3.2 Sample: concept model

A sample study for physical modelling

Digital Fabrication Facilities for Architecture

LSBU

Contents

Q: How to make a concept model?

A:

Concept models are vital for making design decisions and laser-cut can provide major benefits for prototyping conceptual designs due to its speed. Laser-cut model can also be used to mimic complex geometries during the prototyping process. Of course, with the advent of 3D printing technology, it has become increasingly popular to use 3D printing for concept models. However, you need to consider the following when it comes to turning your 3D design into real life objects:

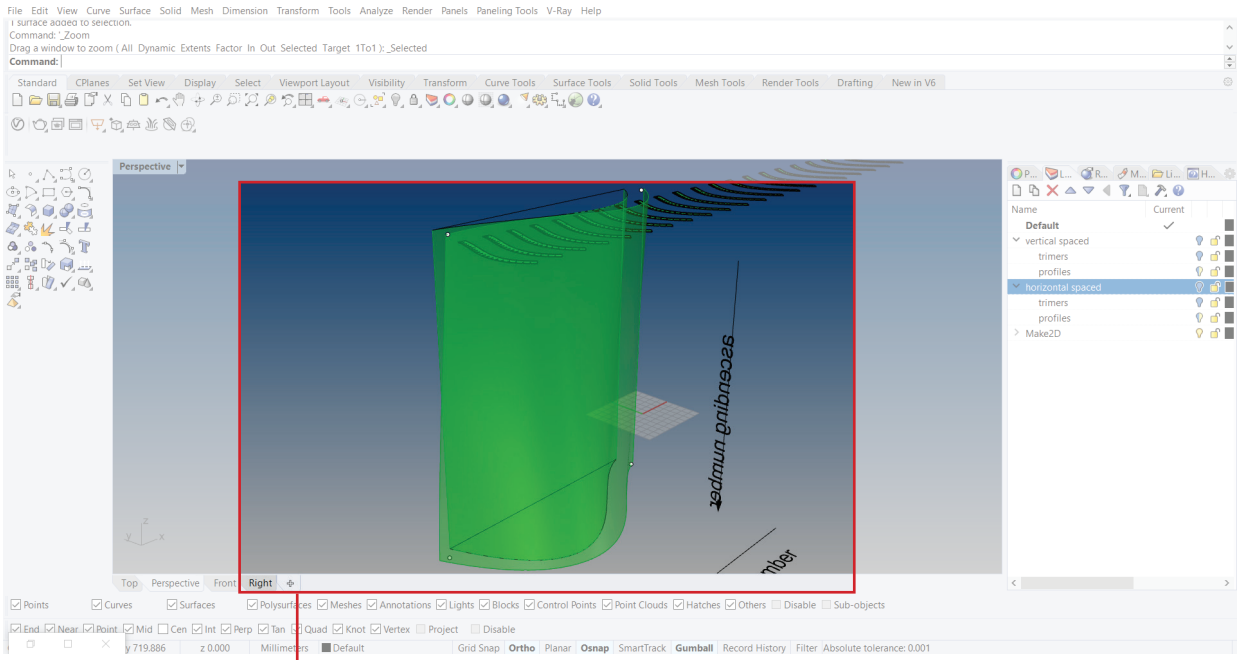
- Timing and deadlines
- Financial budgets
- Quality and accuracy of the 3D model

