3DXPERT-DENTAL EXERCISE

3DXpert 15

Tutorial_V1 - Updated: 15,0201,1774,804(SP2P1)

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Introduction

The 3DXpert Dental Package is a new addition to the 3DXpert solution portfolio. This package offers an optimized suite for the preparation and printing of metal dental workframes in a production environment. The new Dental package is fully compatible with the Digital Dentistry process, by enabling a complete **automatic workflow** for easy and fast preparation and printing of dental frameworks.

The 3DXpert Dental Package offers a simple and easy to use platform to select multiple dental models and, with a single operation, have them all placed, oriented and nested on the build plate with the best fit support structure ready to be sliced and printed.

Part 1 – Dental Automatic Workflow.

The automatic Dental workflow includes the following phases: Part Classification, Part Orientation (Face-up), Detachable label tags, Nesting and Supports generation, all based on predefine settings. The dental automatic workflow also enables assigning a specific support structure type per a specific dental part classification type (Crown, Bridge, RPD, etc.).

Note:
The automatic workflow for dental is applied only when a project is defined with a dental printer type. A new checkbox setting was added to the “Edit Printers and Materials Parameters” dialog; when the checkbox is ON the printer is defined as Dental.

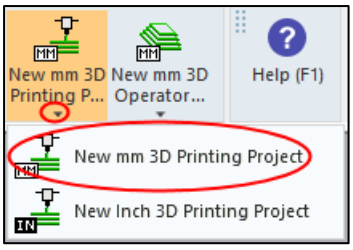
3DXpert also supports 3D Systems metal dental printers: DMP Dental 100 and the ProX DMP 200 Dental and the LaserForm CoCr type (C) certified material.

A typical dental prepare and print process includes the following steps:

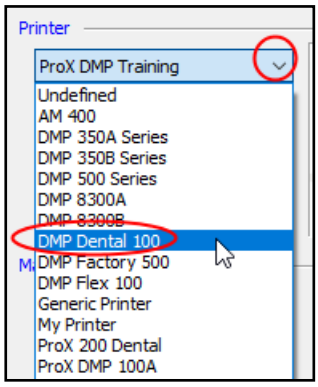
- Define/Set a Dental Printer
- Define the required Dental settings (if needed) – Dental Setting tool is available only when the Printer is define as dental
- Select the parts to be printed and run the automatic workflow
- Slice
- Send to print

Part 2 Define a Dental Printer

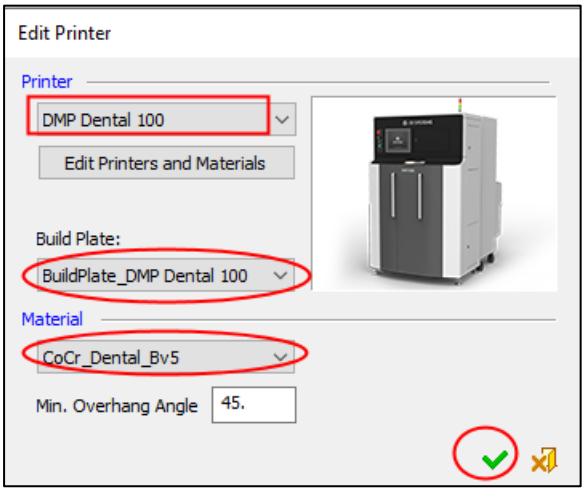
1. Let's open a new 3DPrinting project. From the menu bar, press the 'New 3DPrinting Project' button.



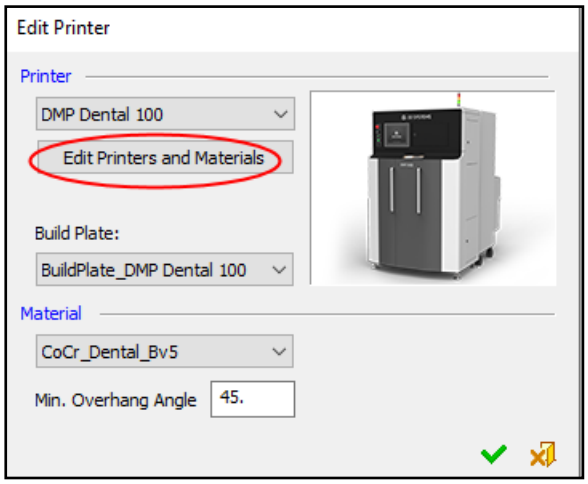
2. Through the Guide Bar, click '**Edit Printer**' and define the printer you are going to work with. From the list of available printers, select '**DMP Dental 100**'.



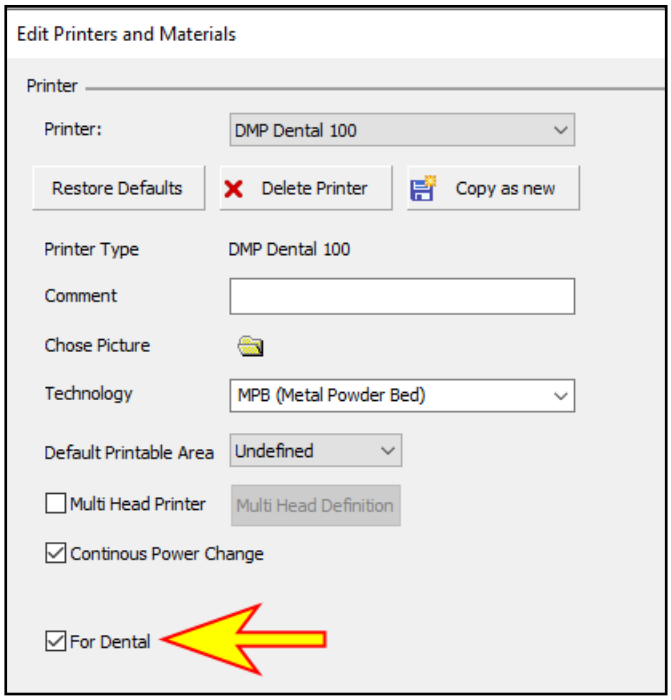
3. Select a **Build Plate** and define the material. Select **OK**.



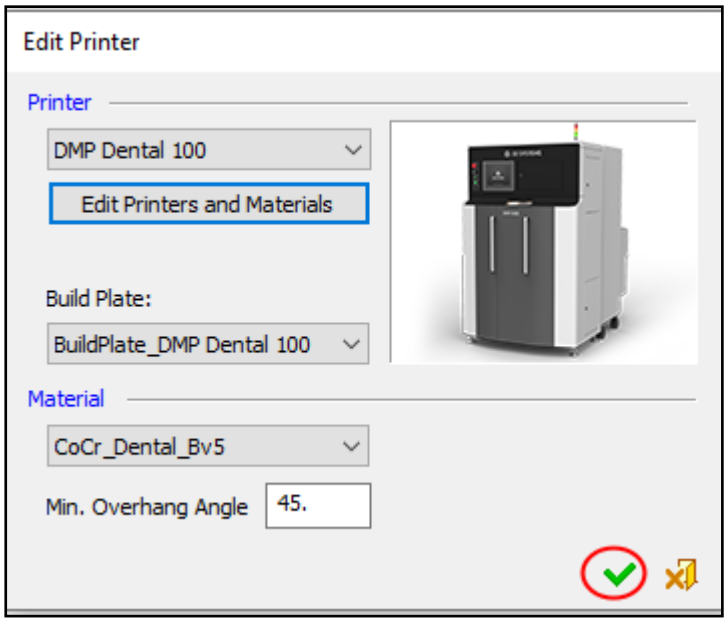
4. Click **Edit Printer Parameters** to enter the **Edit Printers and Materials** dialog. (You may also access the dialog directly from the 3D Printing Guide Toolbar).



