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### STL Creation Tips

To print a 3D model from your rendering we will need it to be exported in the .STL file format. The .STL (Standard Triangulation Language) is the format most widely accepted by rapid prototyping machines and their proprietary software.

In order to properly export a printable .stl, it must be a single solid model with a completely watertight mesh lacking any internal geometries. If there are holes or edges where the triangles don't touch there are potential building problems. When modeling it is critical to ensure that each edge is connected without overlapping. Solids should be booleaned together as you model.

**DESIGN NOTE:** This can be done to a separate layer in parallel, to allow for design changes.

#### How do I prepare a printable .STL?

Many 3D CAD or NURBS based modeling programs can export the .STL format. This file format breaks down a 3D CAD solid representation into a series of connected triangles to represent the surface features of the solid. If your program doesn't offer a .STL output you still can prepare the file for printing and send us the native file.

Consider the end result as you begin modeling. To create a printable mesh you need to plan for modeling a solid while you are designing. Some prefer to design in a more sketchy fashion, generating faces after a wireframe is complete. Others, model as though they are working with solids. Carving, transforming and joining solids to create your design. Of course, lines are still used in solid modeling, but each piece of the design is modeled as a solid, then Booleaned to the other solid components of the design resulting in one watertight solid 3D model of the design. A file modeled in this way will be easily converted to a triangle mesh, exported (.STL), and printed. Files modeled using a planar modeler (i.e. sketchup) often have many overlapping surfaces and gaps resulting in a very difficult file to work with. This is more related to how the user models as opposed to a limitation of a surface modeler such as sktechup. We have printed many sketchup files successfully, if you follow the same guidelines as if you were using a solid modeling program it will make it much easier to print your file.

**STL file :** The most widely accepted file format for representing 3D data. Three Dimensional objects are represented as a triangulated mesh. Each triangle has four properties that define an STL file. The triangles are defined by 3 points in space and one orientation called a normal. Each of the three sides of the triangle is connected and interlocking with another triangle and the normal of the triangle points towards the exterior surface of the object.

**Mesh :** A collection of vertices and polygons that define the shape of any polyhedral object. A STL mesh is made up of triangles

**Solid :** A volume is a "solid" when all the edges of all the surfaces involved join up without any gaps or holes. The absence of unjoined (or "naked" in Rhino terms) edges implies that the object is a closed volume or a solid.

**NURBS (non-uniform rational basis-spline) :** A form of 3D modeling that uses specific mathematics to define curves, surfaces and solids.