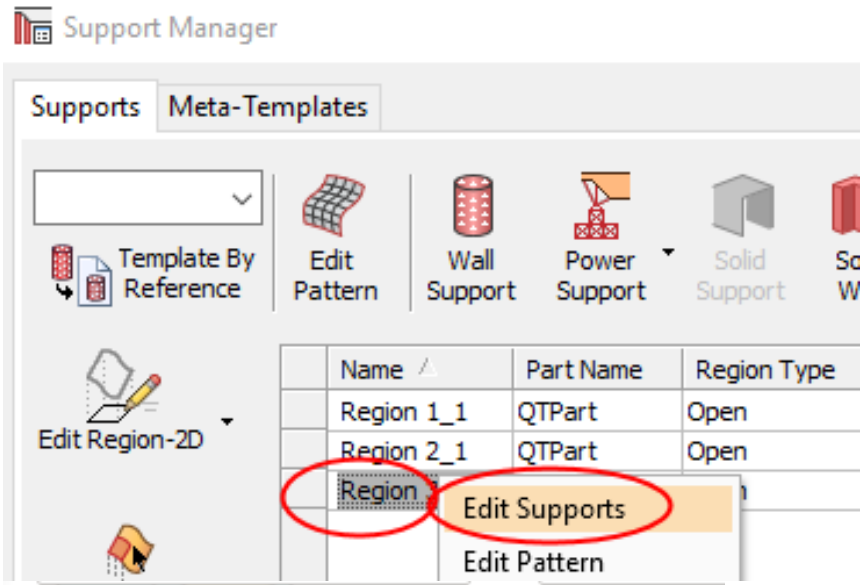
42. *Pick* the ***Template box*** and select from the list the template name you have just created.

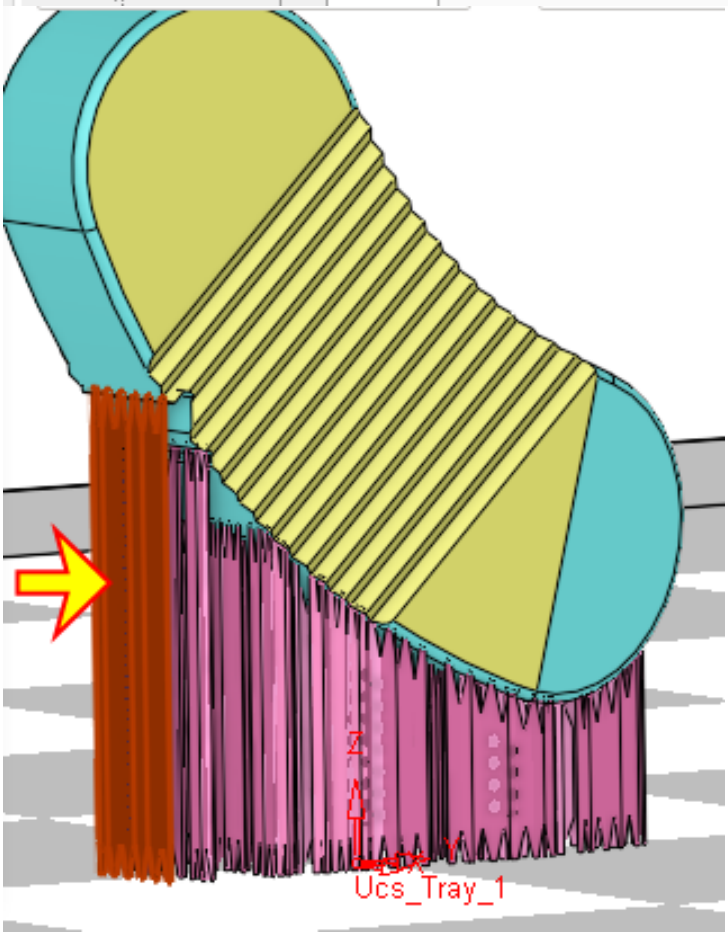


Although the supports were generated by a template, we can still edit them individually.

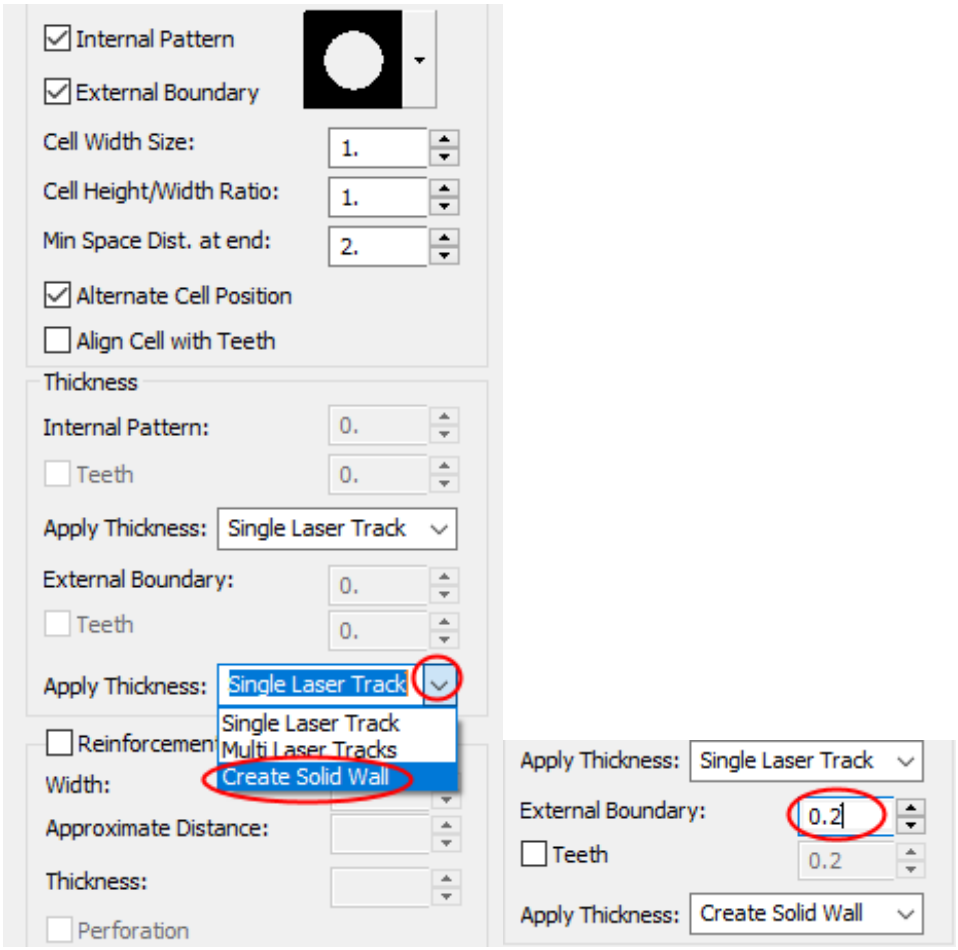
43. **Edit** the outer wall support:

Either
Just double *pick* the support on screen
Or
Right mouse *click* on the 3rd Region and select from the sub menu ***Edit Support***



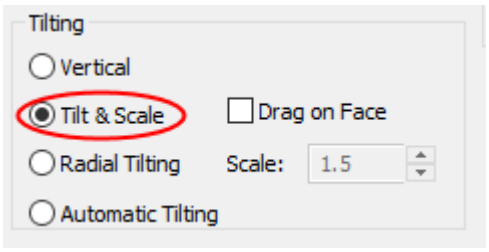


44. In the Wall Support Dialog, set the **Apply Thickness** option of the **External Boundary** to 'Create **Solid Wall'** and **Thickness** to **0.2.**