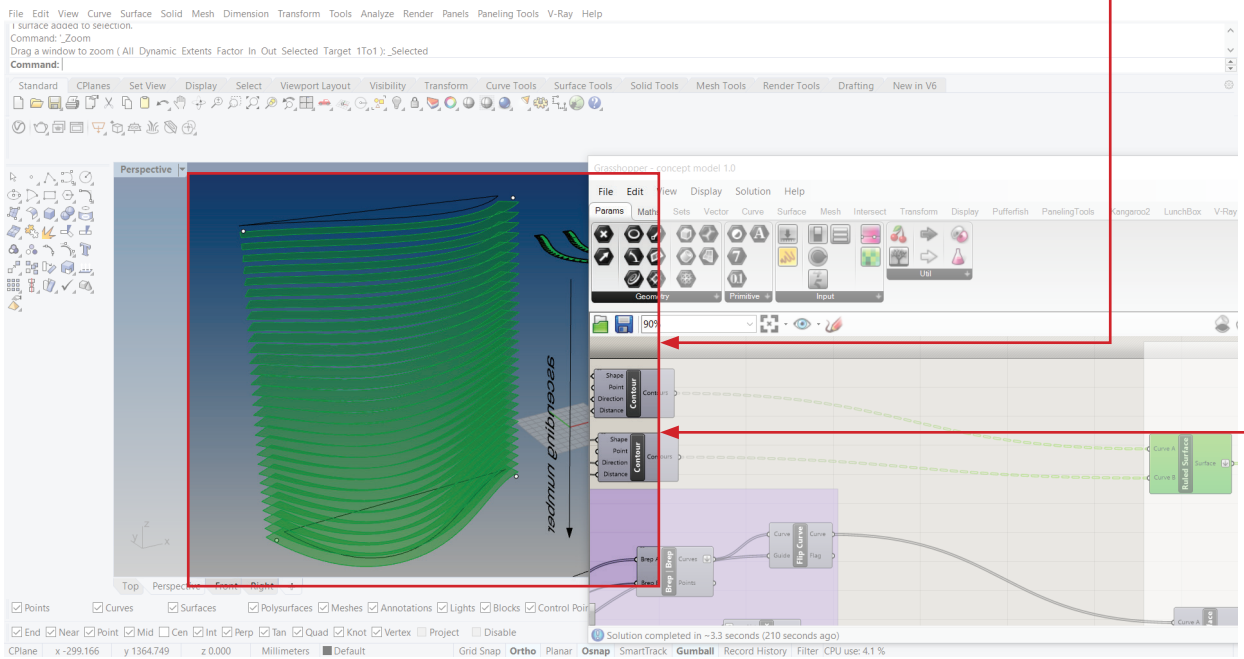
It is important to keep in mind that laser-cut can only produce flat-packed design which means that a system needs to be in place to convert complex non-orthogonal geometries into appropriate formats.

This guide will focus on creating a system of ribs and rafts assembly to mimic the curvilinear geometry. This is one of the method to produce concept model as an alternative to 3D printing and it offers faster speed and larger scale than any conventional table top 3D printer. This method can also be more predictable results for some and does not require the same level of 3D modelling accuracy when compared with 3D printing.

Please note the document shows you the principle and in practice details may vary.

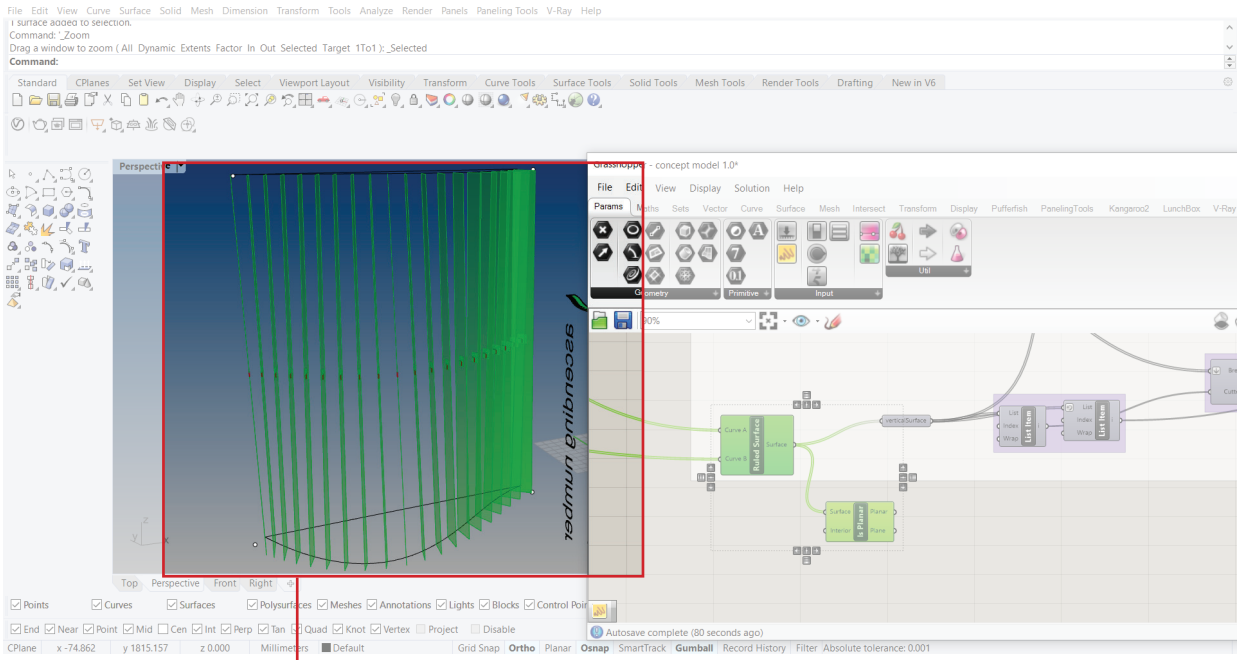
The first step of design process is to convert the curvilinear geometry into flat packed geometries. The example used Grasshopper as a tool to do this but it is not a necessity. You can simply use the “contouring” command in Rhino to carry out this process. However, the result may vary and we highly encourage students to learn Grasshopper.