Notice the 'For Dental' checkbox in the dialog (image below).
When this checkbox is ON, the printer is defined as a Dental printer.
When a Dental printer type is selected, this enables the Automatic Dental Workflow to be applied, for the preparation and printing of Dental models.



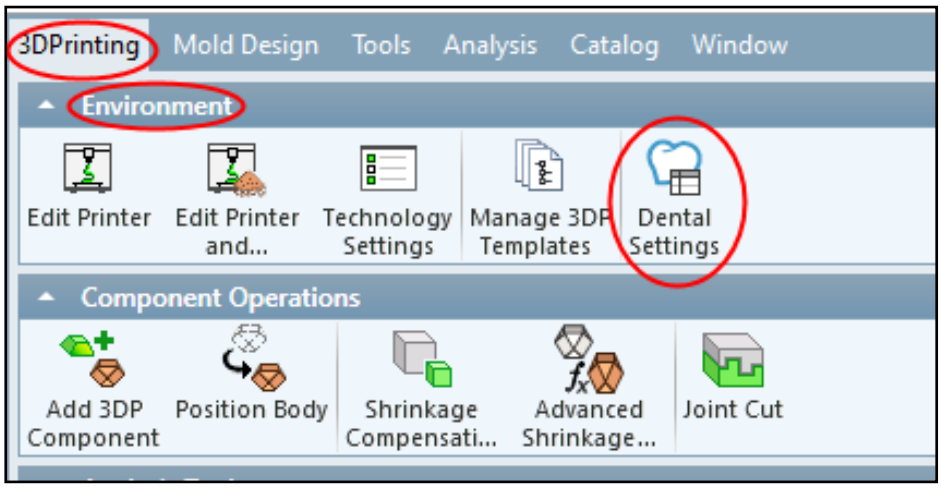
5. Exit the dialog and select **OK**.



Part 3 Dental Setting

Before adding the parts, let's define the Dental Setting parameters that will be used in the automatic workflow.

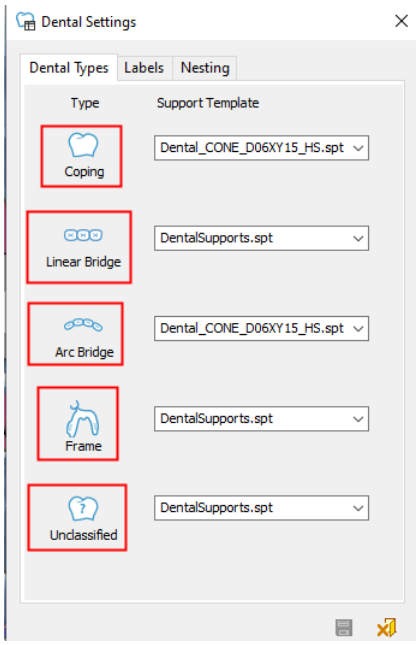
6. Invoke the **Dental Settings** option through the **3DPrinting / Environment** menu.

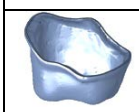
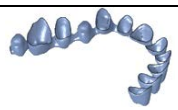


Dental Part Classification.

The first stage of the Automatic flow is the Dental Part Classification.

The automatic dental part classification recognizes the following dental types:

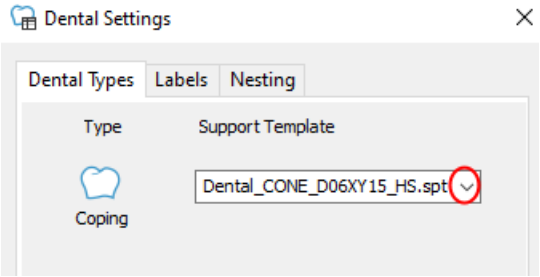


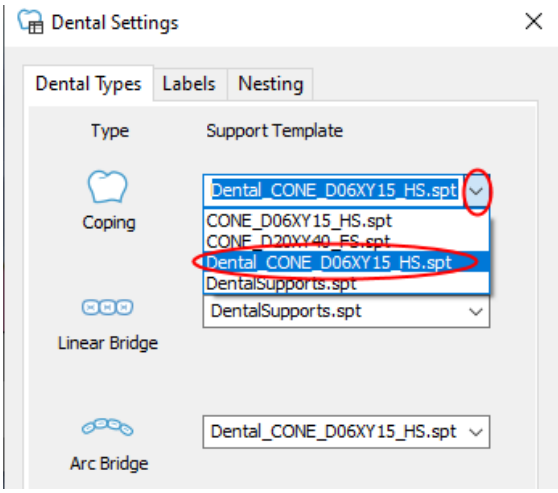
Coping/Crown	Linear Bridge	Arc Bridge
		

Frame/RPD	Unclassified	

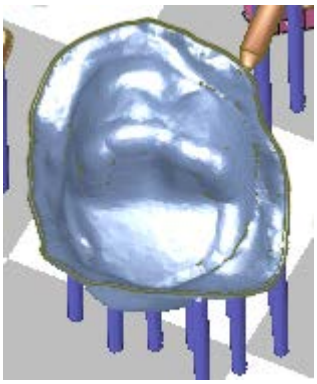
You may select and assign a support template for each dental type.

7. Click the 'Support Template' dropdown button. The dropdown list displays the templates and available for the current printer and material. The Template list is taken from the current Printer/material folder.





The relevant support will be applied to the relevant type:



The **Dental Settings** are saved per printer and material in the file **Dental.3DScript**, under the folder:
...\ProgramData\3D Systems\3DXpert\15.0\Data\3D_Printing\Technology_Folder\<Printer_Name>\<Material_name>\AutomationScripts

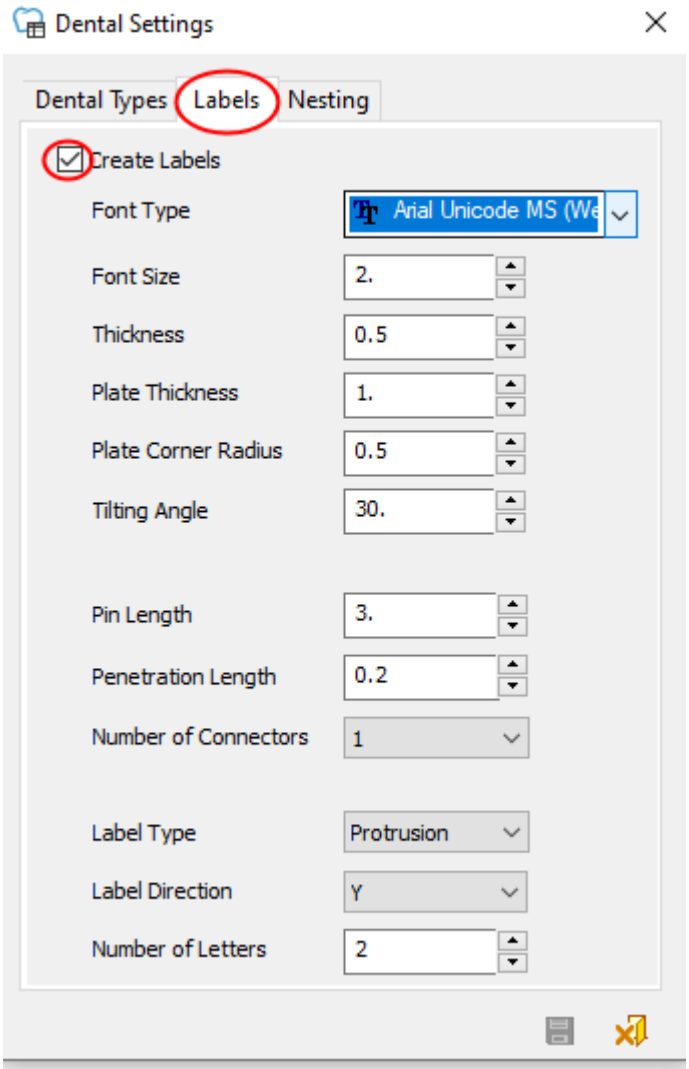
If the support template(s) are displayed in **RED**, this means that the support templates and/or the Dental.3dScript file do not exist in the material's folder.