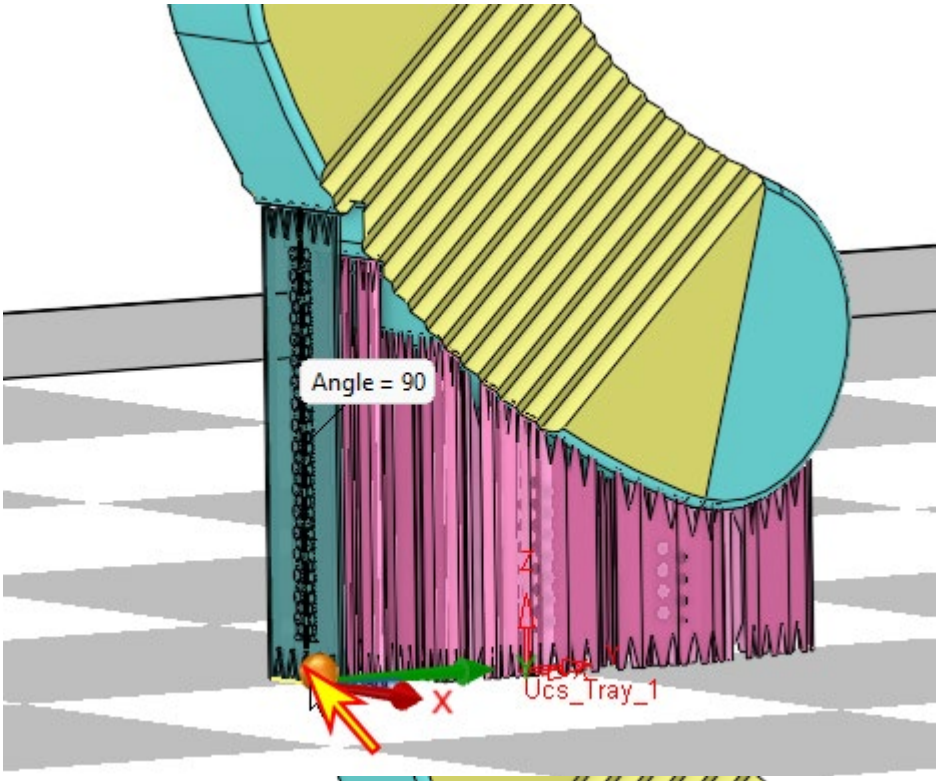


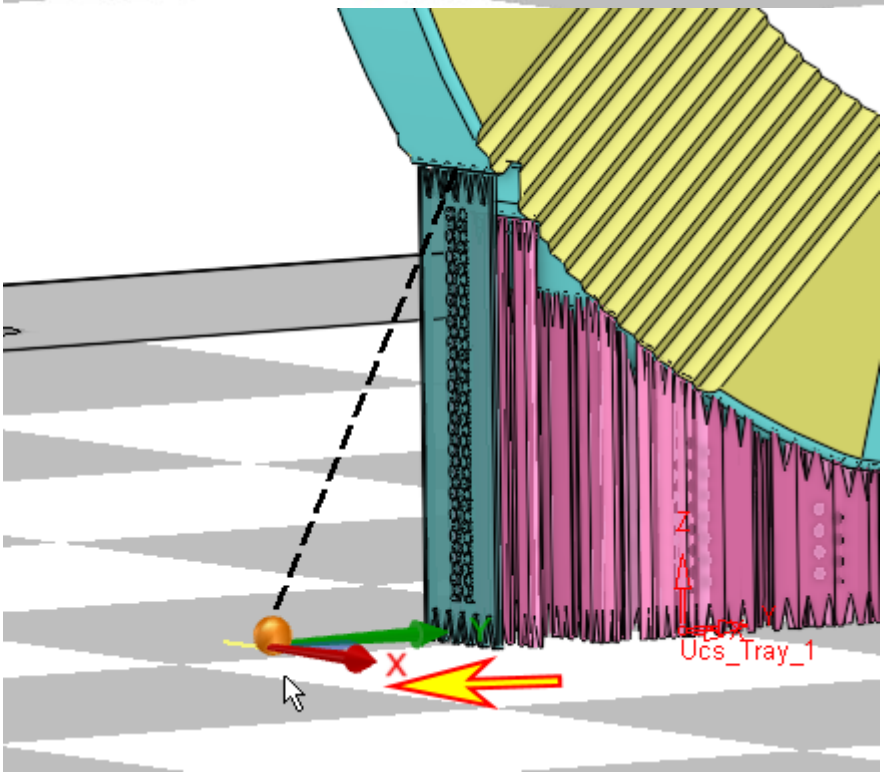
45. In the bottom of the dialog switch from **Vertical** to **Tilt & Scale**.

    This option allows you to move the support from the part when needed.

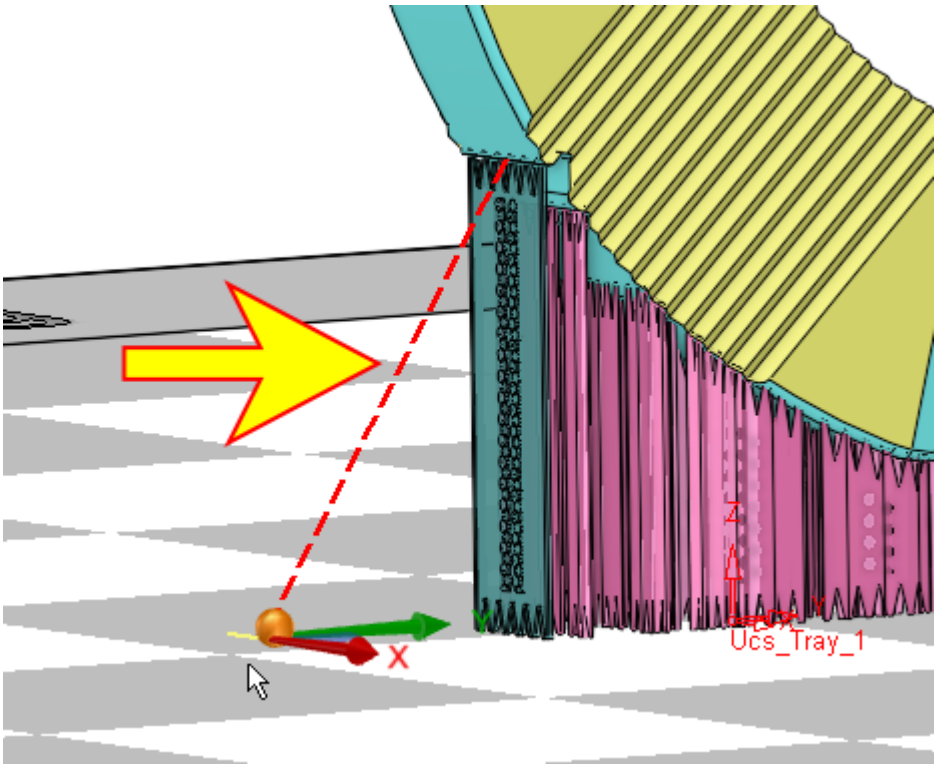


A Triad is displayed, together with a dashed black reference line along the supports. Drag the Triad to tilt the support. As you release the mouse, the supports will move accordingly.

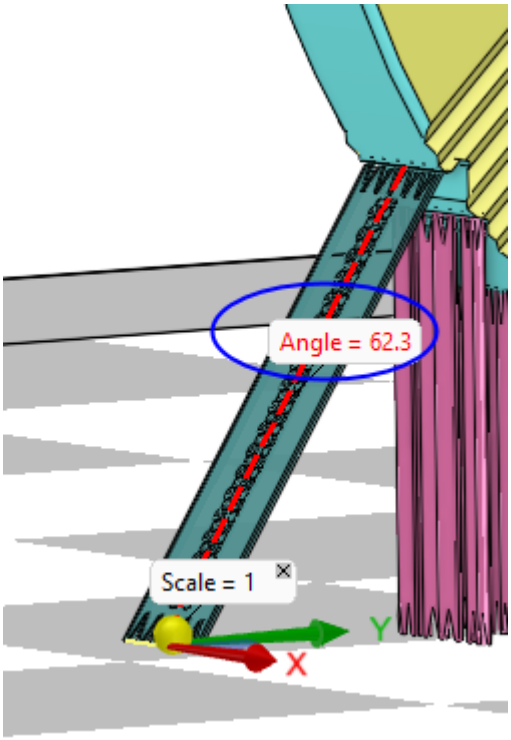




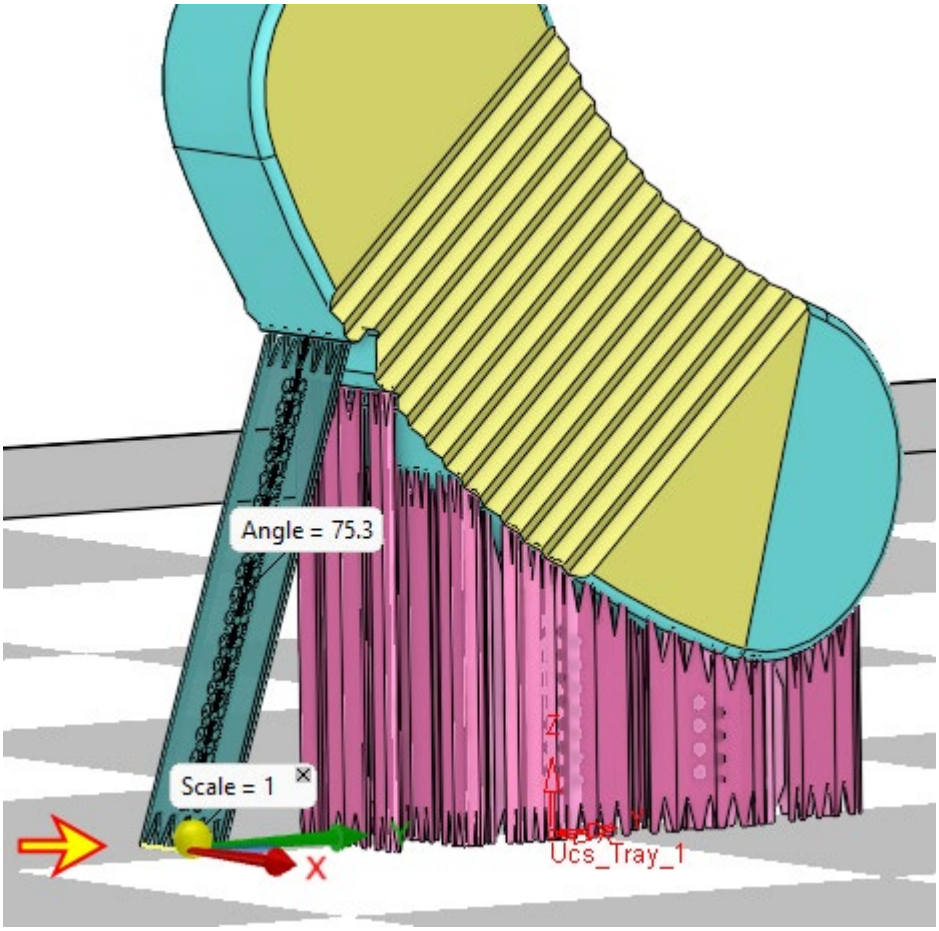
If the angle is below the minimal overhang value, the dashed line and text appear in **RED**. This means that the supports cannot hold themselves due to the tilt angle.