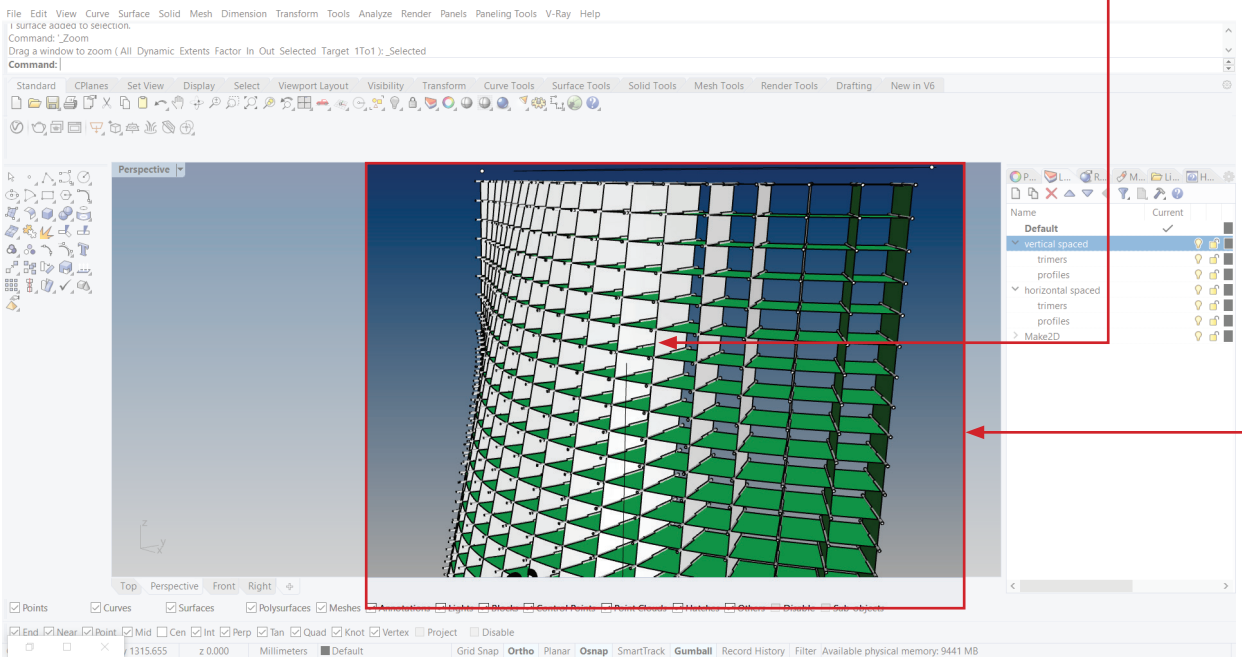




1. To create the rib-raft system, first create a series of vertically spaced horizontal frames across the entire geometry.