Detachable Labels

The detachable labels are automatically created as part of the dental workflow.

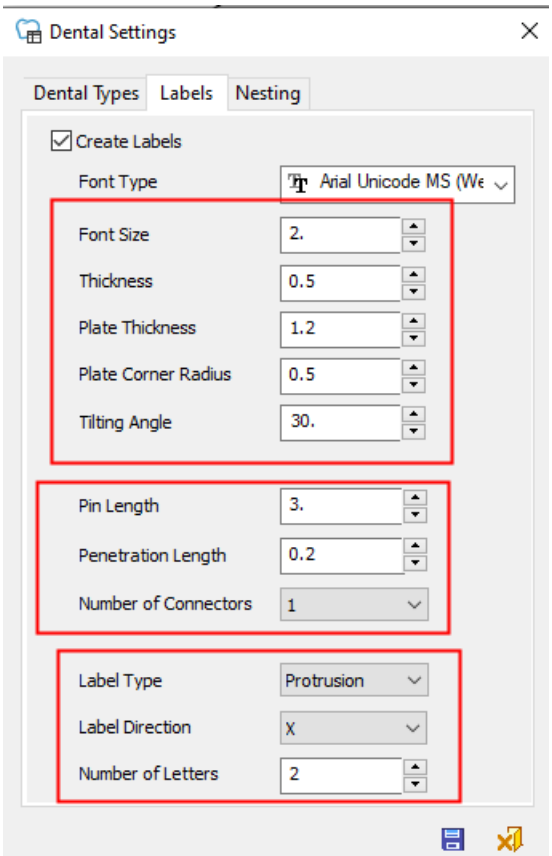
8. Set the label parameters for the automatic creation and attachment of detachable label tags.
9. Check the Create Labels checkbox to activate the parameters.

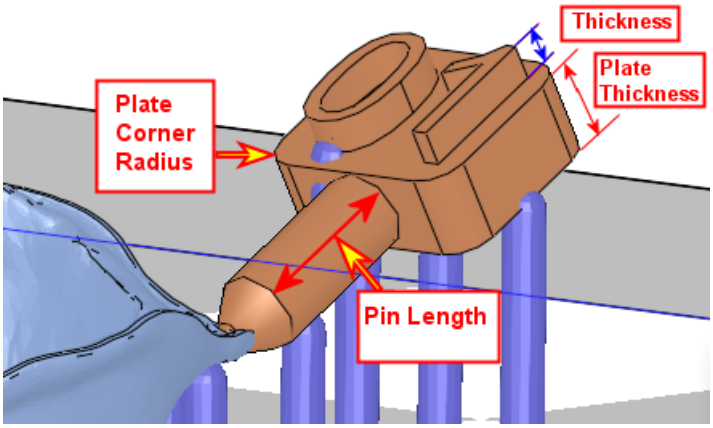
This option enables to create automatic detachable label tags per every dental model that is imported, as part of the dental workflow.



By default, each attached label is assigned with a running index number. You can control the detachable tag direction and, based on that, the connection point. The Label tags are always created perpendicular to the connector and are included in the nesting and support generation.

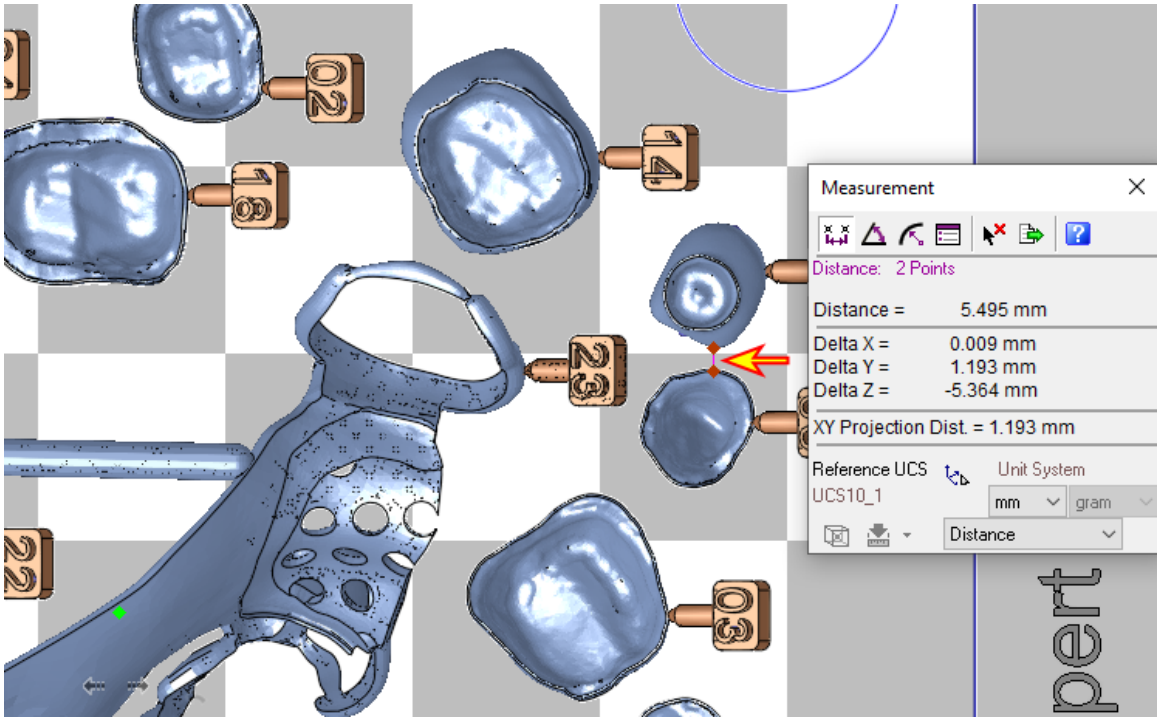
10. Set the parameters as follows:





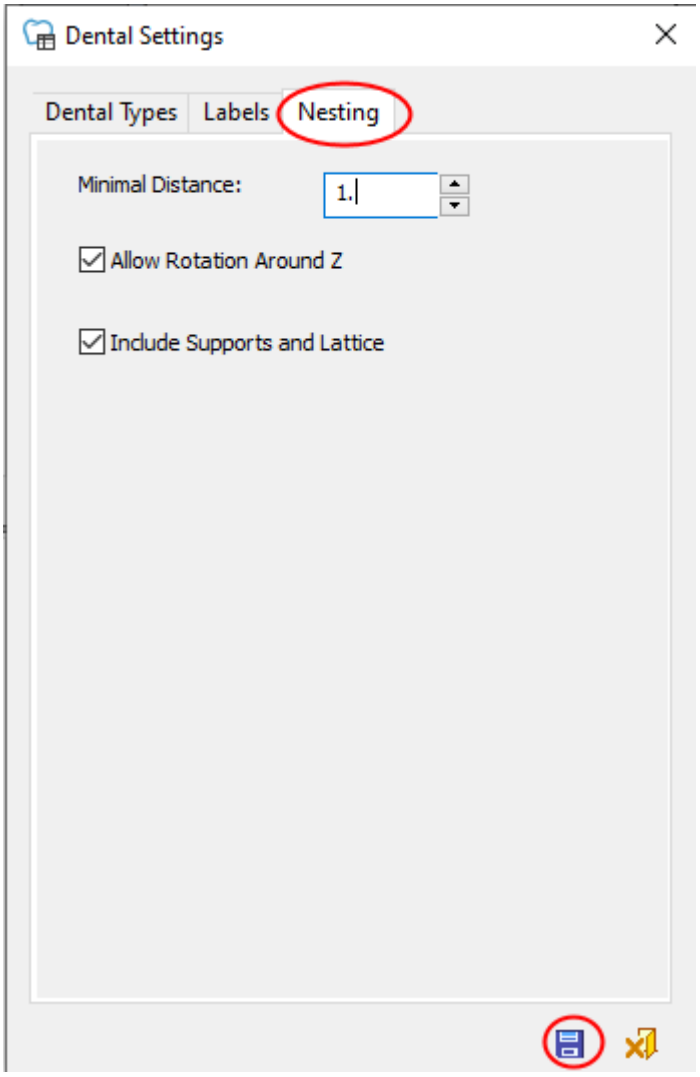
11. In the same dialog, click the Nesting tab to set the parameters for the automatic nesting as part of the dental workflow. This maximizes the number of parts that can be placed in the 2D space of the tray.