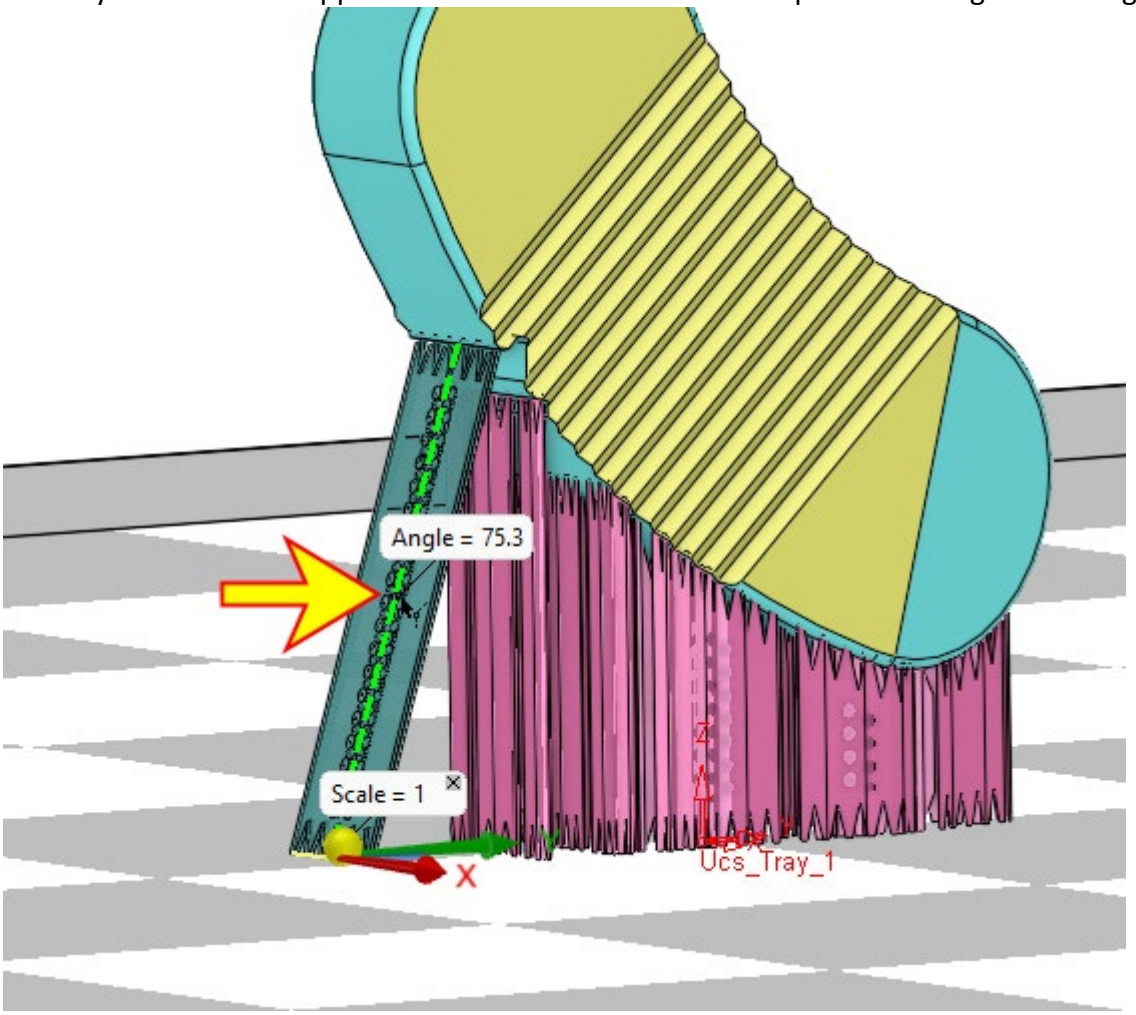
An **Angle** box displays the current tilt angle of the support.

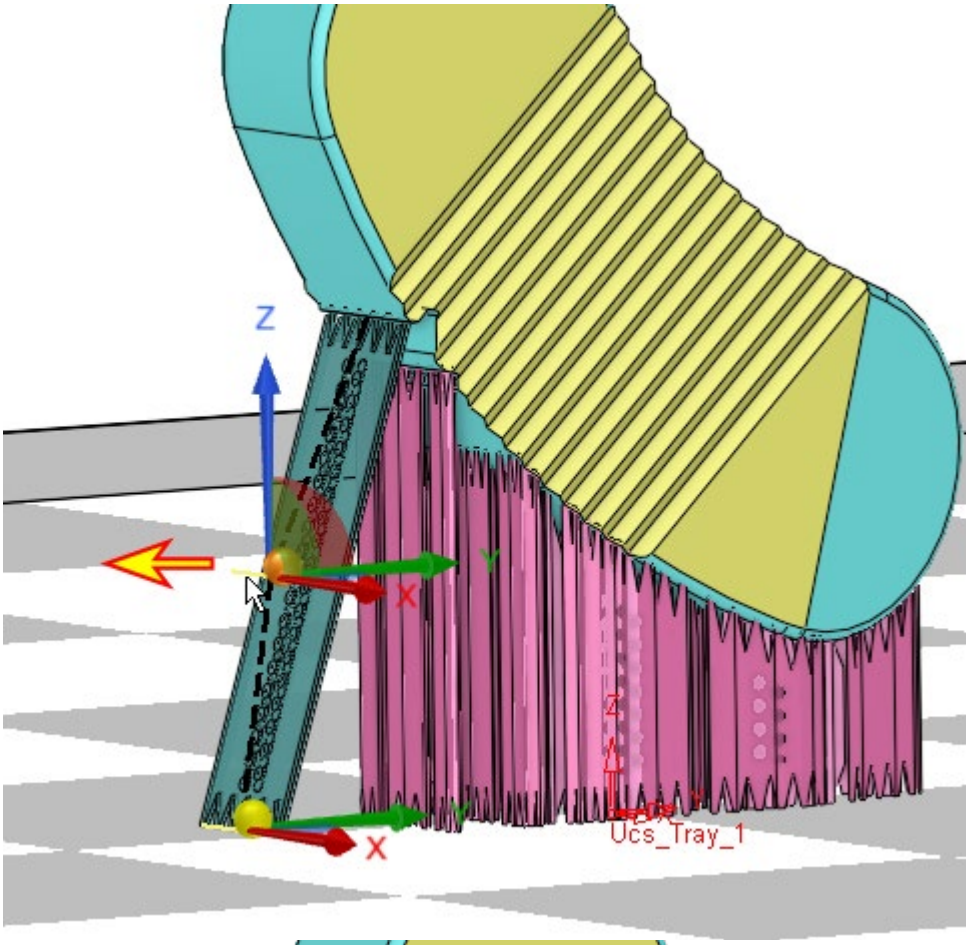


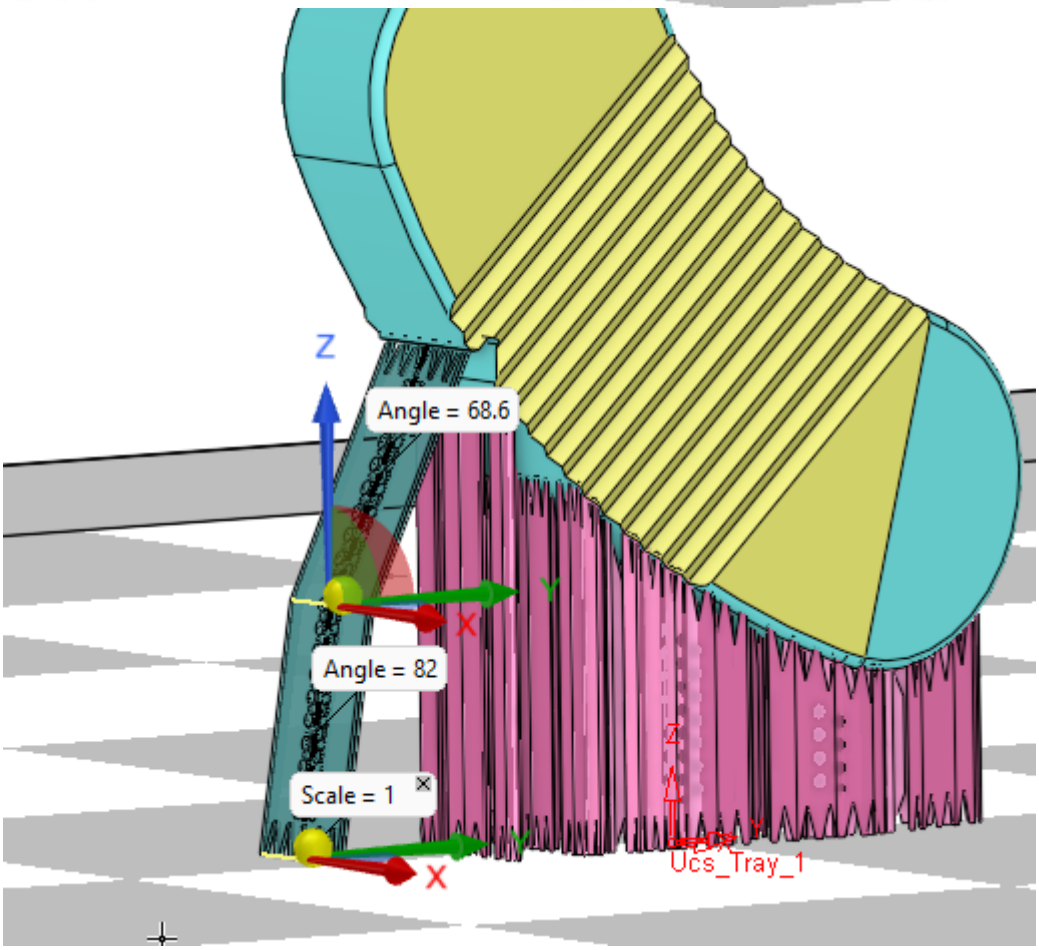
Drag the support towards the Y direction (75.3 degrees).



Pick anywhere on the support's reference line to add a breakpoint and drag it to the right.