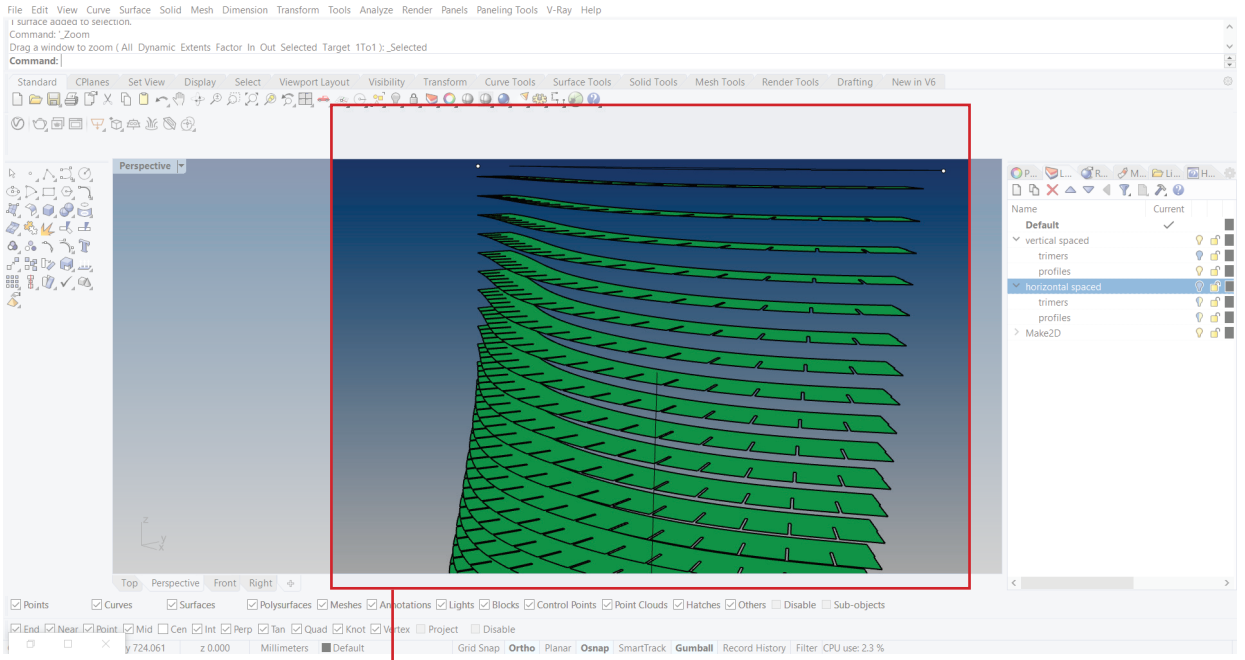
After completing the previous step, Create a series of horizontally spaced profiles along the geometry. If you are using "Contouring" command in Rhino, you may do this step in X, Y or any linear direction. If you are using Grasshopper, you can create space frame along the curvature of the surface.

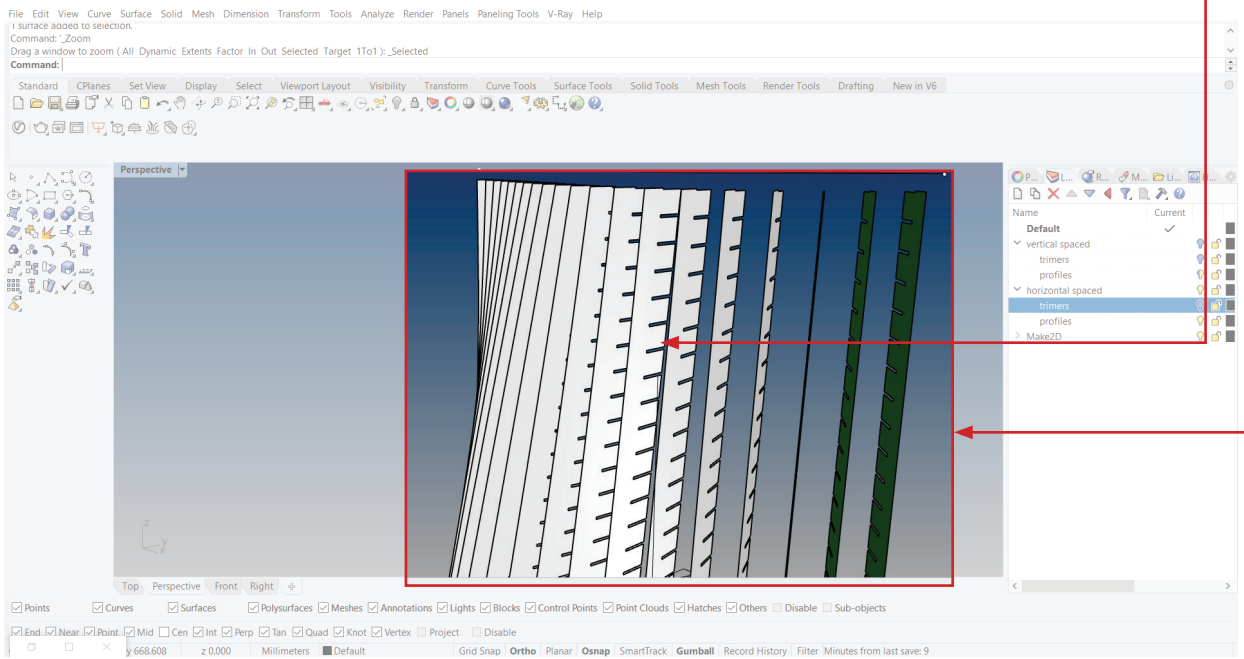




2. Once you have generated the rib-raft system, it is time to create slot joints for assembling the model. At this stage you do not need to assign your profile any thickness. Instead, use the "intersect " command in Rhino or the equivalent command in Grasshopper to find the intersection between geometries. Use the intersection lines generated in this step to create slots for assembling the model.

