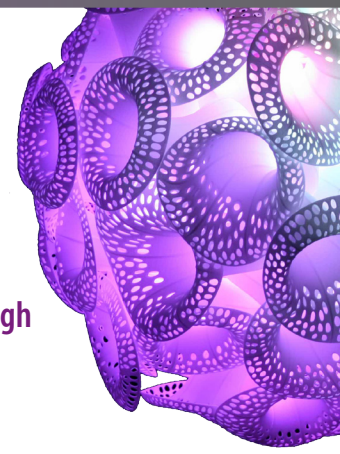




# 3T RPD Ltd

## Guide to Architectural modelling



This guide will help you to create a solid model that is completely 'watertight'; achieved through geometric surfaces that fit together properly and contain no gaps or overlaps.

### Overview of main points

- Use a good quality 3D Modelling package.
- Keep the available build printing volume in mind. Consider the smallest details you plan to model, will they be thick enough when scaled down?
- Often some work is required before you can translate a model to .STL especially if the software you are using is for rendering purposes.
- Selective repairs and rebuilds of the CAD are sometimes required, removing problem areas. Addressing the largest areas first is often the most effective way to proceed.
- A model intended for rendering purposes is likely to contain several invalid features for .STL export. In this case it is often best to rebuild only the most prominent features of the model – enough to capture the essence of the model.
- Direct Modelling is a rebuilding technique, which utilises the existing invalid 3D geometry, and is modified to generate good quality data.
- Reference Based Modelling utilises the existing invalid geometry as a 'reference' only to generate valid surfaces, and are not directly used.
- Often it is more convenient to build more complicated or large models in pieces and glue or weld the model in the workshop.
- In 3D printing, two objects that meet exactly at a face are treated as contiguous and are printed as bonded together.
- .STL export resolution is an important factor in achieving a quality CAD model.
- For architectural models, scale the CAD model to the required size before exporting to .STL.

### Methodology

- Try to use a 3D modelling package with good workflow and organisational tools and the ability to export to .STL.
- Keep the available SLS machine build volume in mind, consider the smallest details you plan to model – will it be thick enough when scaled down? It may be helpful to work out the overall size of the model and the factor by which it needs to be scaled in order to fit the machine or project requirement. You can then use the scale factor as a reference for component thickness when modelling and adjust according to the printers specifications (1mm wall/feature thickness or greater).
- Consider load bearing components of a model, these may need to be thicker to support other features.
- Structural integrity is important for post build breakout, powder blasting, and the finishing process.

### The Common Tasks to Translate 3D Data to .STL

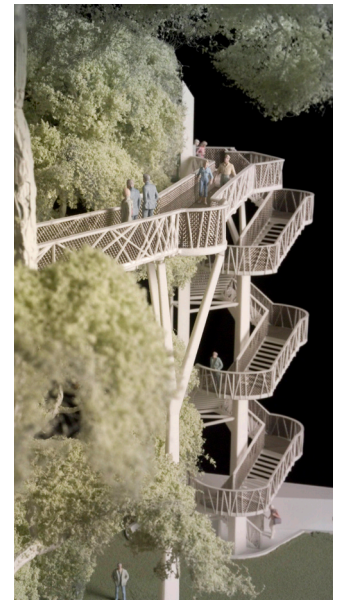
- It's not always possible to export a file to an .STL straight away. Often the problem lies with the intended use of such models. Models created for rendering purposes can represent or fake geometric features with bitmaps. Software packages can use infinitely thin planes to represent walls, and exact mating of surfaces may be unnecessary for rendering purposes.
- Repair and Rebuild: Selective repair and rebuilding of the data is often the most appropriate. Breaking down the problem starting with the largest features first is often an effective way. Complex features that would require significant rebuild time may be better diagnosed in .STL form and fixed accordingly.
- Time is obviously a critical factor and you need to weigh up whether it is quicker to rebuild or repair a model. A complex model with large amounts of detail that was perhaps intended for rendering purposes only (likely to contain .STL invalid features) may be best rebuilt with only the most prominent features. If you isolate the most important details (ie. main structure, prominent wall, columns etc.), you will have a better chance of capturing the essence of the model and its unique overall structure.

### Rebuilding Techniques – Direct Modelling (3D)

The aim of this process is to utilise existing invalid 3D geometry. Addition or modification of existing geometry can save you time that would otherwise be spent rebuilding from scratch.

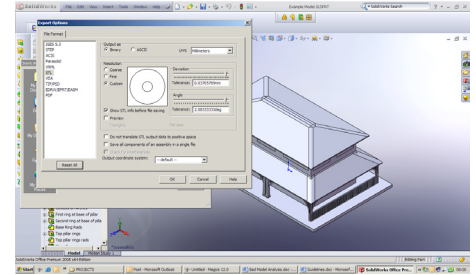
### Reference Based Modelling (3D)

This process would most likely be used hand in hand with direct modelling. The goal here is to use existing invalid geometry as 'reference' only to generate valid surfaces. The tools associated with reference modelling are snapping, projections, user grids and sectioning.



## Guidelines for STL Export – Ensuring Bonding (Snapping & Overlapping)

- It is often more convenient to build more complicated models in pieces rather than as complicated compound objects.
- Snapping and overlapping can significantly reduce the complexity and time associated with creating complex objects.
- In terms of 3D printing, two objects that meet exactly at a face (two cubes side by side for example) are treated as contiguous and are printed as bonded together.
- .STL export resolution is an important factor in achieving a quality CAD model. For sloping or curved surfaces you must guarantee that the facets (individual polygon faces) are sufficiently small to avoid a faceted look when printed. This can be accomplished by increasing the density of the mesh.