12. Set the minimum distance between objects, when multiple objects are placed on the printing tray. Set the **Minimal Distance** between the nested parts to **1**.



This uses the functionality of the 2D Nesting function in the dental workflow.

13. Save the modified Dental Setting and close the dialog.



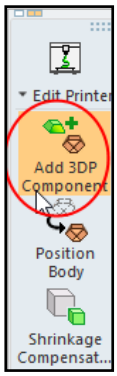
Part 4 Select the Parts to be Printed

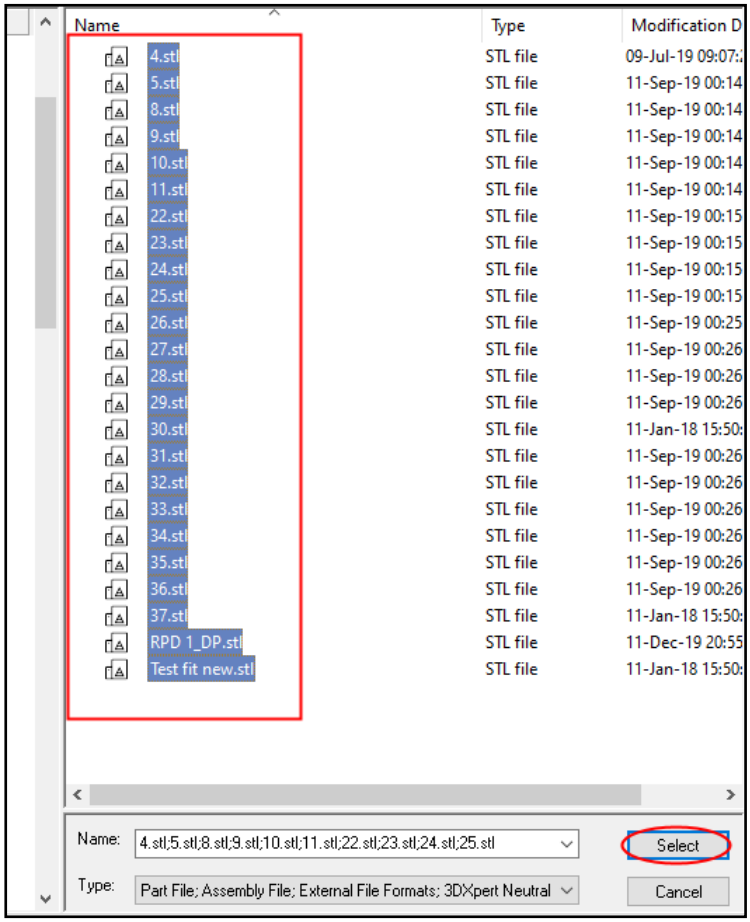
14. Add the parts to be printed.

    Select **Add 3DP Components**. Select the parts to be printed (Add 3DP Component).
    The STL format is the common format for Dental model files.
    STL format files can also be selected, and automatically converted to 3DXpert files.

15. Select the *.STL files under the **Dental\Start** directory.

    Note, that the selection of ELT files as input data is also possible, but these file types will be imported as-is, without applying orientation and supports.





This starts the **Automatic Dental Workflow** operations.

The Automation Process

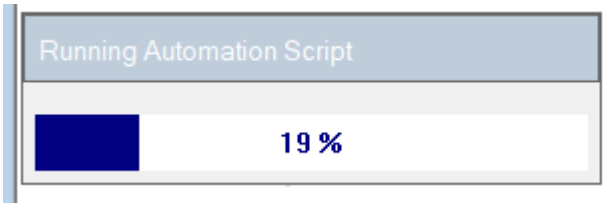
As mentioned before, the **Automatic Dental Workflow** performs the following operations **automatically**, based on predefined Dental Settings:

The Dental Part Classification (Coping, Crown, Bridge, Removable Partial Dentures (RPD), etc.) is the first stage and the classification results also define the dental part orientation and the assignment of supports.

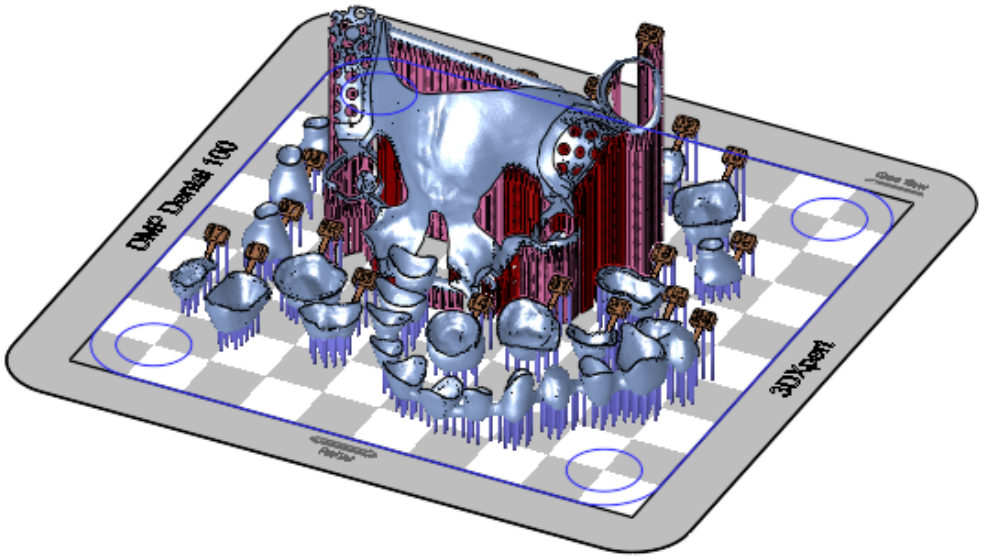
Following the Part Classification stage, the system automatically defines the 'Part Orientation' (Face-up), creates 'Detachable label tags', applies the 'Nesting' and generates the 'Regions' and 'Supports', all based on predefined settings.

A progress bar is displayed to enable you to monitor the current stage of the process.

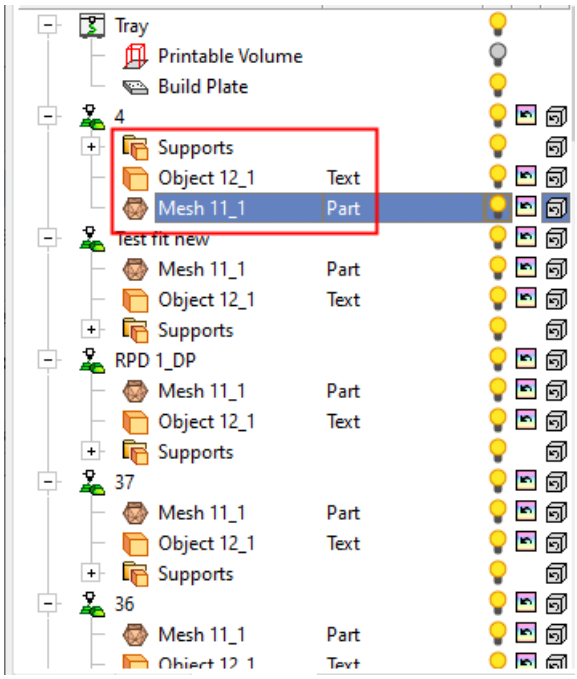
The Automation Script is dictated by the parameter settings, as saved in the **Dental Settings** function.