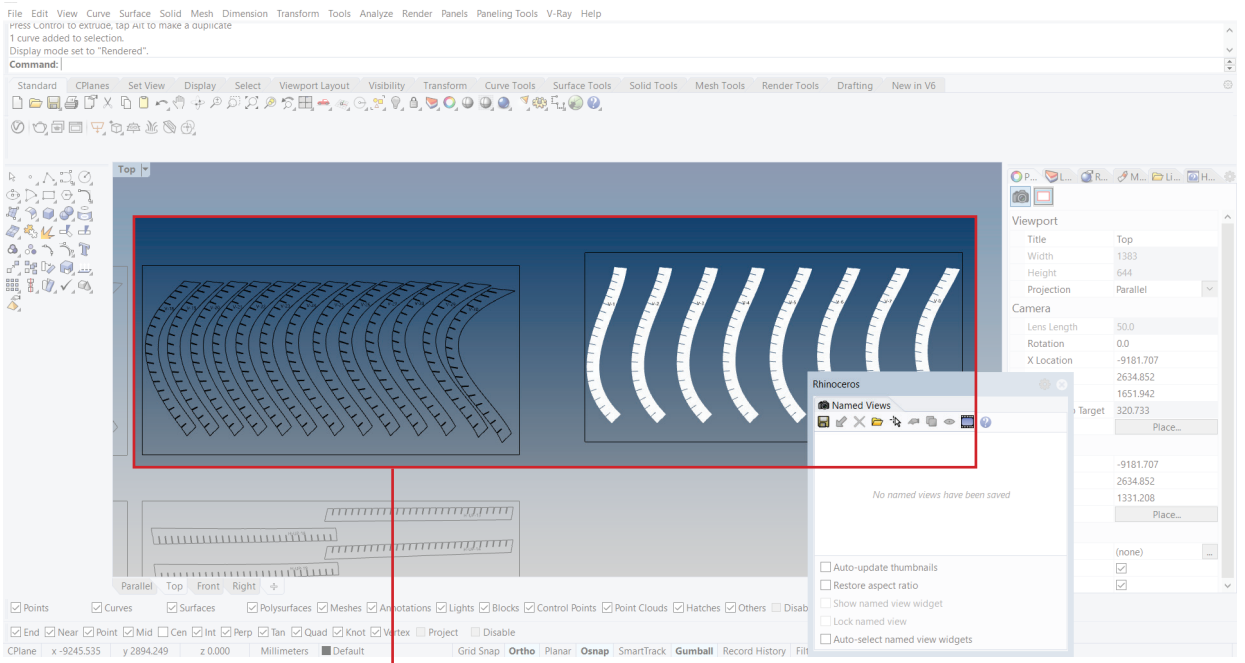
To create the slots, you will need to utilise the slots generated in the previous step. Use "Pipe" command in Rhino or Grasshopper to create objects for making slots. Depending on the thickness of material you are using, assign the same diametres to the pipes as the thickness of your material.