Z
Y
X
Z
Y
X
Ucs_Tray_1

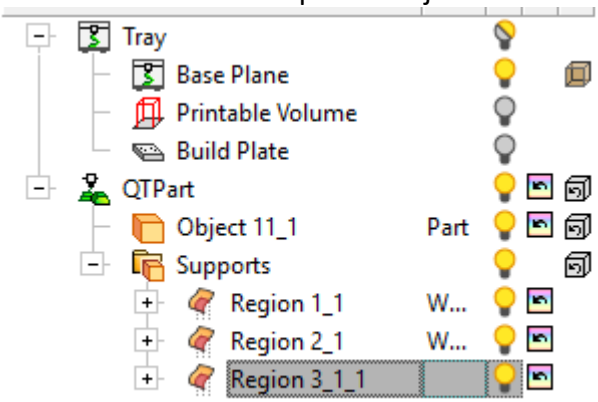

Z
Angle = 68.6
Y
X
Angle = 82
Scale = 1
Z
Y
X
Ucs_Tray_1

To delete a breakpoint, right-click it and select **Delete** from the popup menu.

46. Right mouse *click* and *pick* OK.
47. Close the Support Manager.

    See that the Supports that you have created were also added as objects to the 3DP Objects tree.

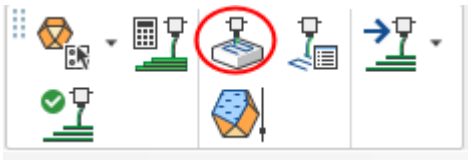
    Notice also the **Technology Name** appearing alongside each object.
    This name identifies the slicing technology to be used for the specific object.



The model is now ready for slicing.

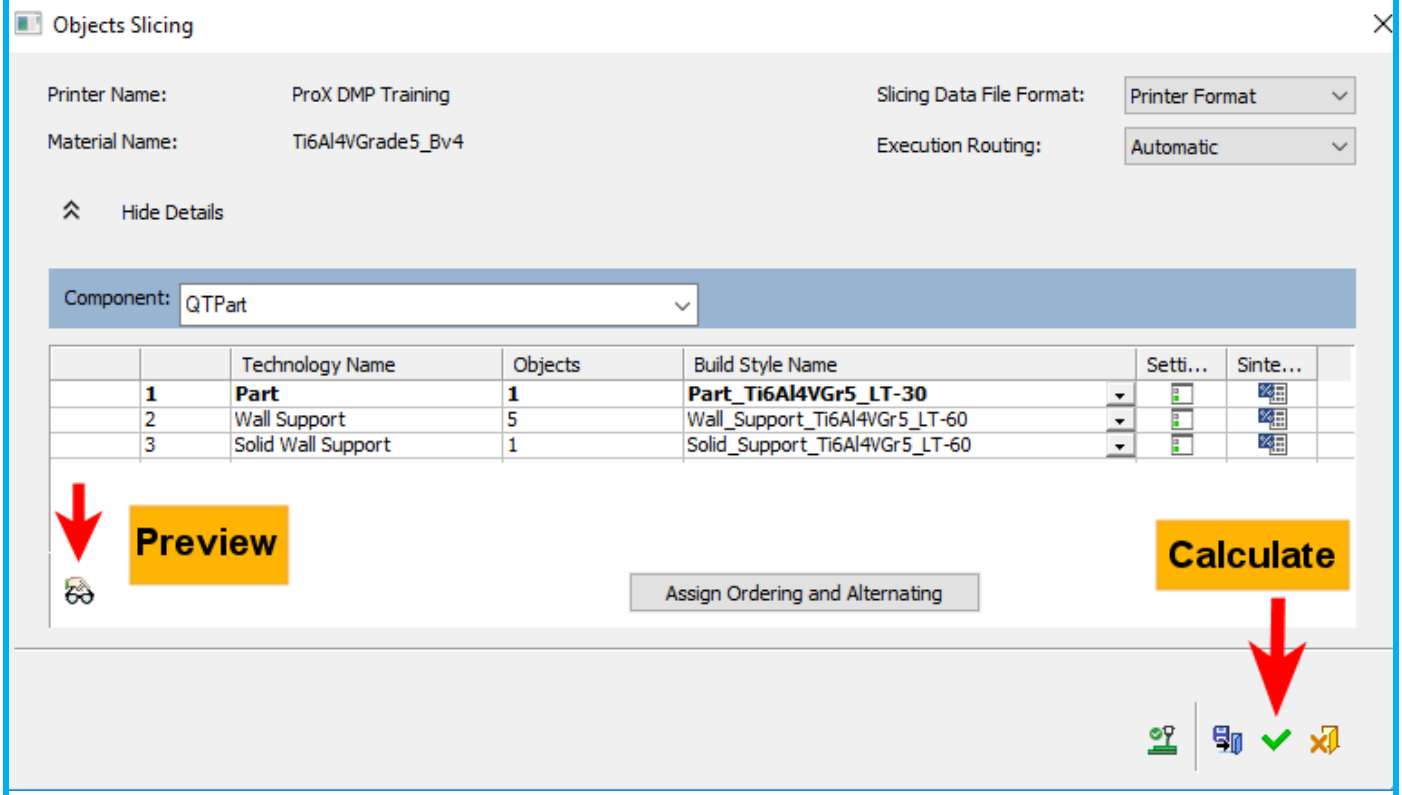
Calculate Slices

48. *Click* Calculate Slices.



Objects Slicing

The upper area of the dialog shows the technologies used for slicing.



*A **Technology** specifies the printing technique to be used on a specific object. For example, a part to be printed may have a Part printing technology and each Support type may have its own printing technology (Cone Support technology, Wall Support technology, etc.).*

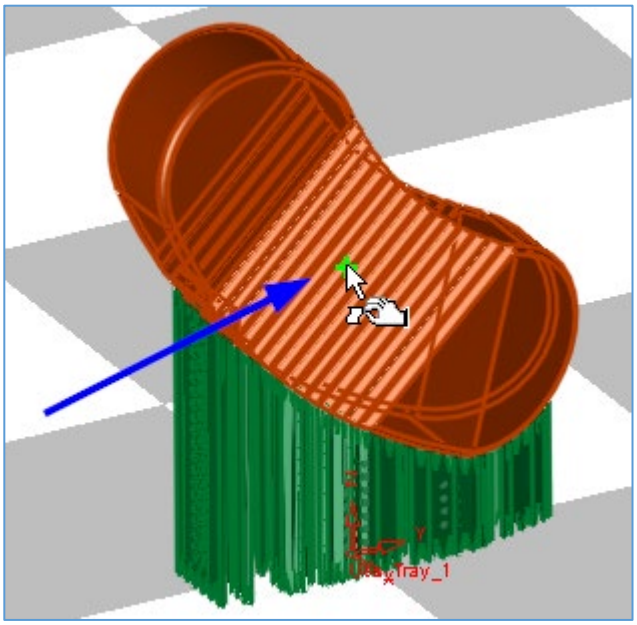
Each Technology contains its own specific set of printing parameters, consisting of the following:

1. *A **Build Style** - The printing (laser motions) parameter settings for each Technology*
2. ***Laser Parameters** - laser parameter settings (focus, speed etc...)*
3. ***Scanning Order** (if defined) - the order in which elements are scanned, within each layer*

Build Styles and Laser Parameters are standalone groups of parameter settings that can be applied in any combination and in multiple Technologies.

Before the calculation of the slicing, you can preview specific layers.

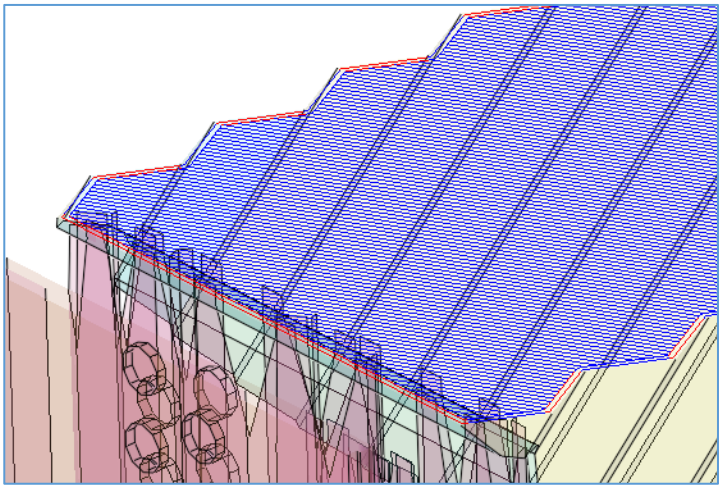
49. *Pick* **Part** (1st row) from the list of Technology Names and press the **Preview** button.



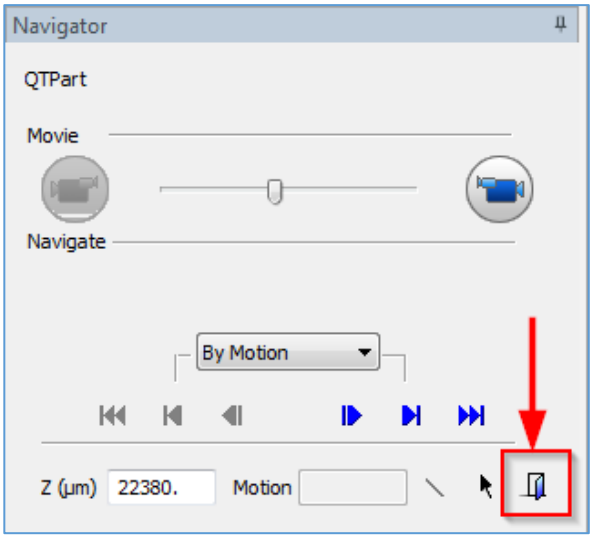
50. *Pick* on screen anywhere on the part to see the slicing on that specific layer.