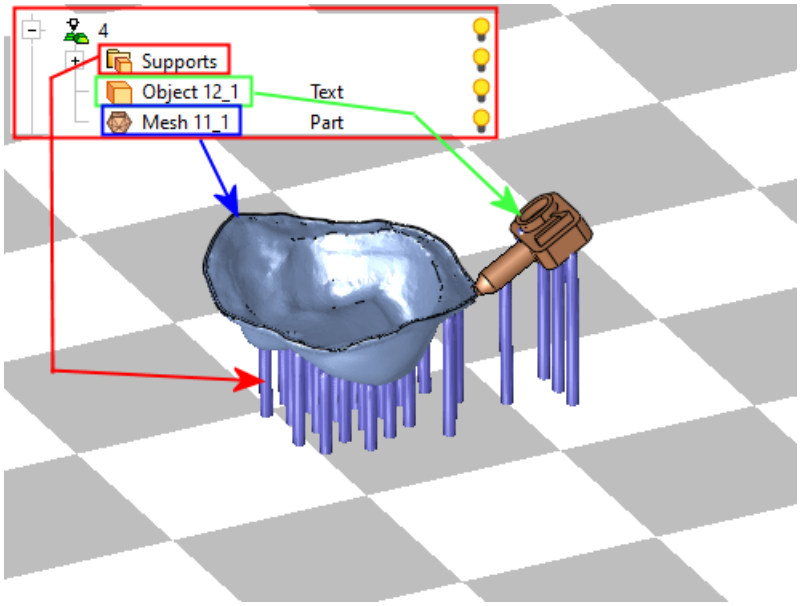
Once this is over, the Dental project is loaded.



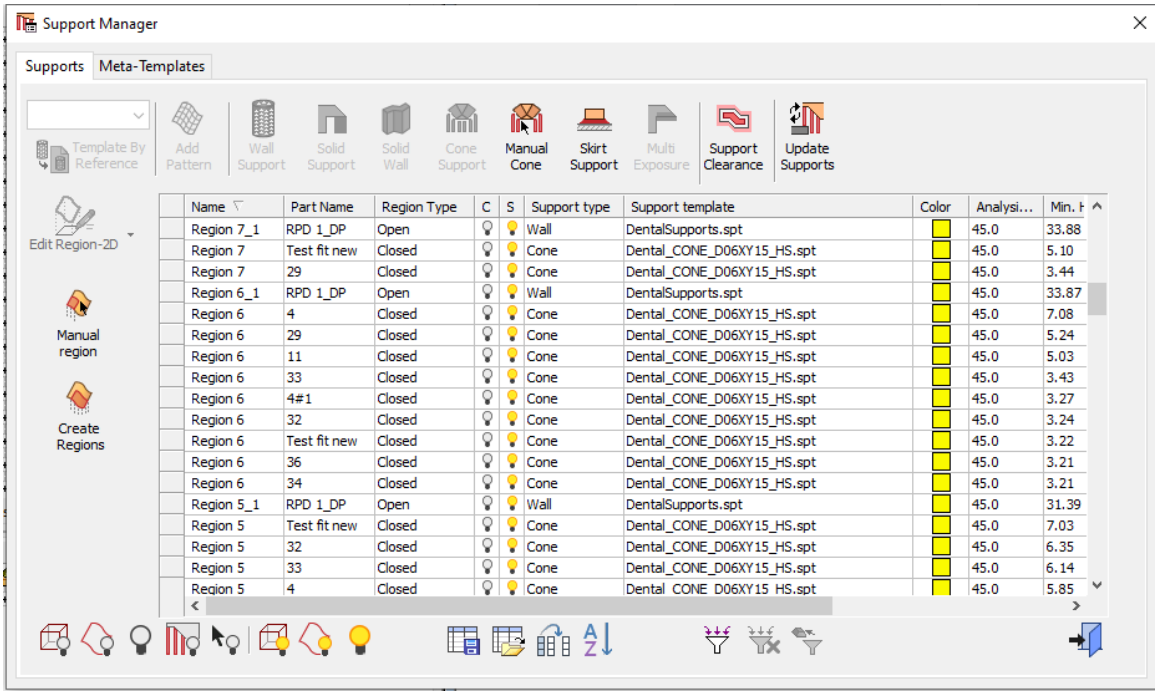
Note that each stl file turned into a separate elt file. The elt contains the mesh object, detachable label and relevant supports as defined in the Dental Settings dialog.



16. Each part file composed of three components:
    - Supports
    - Detachable Label
    - Mesh object (one of the classified dental types)



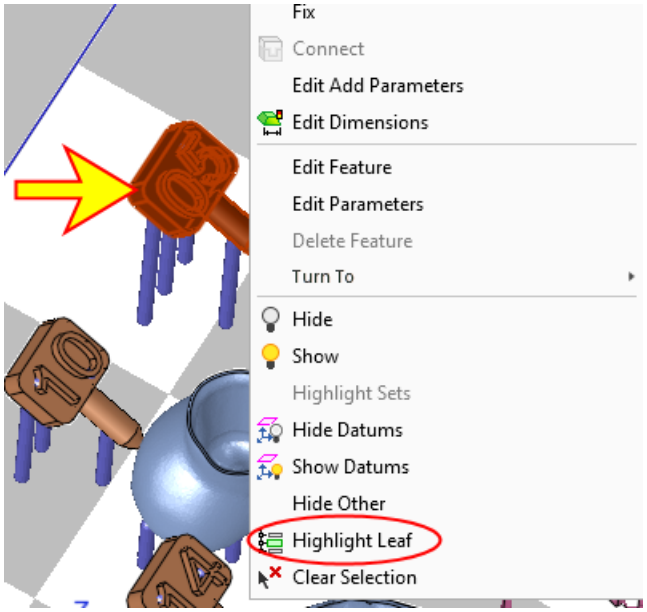
17. Enter the Support Manager to view the created regions and supports.



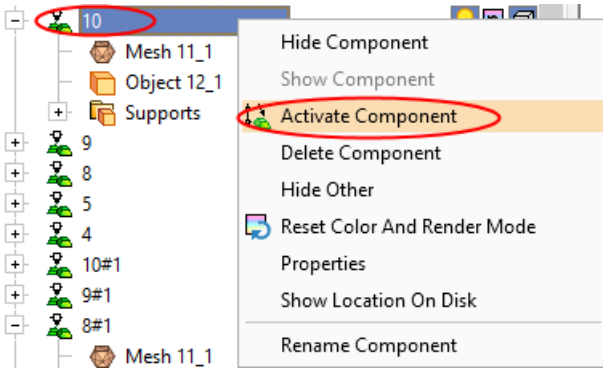
Name	Part Name	Region Type	C	S	Support type	Support template	Color	Analysi...	Min. H
Region 7_1	RPD 1_DP	Open			Wall	DentalSupports.spt		45.0	33.88
Region 7	Test fit new	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	5.10
Region 7	29	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.44
Region 6_1	RPD 1_DP	Open			Wall	DentalSupports.spt		45.0	33.87
Region 6	4	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	7.08
Region 6	29	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	5.24
Region 6	11	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	5.03
Region 6	33	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.43
Region 6	4#1	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.27
Region 6	32	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.24
Region 6	Test fit new	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.22
Region 6	36	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.21
Region 6	34	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	3.21
Region 5_1	RPD 1_DP	Open			Wall	DentalSupports.spt		45.0	31.39
Region 5	Test fit new	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	7.03
Region 5	32	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	6.35
Region 5	33	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	6.14
Region 5	4	Closed			Cone	Dental_CONE_D06XY15_HS.spt		45.0	5.85