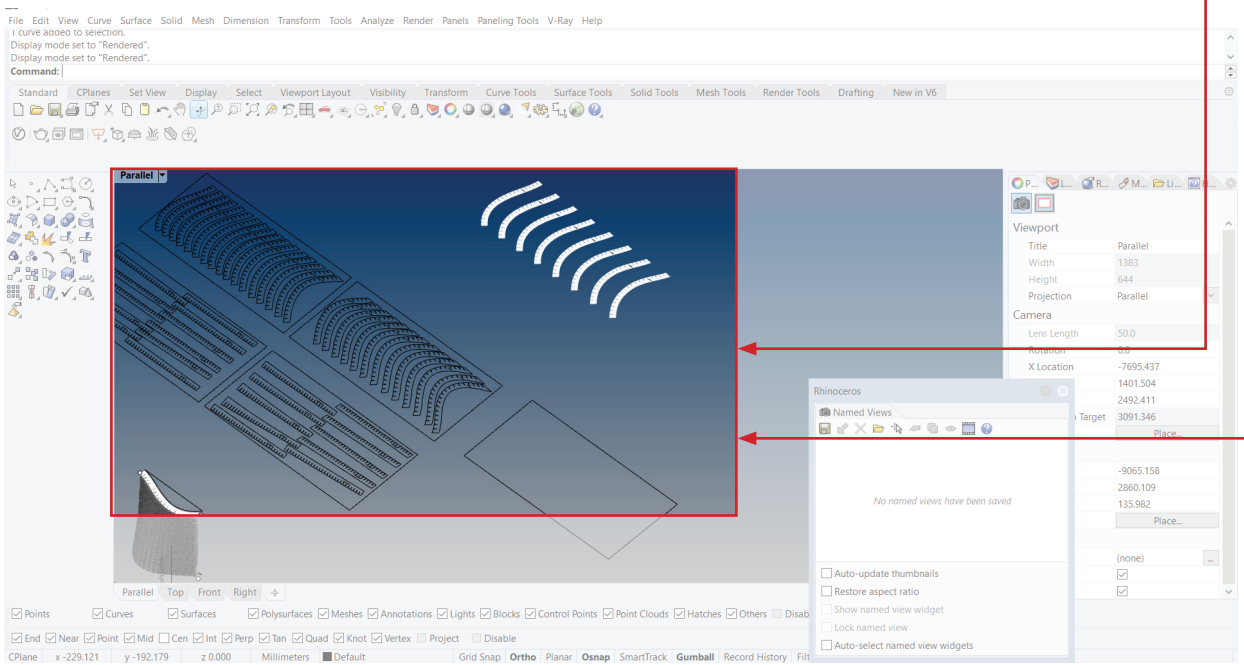




3. Once you have the pipes, use "trim" command to create slots. Keep in mind that you need to create a "positive" and a "negative" slots for both sets of profiles.
In order to do so, move the generated pipes in opposite direction but for the same distance before using the "trim" command.

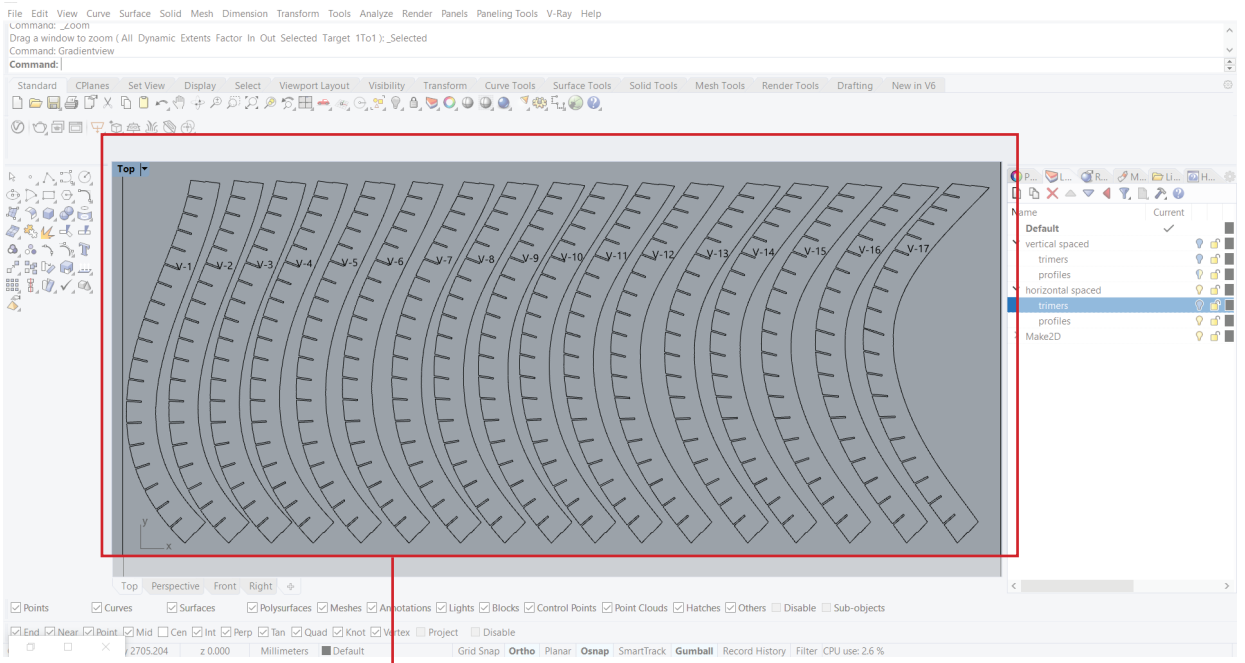
Now once you have the profiles, it is time to make them into flat-packaged pieces. In Rhino, use the "Gumball" tool to orient the vertical pieces for flat-packaging. In Grasshopper, you can use the "orient" command. Then use "move " command to place the pieces into the designated spaces of 600x300 mm areas(the dimension for university department's laser-cut).