Slicing preview of part for a **specific layer**: Zoom in closely to see the scanpath. (The display may appear differently due to previous settings).

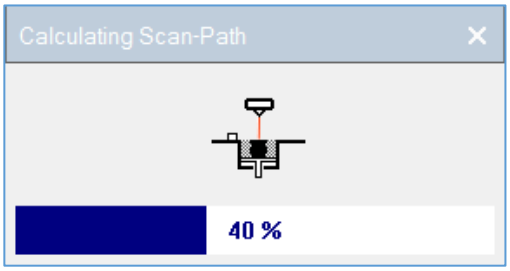
As we selected Part for preview, the scanpath is shown for the model only, in this case, it does not include the supports.



51. Exit the **Navigator**.



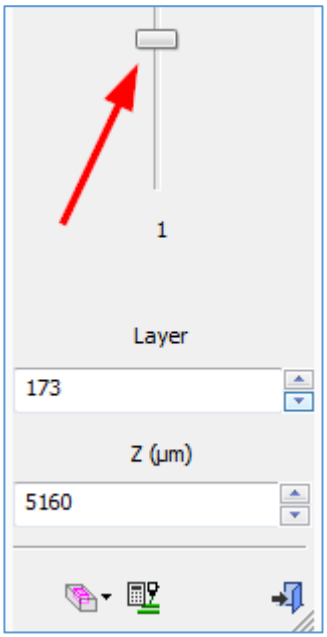
52. Back in the **Object Slicing** dialog, *click* the **Calculate** button to run slicing and wait until the calculation ends.



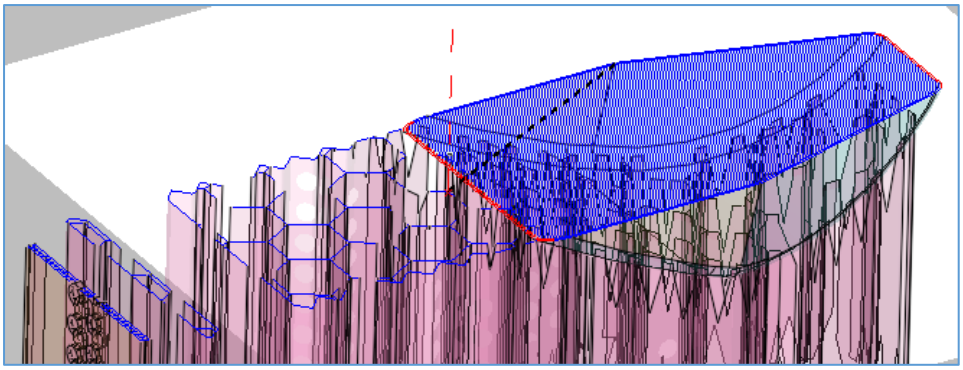
After Slicing is done, you can view the results.

Slice Viewer

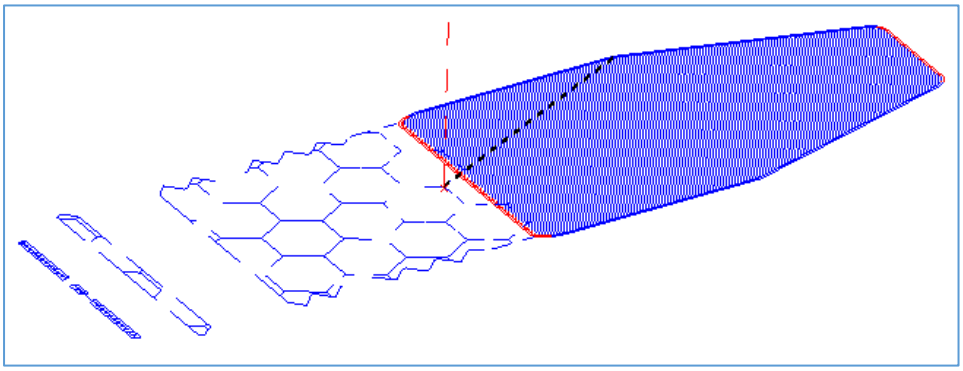
53. Enter the **Slice Viewer**  .
54. Move the bar on the right up and down to see the scanpath in each layer.

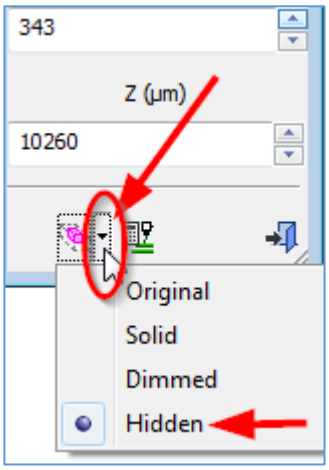


55. Note the slicing for the part as well as the supports.
56. Zoom in closely to see the scanpath:

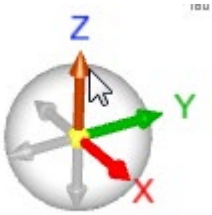


57. Set the display control to **Hidden**; this will hide the tray and model. This will show only the scanpath.





58. To clearly view the scanpath, set the **view orientation** to be from top view (right mouse *click* the **Z axis** of the dynamic UCS) and hide the model as described above.



Scanpath results

Scanpath results may differ from one material to another.

*The scanpath result depends on the preset material configuration files (the '**Buildstyle'**.)*

The scanpath result you see here is based on the specific Buildstyle defined for the material used for training purposes.

59. Exit the Slice Viewer.

Create a **Print Estimation** Report.

Volume Base Print Estimation

*A **Volume Based Calculation** is always available on the bottom right of the screen, even if slicing is not performed.*

Note that as you worked on the part(s), the system updated the material in use (volume).

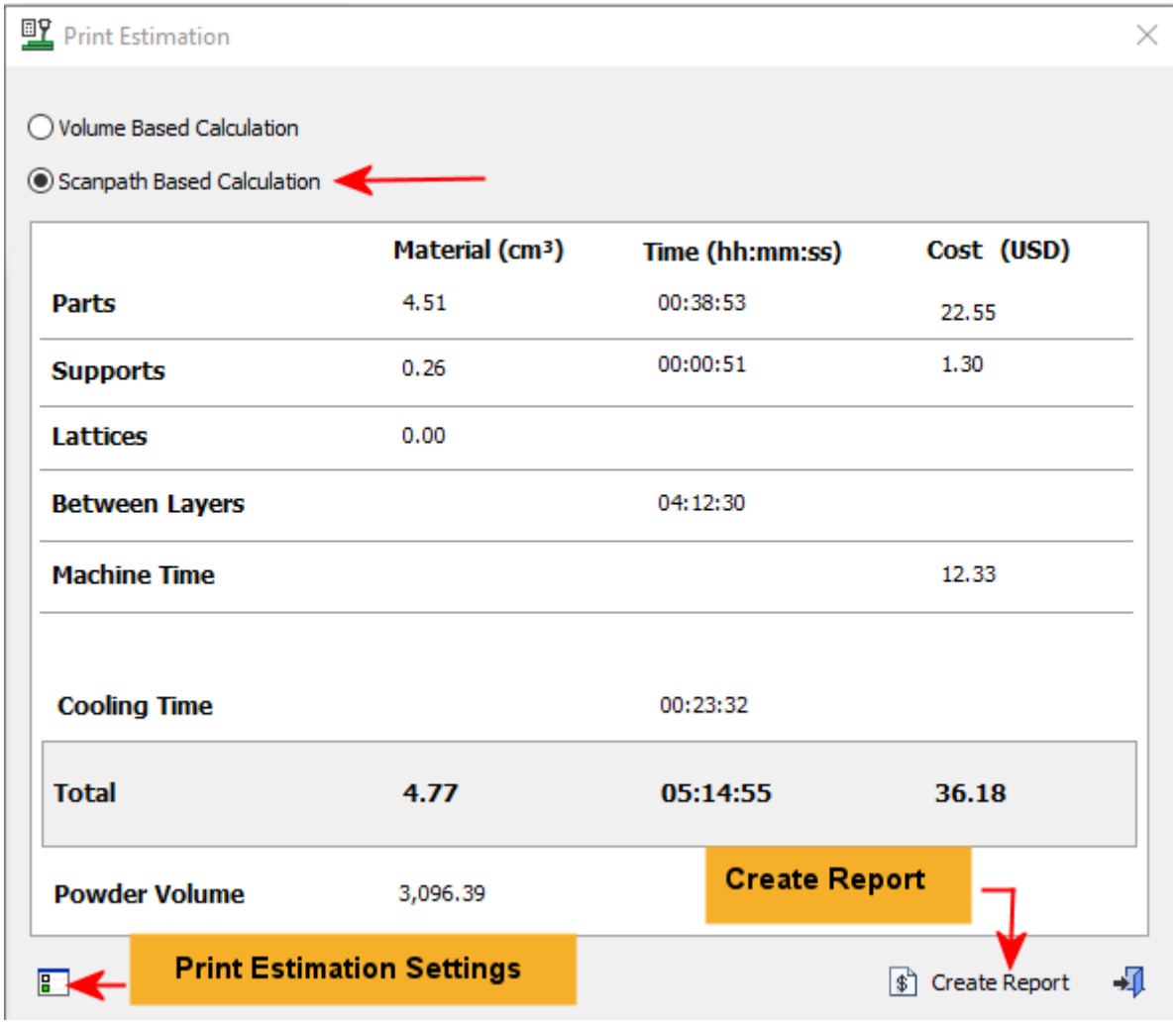
*As we did calculate slicing in this part, we can use the more accurate **Scanpath Based Calculation**.*

Material:	Ti6Al4VGrade5_Bv4
	Material (cm^3)
Parts	4.51
Supports	0.29
Lattices	0.00
Total	4.80

As we did **calculate slicing** in this part, we can use the more accurate **Scanpath Based Calculation**.