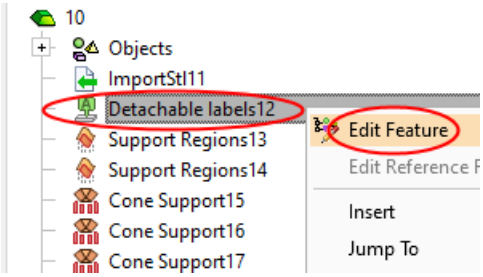
Part 5 Edit the Deatachable Lable Feature

18. Highlight one of the detachable labels, and select Highlight Leaf.

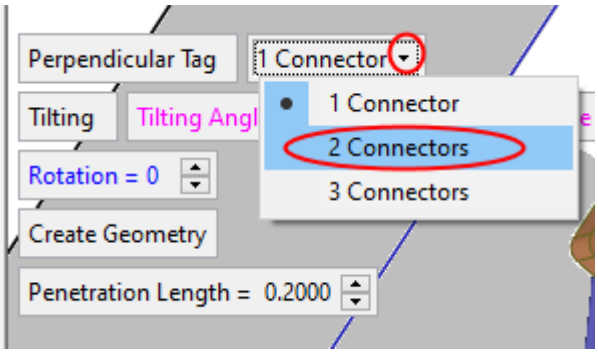


19. Activate the component, and edit the **Detachable Labels** feature.

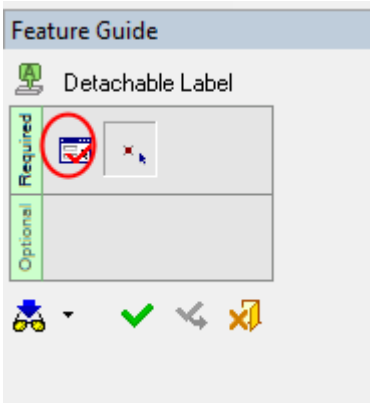


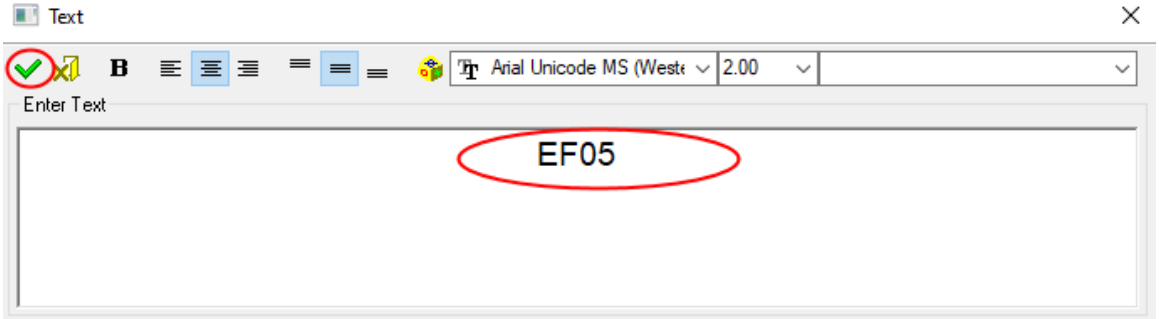


20. Add another connector to the label.

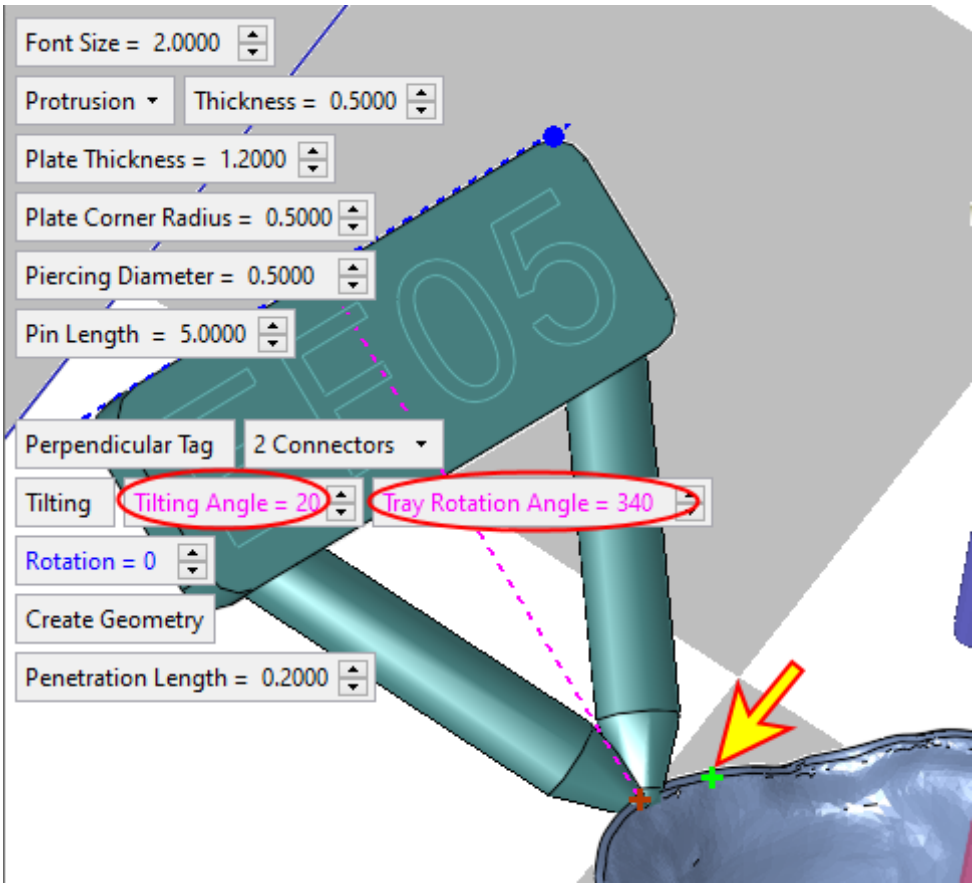


21. Edit the text and type: **EF05** in the dialog.

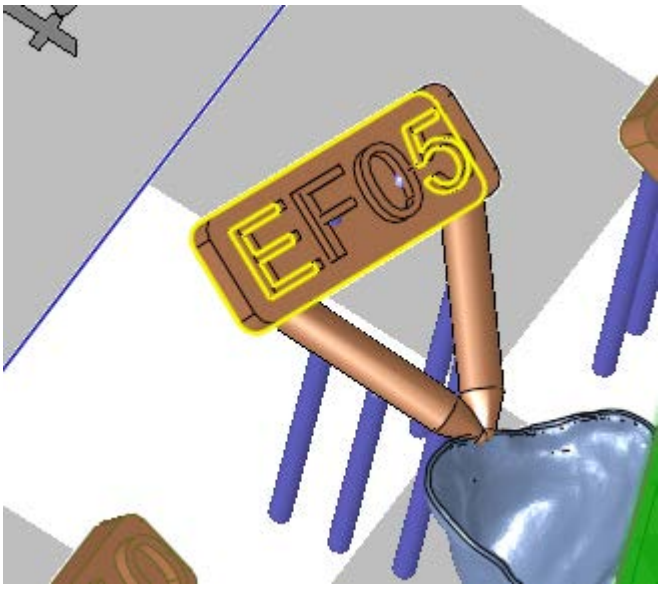




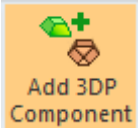
22. Apply a Tilting angle of 20, a rotation angle of 340 and reposition the connecting point as indicated by the arrow in the picture below.