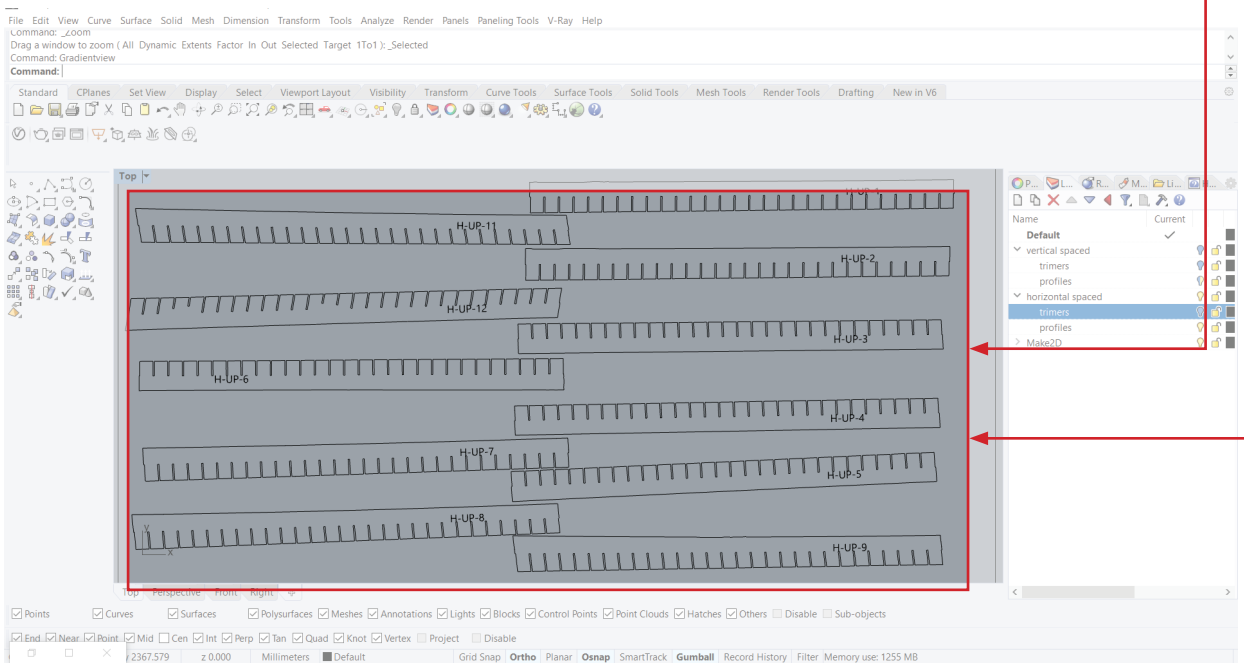




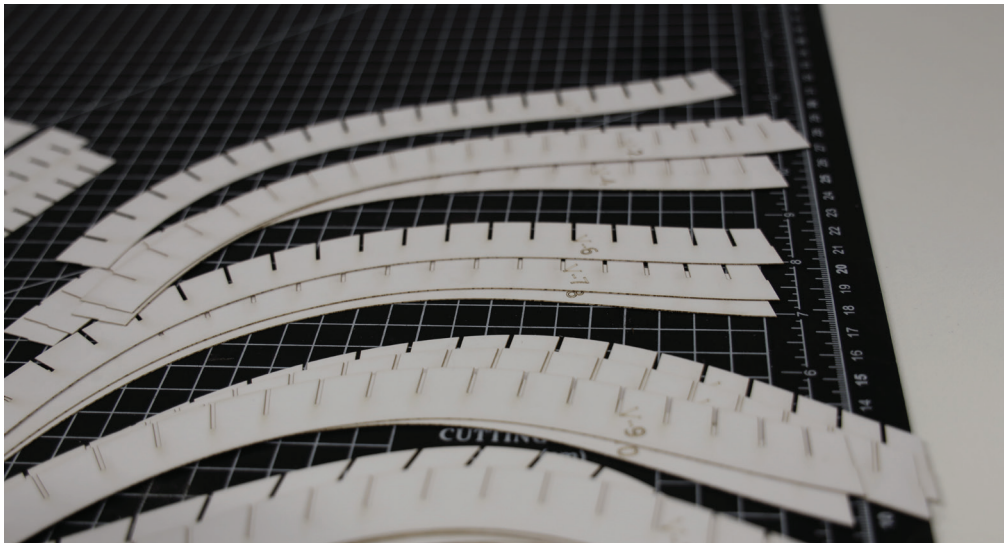
4. Before exporting your drawings, it is important to convert the profiles into 2D CAD profiles. Use the "make 2D " command to do this to make sure the CAD profiles are all located on the same plane.