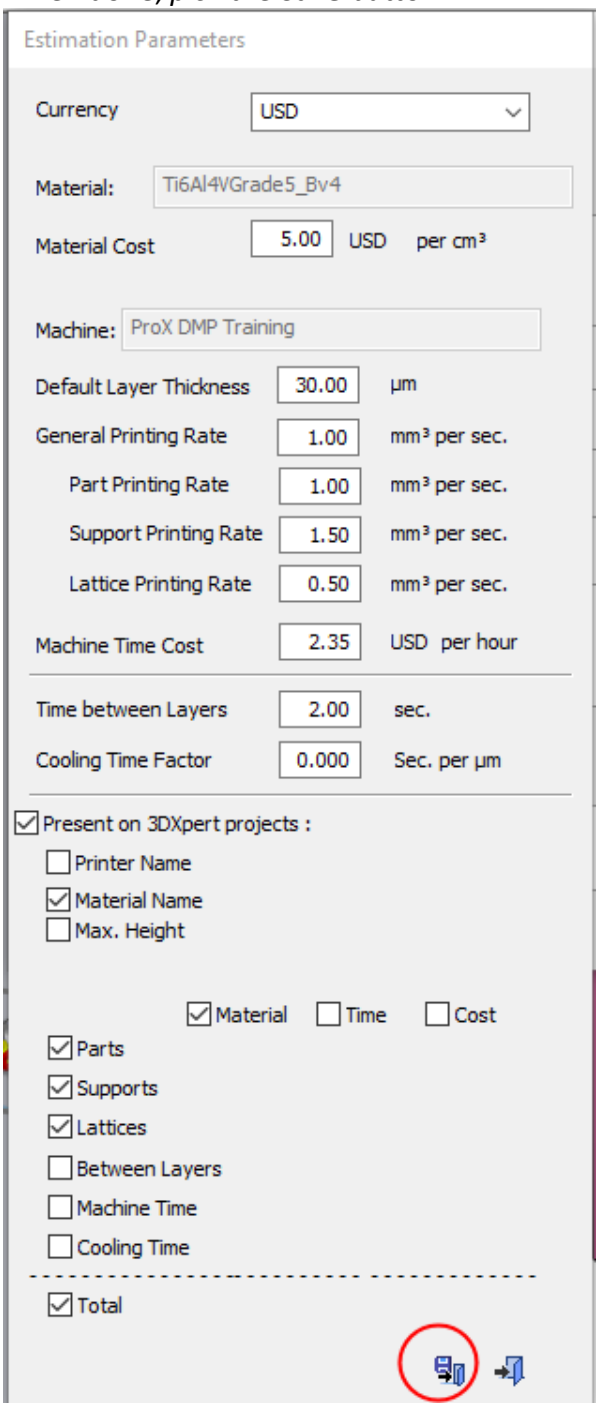
Print Estimation

60. *Pick* **Print Estimation**  . The option '**Scanpath Based Calculation**' is selected.

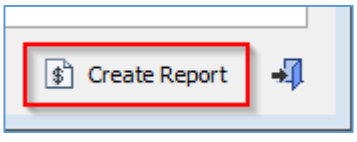


61. *Click* the **Print Estimation Settings** to add the currency, material cost per unit volume and cost of machine time per volume unit.

    You can set also the **Time Between Layers** (this is usually the time needed for each powder recoating cycle).
    When done, *pick* the **Save** button.



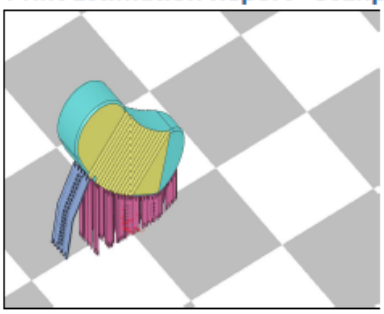
62. *Pick* Create Report. Use the default Excel template and click OK.



Sample **Print Estimation Report**:

3DXpert™

Print Estimation Report - Scanpath Based Estimation - 3DP_Project0



Printer Name:	ProX DMP Training
Material Name:	Ti6Al4VGrade5_Bv4
Project name:	3DP_Project0

Material (cm³)	
Part Material:	4.51
Support Material:	0.26
Lattice Material:	0.00
Lattice Material:	**4.77**

Time (hh:mm:ss)	
Part Time:	00:38:53
Support Time:	00:00:51
Lattice Time:	
Between Layers Time:	04:12:30
Cooling Time:	00:23:32
Total Time:	**05:14:55**

Cost (USD)	
Part Cost:	22.54
Support Cost:	1.29
Lattice Cost:	
Machine Time Cost:	12.33
Total Cost:	**36.17**

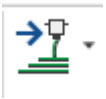
Sizes	
Total Build Height (mm):	40.94
Tray X (mm):	275.00
Tray Y (mm):	275.00
Tray Z (mm):	420.00
Powder Layer Height (µm):	0.00
Powder Volume (cm³):	3096.39

General Parameters	
Currency:	USD
Material Cost per cm³:	5.00
Layer Thickness:	30.00
Recoating Time (sec.):	2.00
Machine Time Cost per hour (USD):	2.35

63. Exit the Print Estimation dialog.

Send to Print

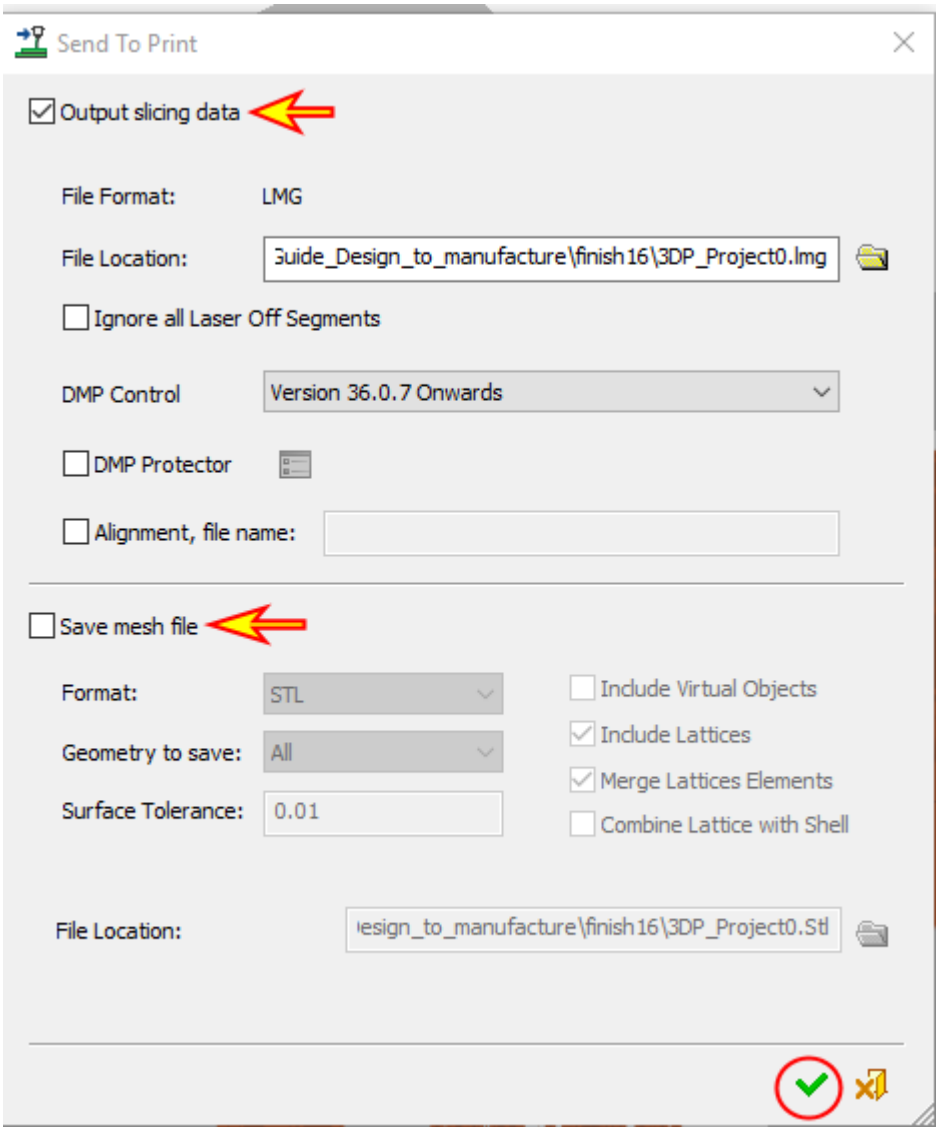
64. To create the file that will go to the printer, press **Send to Print** .



The format of the file depends on the printer. This training printer outputs to the LMG format.

With the **Send to Print** you can also **export** the geometry (model and supports) as **mesh**.

65. *Pick* the **OK** button to create the file(s).



Pick the **Save** button (located at the Quick Access Toolbar) to save the project on your PC.

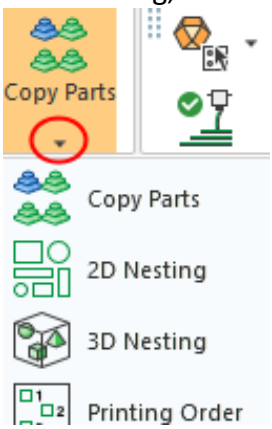
In the Browser, set the folder to save the files, enter the name for the project and approve.
It is also possible and recommended to use the <CTRL>+<S> shortcut to save the project from time to time during work.

You have prepared the part for printing and sent it to the printer.

The **next section** discusses working with **multiple parts**.