23. Click **OK.**



Part 6 – Remove Overflow Parts

24. To demonstrate the **Remove Overflow Part**s, activate the main assembly and invoke the **Add 3DP Component** option. 

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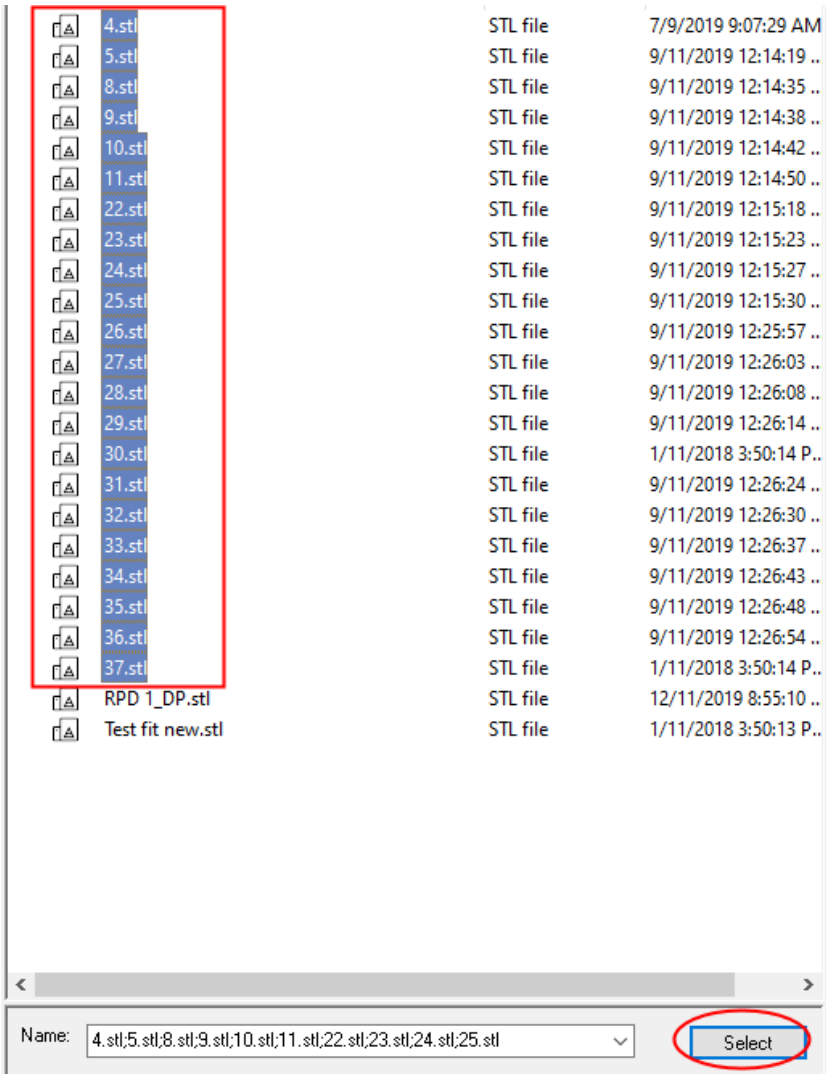
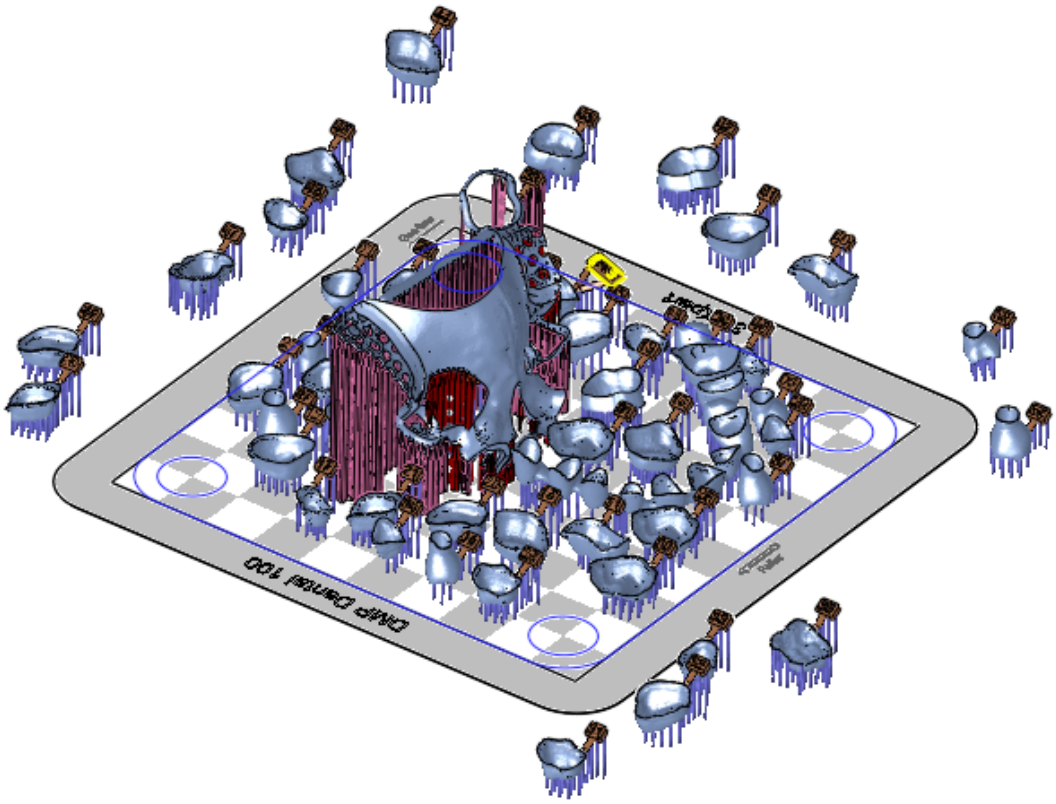
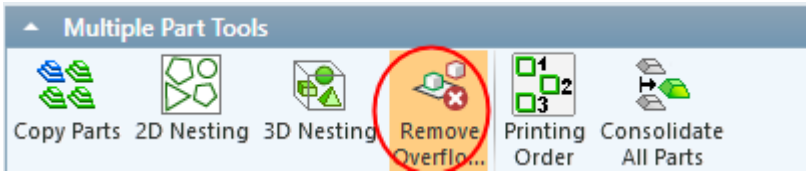
25. Again select a group of STL files from the exercise's Start folder.



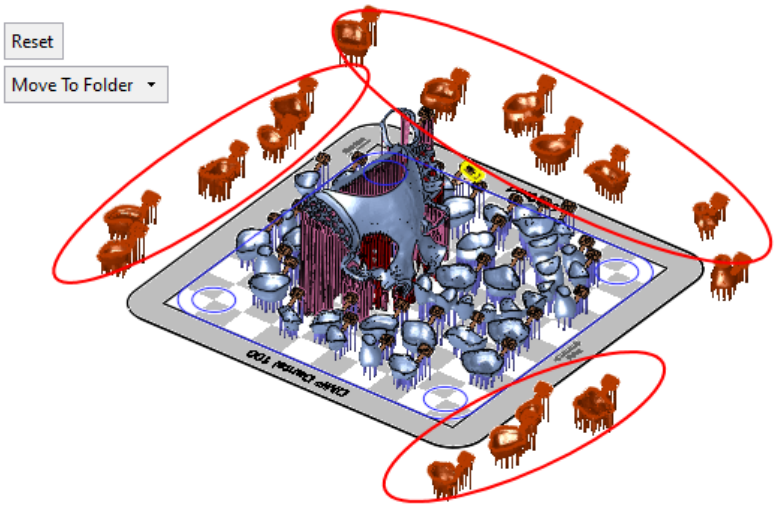
26. The new components were added to the tray. Some of the parts do not fit on the tray.