To make the most out of your material, please pack as many pieces in one sheet of material as possible. However, please make sure there is no overlap. In addition, it is recommended to leave gaps between profiles even if you can place them touching each other. This is done to avoid duplicates lines in the cutting path. Failure to do so may cause the models to catch fire.





5. Sometimes, you will need a bit of clever arrangement to make the most of your sheet materials. In this case, you can not fit the profiles side by side nor can you turn the profile 90 degrees due to its length. Feel free to tessellate the profiles and break the grid lines.

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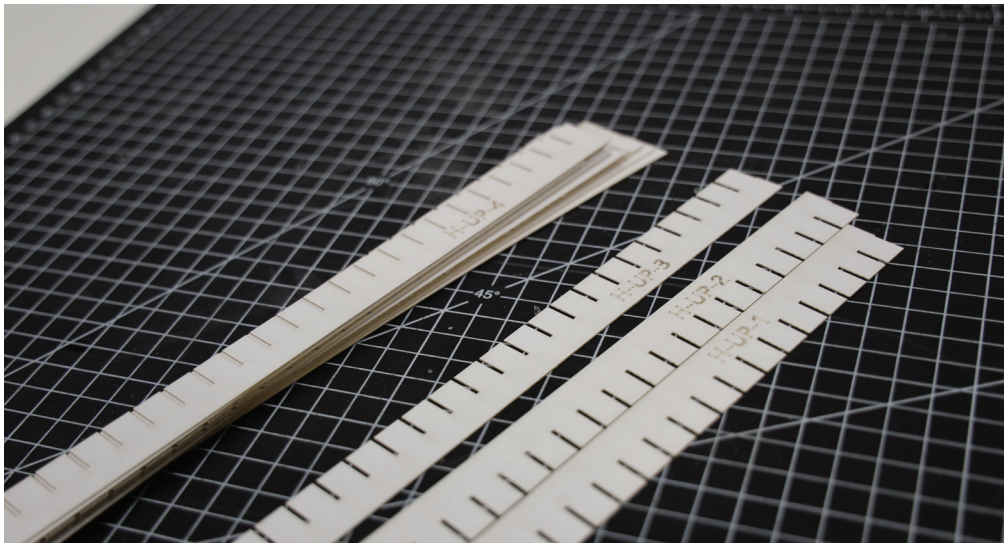
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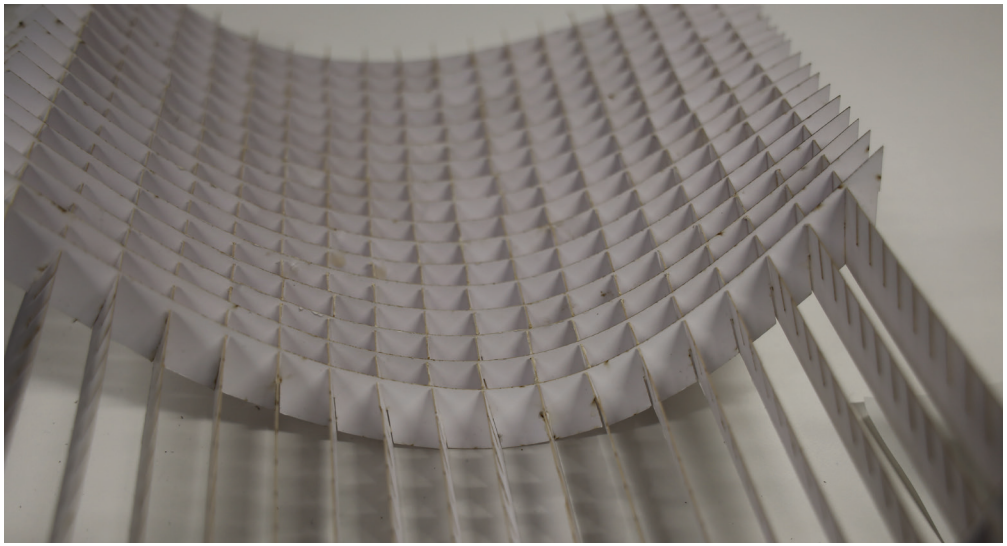
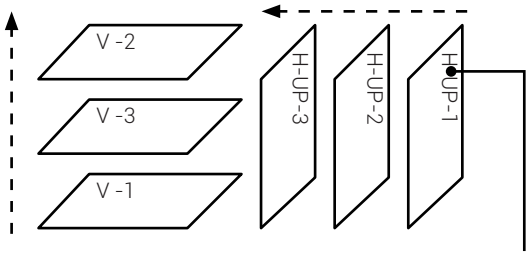


Assemble the model by following the number sequence. Letter abbreviation is used to help better organise pieces.



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