*.STL export resolution settings are an important factor in achieving a good quality SLS model*

## Bad Model Analysis

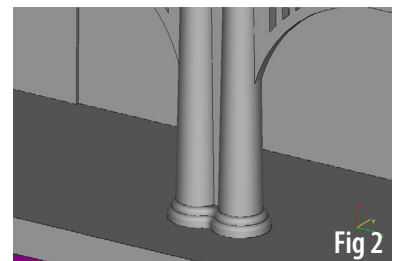
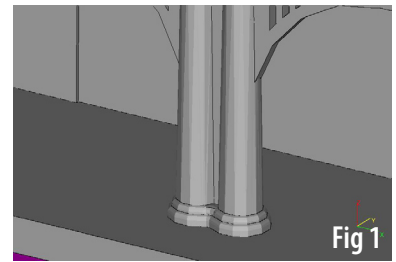
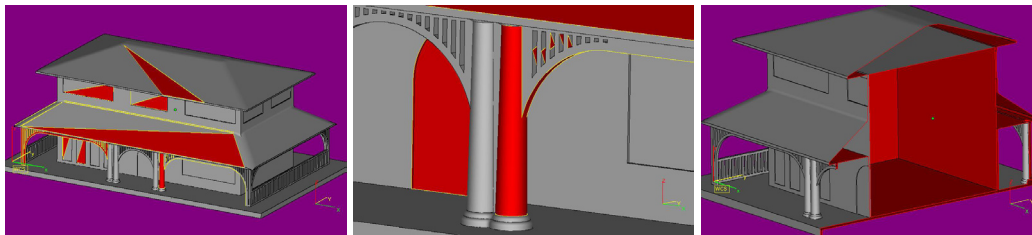
### STL Resolution

.STL export resolution is an important factor in achieving a quality CAD model. Ensure you set your software export settings to create an appropriate resolution .STL file that will have a good surface finish with no faceting. We can offer help and advice on settings. An alternative is to consult the help section of your software, Internet articles, or the Software supplier directly to determine the correct export settings.

The files need to be a manageable size so as not to create data processing issues. This will also keep the part resolution in line with SLS machine's resolution capability. Binary format is more commonly used rather than ASCII as they are more compact.

### Inverted Surfaces

The cause of inverted surfaces is often a result of older CAD programmes which do not translate files correctly or the export settings may be set incorrectly. Depending on your software colour settings, a good quality CAD model looks grey from the outside, and red on the inside (revealed when looking in cross section). Flipped or inverted triangles are shown in red and need to be fixed in order to print successfully.

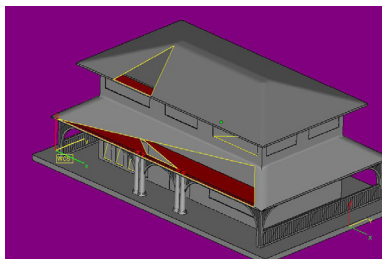


*Fig 1 shows a low resolution file which results in curved surfaces having a faceted look.*

*Fig 2 shows a smooth high resolution file which will be suitable for building on an SLS machine.*

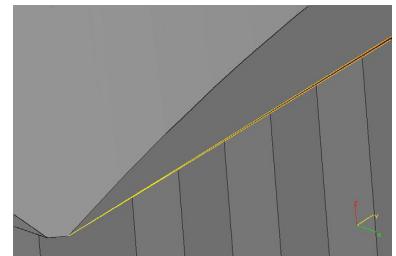
### Gaps on Edges

Under normal circumstances a triangle shares every edge with just one other triangle. Errors can occur when an edge hasn't got a neighbouring triangle or one edge has more than one neighbouring triangle. These problems can be solved by 'stitching' the bad edges together.



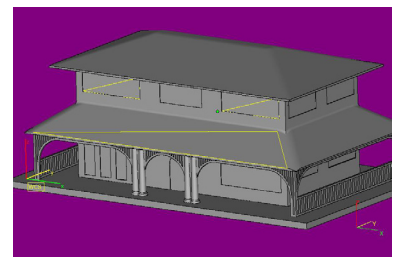
### Holes

Holes come about when several triangles are missing in one localised area. In this case stitching itself will not work because there is too much information missing. Usually it is necessary to create triangles individually to fill the holes. It is often important to draw the triangle in such a way that it is in keeping with the localised area's profile.



### Overlapping Surfaces

Sometimes there is an interference pattern between red (or green) and grey surfaces. This is typical in the case of double surfaces (two surfaces on top of each other). To fix a double surface it is advised to delete all the surfaces and manually replace the surface by creating triangles.



### Data Transfer

The easiest and quickest way to send us your 3D CAD data for quotation is to attach it to an email and send it to [post@3trpd.co.uk](mailto:post@3trpd.co.uk). Our server can easily allow **10MB** through without any problem but your files should be zipped before sending; Stlzip software is a very efficient means of doing this - a **free copy** can be emailed to you upon request. Alternatively, you may complete our **secure online Request a Quote form**, however the maximum file size that can be transmitted is **8MB**. If your data files are too large to send via either of these methods, you can upload them to our **FTP (File Transfer Protocol) site**; call our **Projects Team** on **+44 (0)1635 580284** for a **free download** of the Core FTP software, together with instructions on how to upload your files.

**3T RPD Ltd**

**Fulton Court, Wofford Way, New Greenham Park, Newbury, Berkshire, RG19 6HD, UK**

t: +44 (0)1635 580284 f: +44 (0)1635 569857 e: [post@3trpd.co.uk](mailto:post@3trpd.co.uk) w: [www.3trpd.co.uk](http://www.3trpd.co.uk)