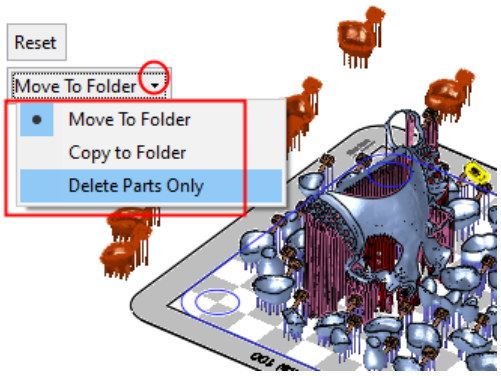
27. From the 3DPrinting menu, select the option: **Remove Overflow Parts**



28. Notice the parts, which do not fit the tray.
    The system automatically identifies and selects all the parts that are currently not fully contained in the printing borders of the displayed built plates. This includes Build Plate borders and Printable area definitions.



29. You may Move, Copy or Delete the highlighted parts:

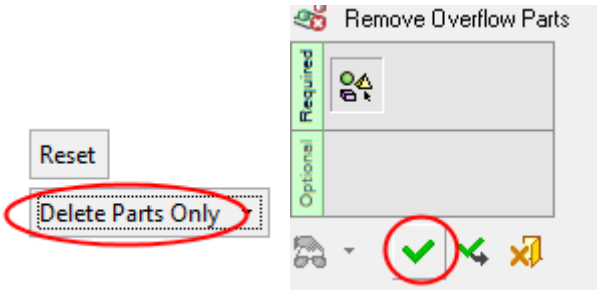


You may **Move** or **Copy** the selected parts to another folder, for reuse in a new plate (project).

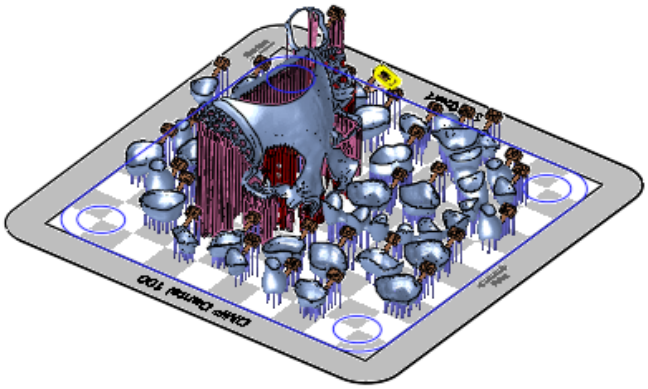
In this case, the target folder is automatically created under the folder where the project was saved and is named as follows:
Removed_Parts_<time stamp index>

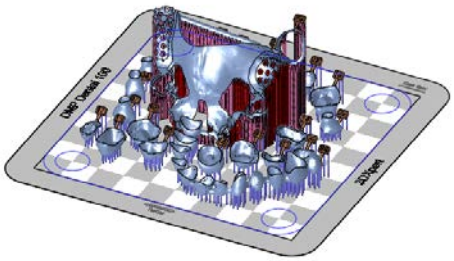
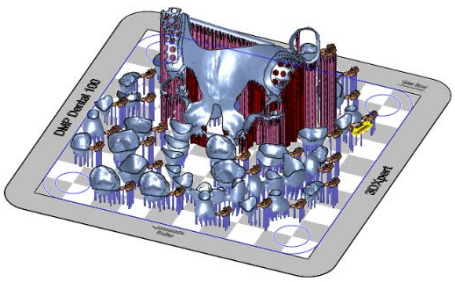
The Move/Copy operation will be activated once exiting the function with the **OK** or **Apply** commands.

30. Select the option **Delete Parts Only** to delete the selected parts and press **OK**.



31. The extra components were removed.

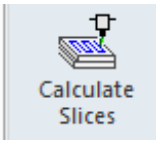


Before adding new parts:	32. After adding new parts (and remove '**Overflow Parts**'):
	

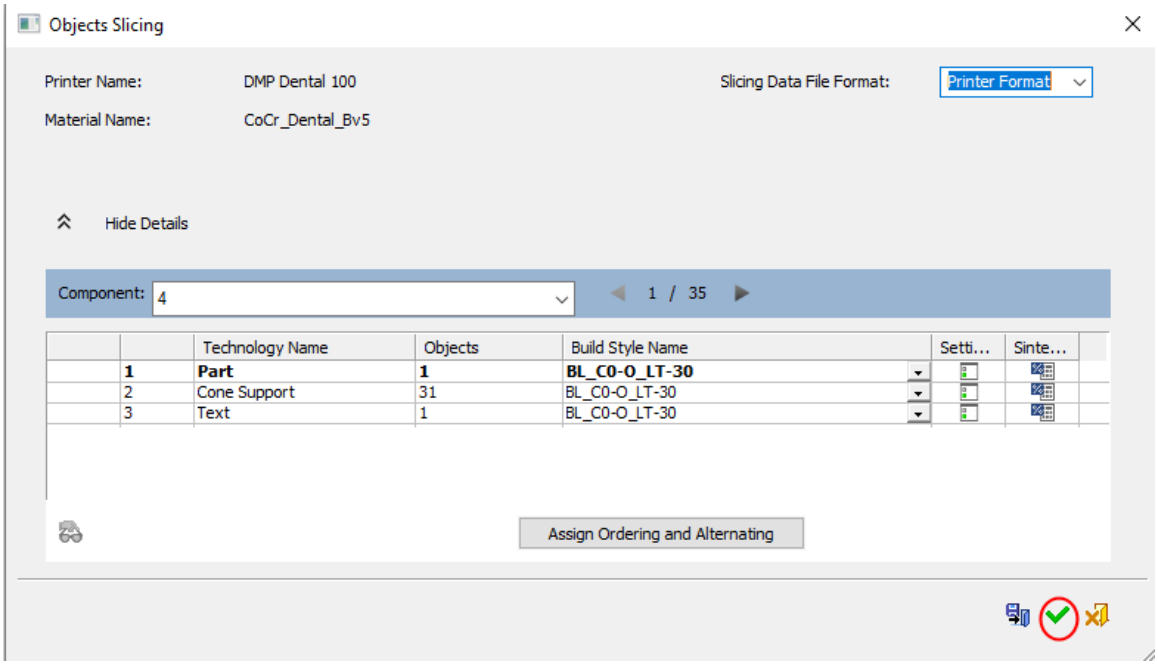
Part 7 – Calculate Slices

The project is almost ready for printing:

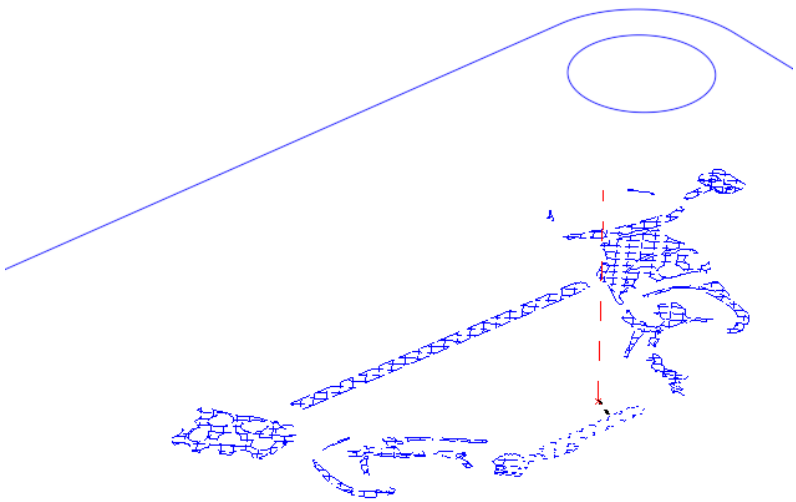
33. Invoke the **Calculate Slices** function.



34. Accept the default parameters and press OK.



35. Examine the result.



End of Exercise