

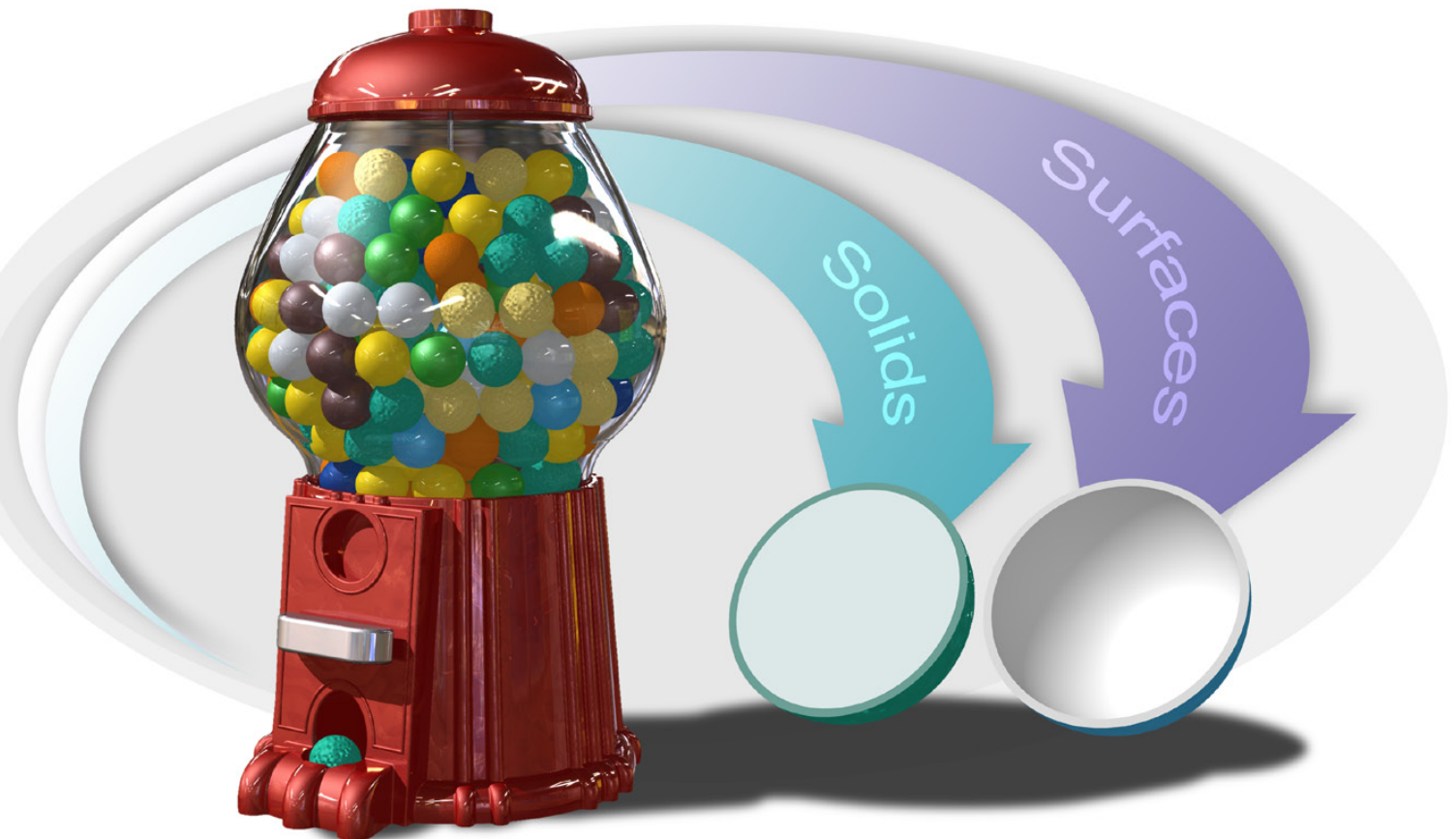
Should I be using Solids or Surfaces when I draw in TurboCAD? What is the difference?

Do those questions sound familiar?

Well, they definitely are common questions and, in reality, are important ones to ask.

Within this tip the TurboCAD user will learn what the difference is and which is better, if a choice is available.

Unfortunately the TurboCAD Deluxe user has no choice as they are limited only to TC Surface objects.



Traditionally, Solid and Surface modeling refers to the underlying math that defines the objects that are modeled in a CAD system.