C. Printing Multiple Parts

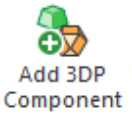
You can **add additional parts to the tray** (Add 3DP Component), and/or put them in an array (Copy Array), and/or arrange them with Nesting, slice and send them to print.



However, this Quick Guide is a short guide to 3DXpert's envelope and as such, we will show here how to work with the **Operator environment**.

Loading Multiple parts: Add 3DP Component vs. Operator:

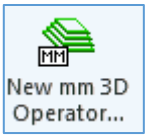
3DXpert has two environments.



*The first environment is the **3D Printing environment**.*

It is designated for the part preparation, support design and slicing of the part. You can also send the part to the printer. You can also add more parts on the tray, arrange them on the tray, slice and send to print.

*The second environment is the **Operator environment**.*



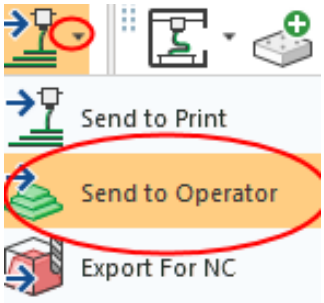
It is designated for tray arrangement of prepared and sliced parts and sending the entire build platform to the printer.

The Operator environment is a friendly environment that can be used as an on-machine environment. Parts that were sliced in the 3DP environment can be arranged on the tray and sent to the printer.

Send to Operator

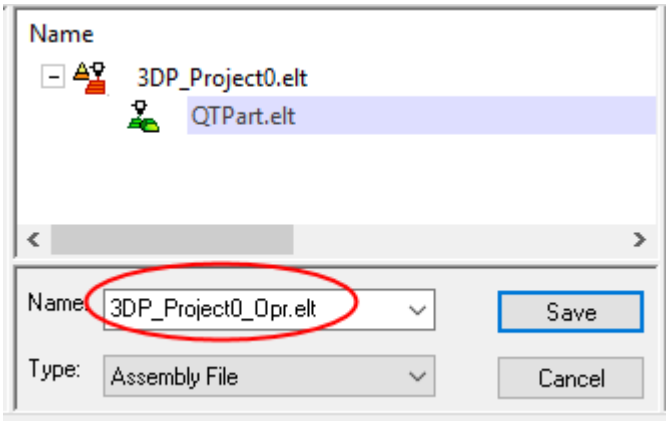
Once you have a sliced part, you can invoke the **New 3D Operator Project** and load the part on the tray.

66. However, if the 3D Printing project you are working on is open, select '**Send to Operator**' from the toolbar.



67. The system asks you to **Save** the work (**Printing project**) if needed before continuing, press Yes.
68. As the Browser opens up, enter the **name for the New Operator project**.

    Note that the **suggested name** for the new Operator project is the name of the **Printing_project + Opr**.



The Operator Toolbar:

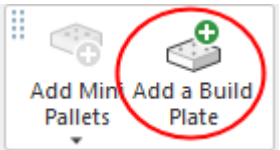
The Operator environment includes the tools to load different Sliced parts on the tray, position them, set their printing order and send to print.

Notice that in the Operator environment, the toolbar showing on the top is different from the one we saw in the regular 3D Printing environment.

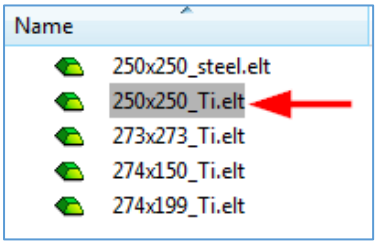
This environment does not contain the various CAD and preprinting preparation tools.

Only sliced parts – part files that were saved in 3DXpert after a slicing calculation has been performed – can be loaded on the Operator.

Since slicing is calculated, the part can be **moved only in the X and Y** direction since the Gas flow and Recoater movements have already been taken into consideration. When rotating the part or Z shifting, the slicing needs to be recalculated.

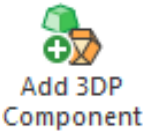
69. *Pick* **Add a build Plate** 

70. Select the plate to use via the browser.



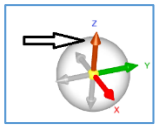
If the tray already has a build plate on it, the one that was added from the Operator environment will take over.

In this exercise, we will send to print multiple instances of the same part.

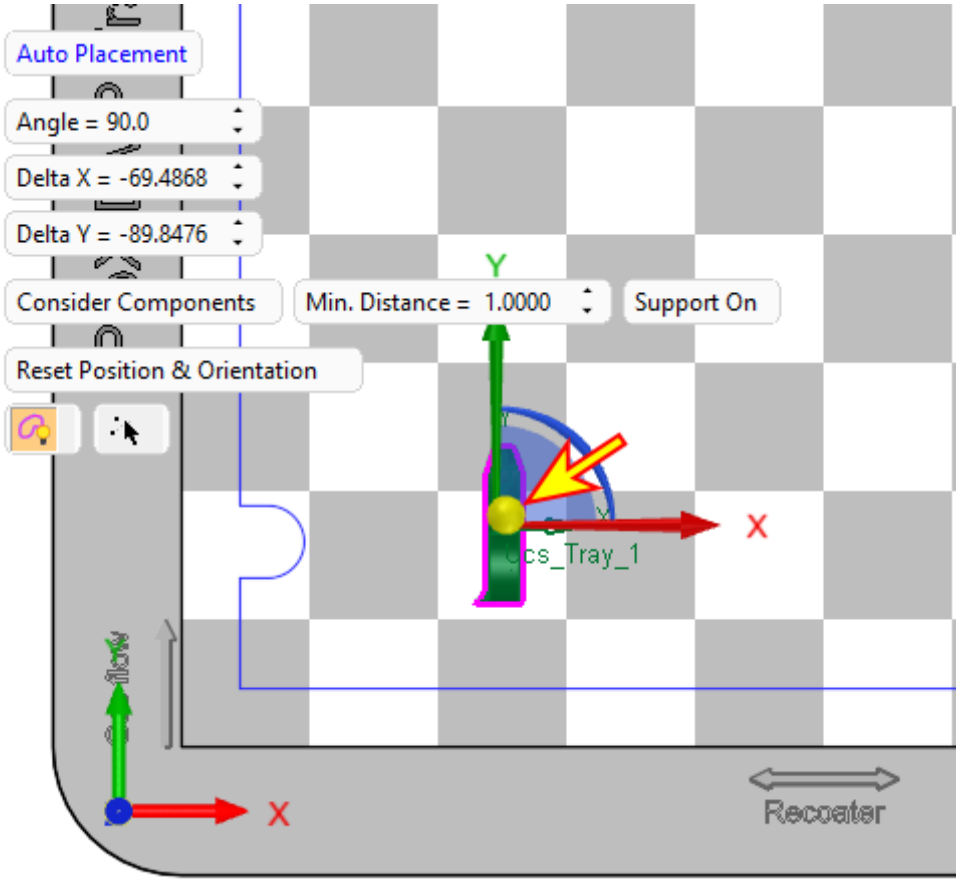
If you wish to add another different sliced part, *pick* 

.

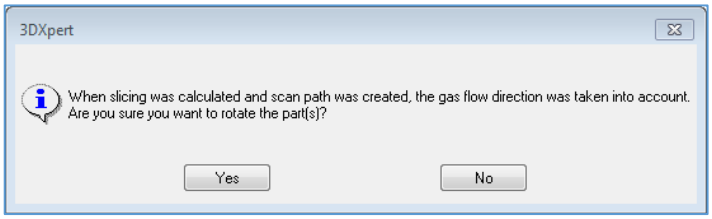
71. *Pick* 

and then pick the Z axis of the dynamic UCS 
to view the tray from above.

72. Position the part by dragging it to the lower left area, (approx. like the picture).



Note that when **Consider Components** is active, the part cannot be pushed outside the build plate borders.
If **Ignore Components** is active instead, the part can move anywhere.



Rotating a part should be carefully considered, as when the slicing was originally calculated and the scanpath created, the gas flow direction has been taken into account.
The rotation anchor point is highlighted in purple on the rotation circle.
Position Part allows rotating the part.
However, when rotating the part, a message will appear to confirm rotation (because slicing takes the gas flow into account)

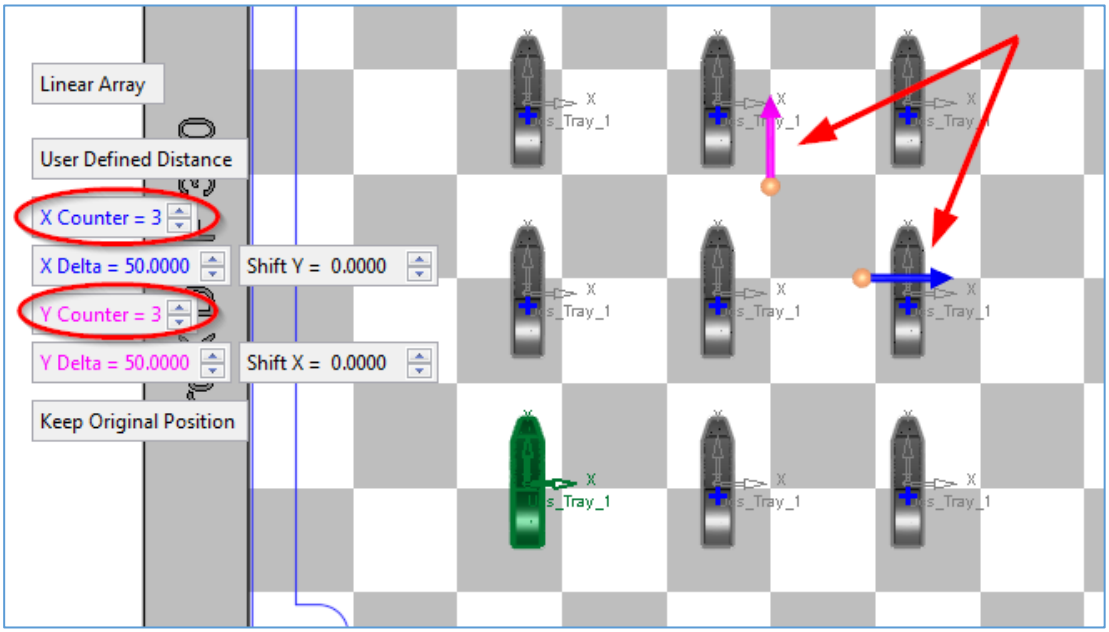
73. Right mouse *click* and *pick* OK.

Copy Parts

74. *Pick* 

and pick the part. Exit (the middle mouse button) to move to the next step.

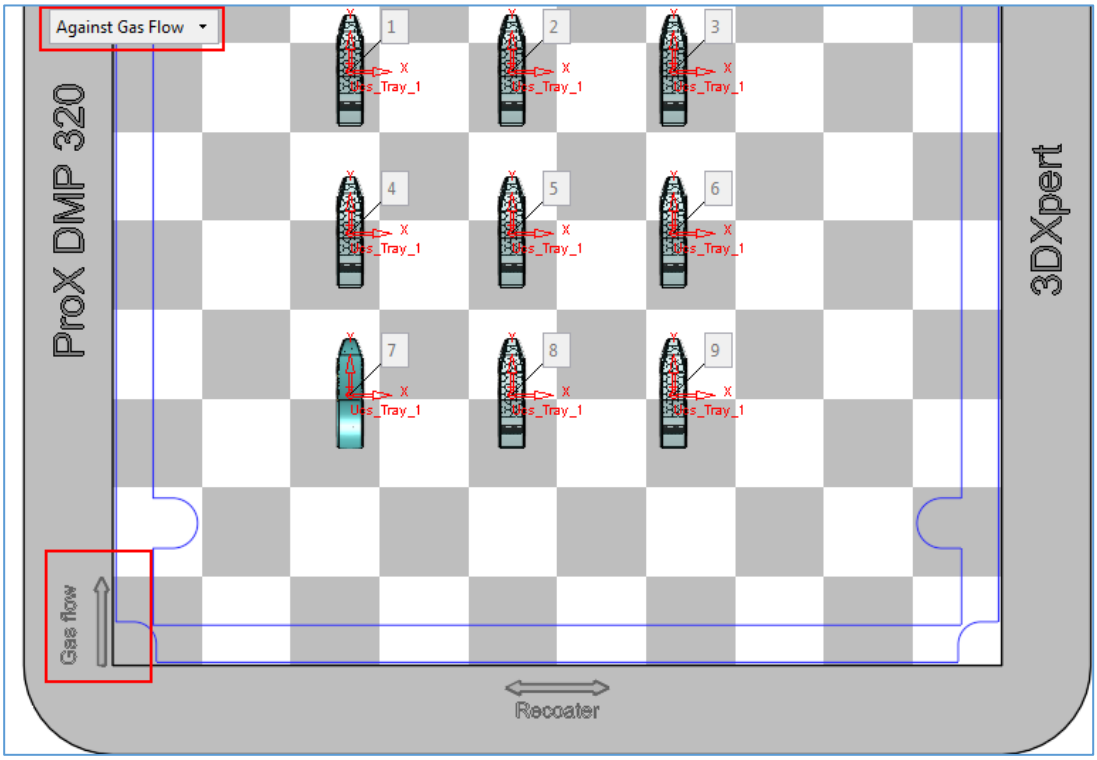
Make sure that the direction arrow points so that the part will be added around the middle of the plate and set an array of 3x3:



75. Right mouse click and *pick* OK.

76. *Pick*  and set the order for printing.

The image below refers to order by **Against Gas Flow** (Gas flow direction here is from bottom to top).



77. Right mouse *click* and *pick* OK.

Appendix 1: 3DXpert file icons

As files are created and saved with 3DXpert, they all get the extension *.elt.

However, *.elt files can still have different types, depending on the specific 3DXpert application saving them. These types are represented by different icons which are attached to the file.

The following table describes the meaning of each icon.

The 3DP column describes whether the icons are set (during the save operation) by a dedicated 3D Printing application (y means 'Yes').

Icon	3DP	3DXpert *.elt File Type
		A part file created in 3DXpert or imported into 3DXpert
		The main assembly file created in 3DXpert or imported into 3DXpert*
	y	The main assembly file of a 3D Printing project
	y	The Tray part (this file contains the Build Plate)
	y	A part which has been added into a 3D Printing project
	y	The main assembly file of an Operator project
	y	A sliced part which has been loaded on the Operator

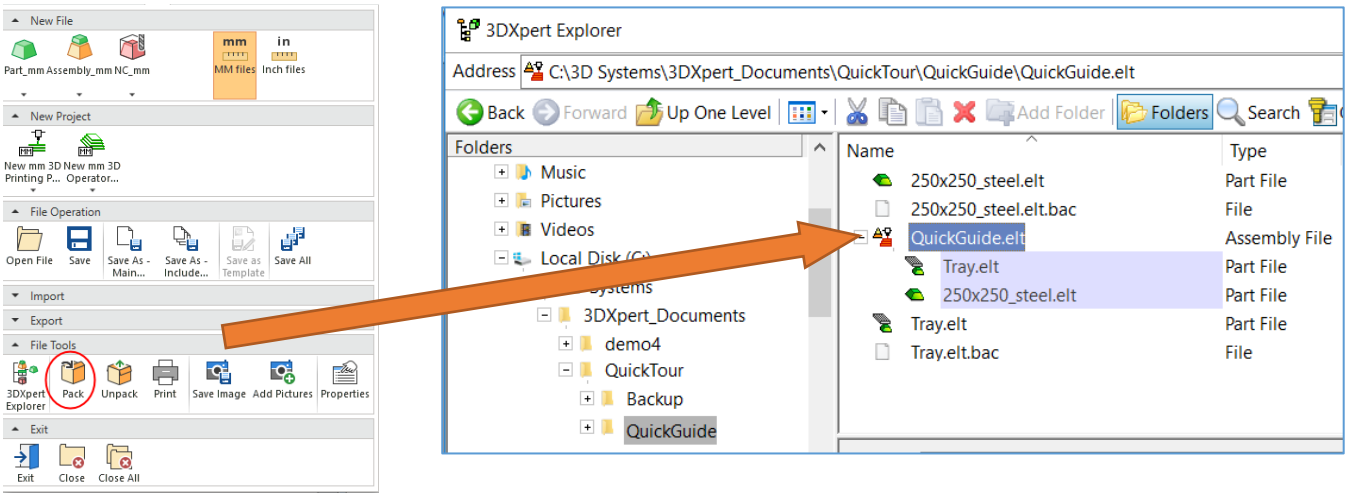
		A packed file (see Appendix 2).

* The main assembly file is always associated with its part files or sub assembly files.

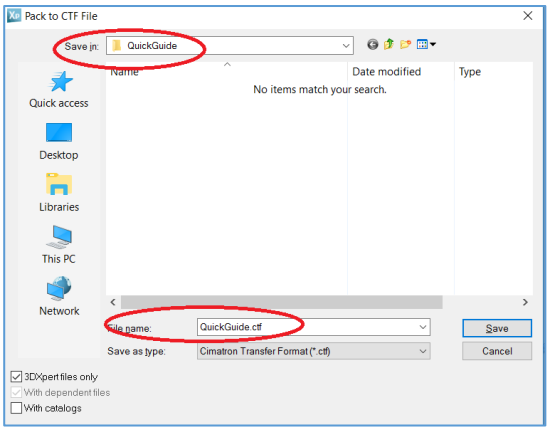
Appendix 2: Packing Files

Once you have a 3DXpert project saved on your PC, you may wish to back it up or send it to another user.
An easy way to do this is using **Pack/Unpack**.

Pack creates a **single file** that includes the 3DXpert elt files which are included with the project.
A packed file has the extension *.ctf.
From the menu, select **Pack** and as the browser opens up, pick the main project file (the assembly file).



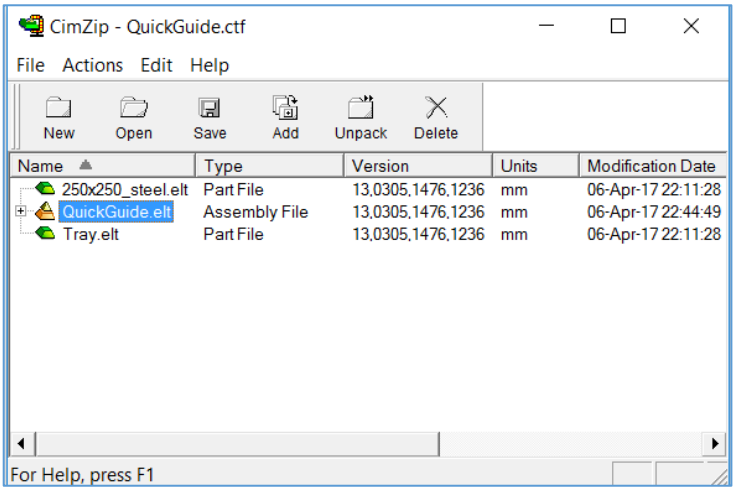
Next, set the **name and location** for the ctf file. *Pick* Save.



To open a packed file either use **Unpack** or **double click the ctf** (on a PC where 3DXpert is installed).

Pick the file to **unpack** (extract) from the ctf.
Picking of the main project file is enough.

Note that it is possible to pack a folder with all files or add non-elt files to a ctf file.



End of Quick Guide.