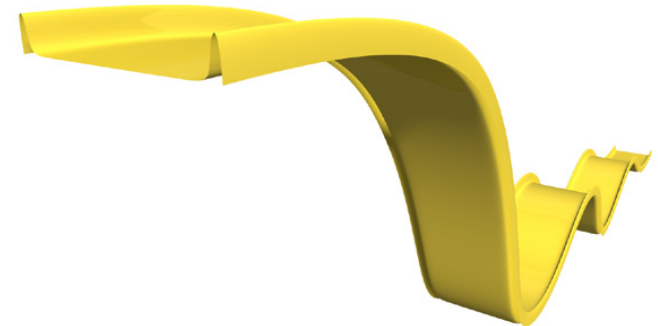
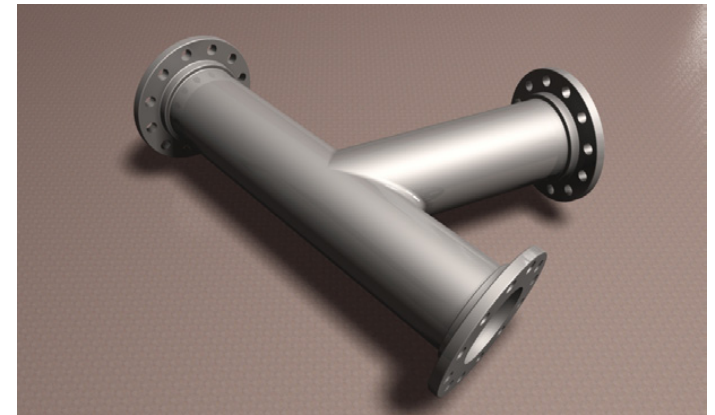
Colin Finkle, in an article commissioned by FireUser.com explains this well for those of use who find it difficult to understand the technicalities of such things.

Colin states that, **solids modeling** is defining an object with geometric mass. Solids modeling programs usually create models by creating a base solid and adding or subtracting from it with subsequent features. This would include such features such as extrudes, extrude cuts, revolves, radii, chamfers, etc. Solid modeling was originally developed for machine design, and is used heavily for engineering with large part assemblies, digital testing and rapid prototyping.

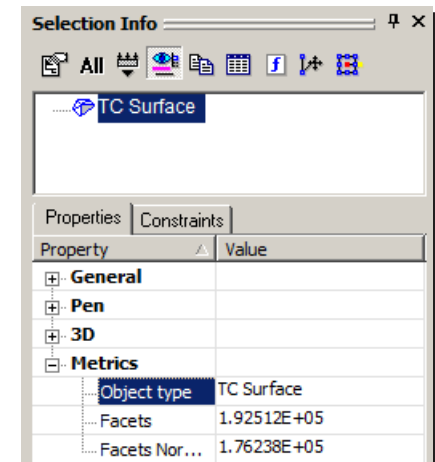
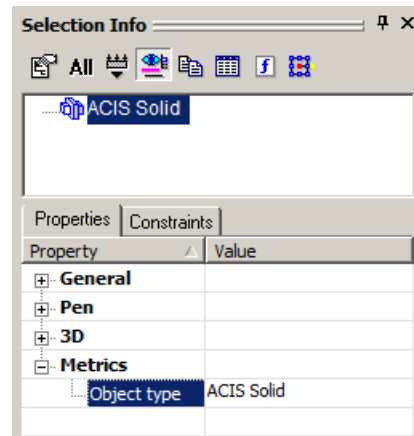
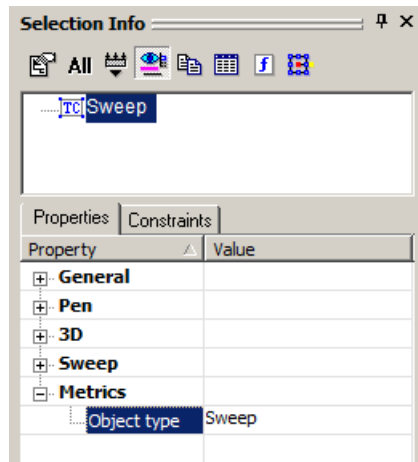
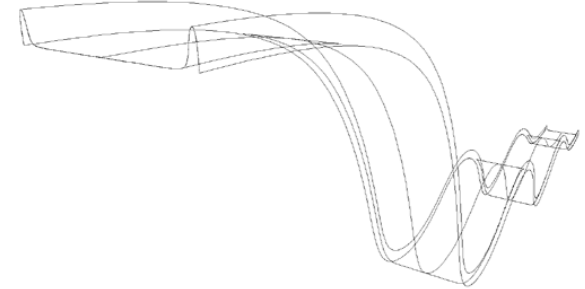
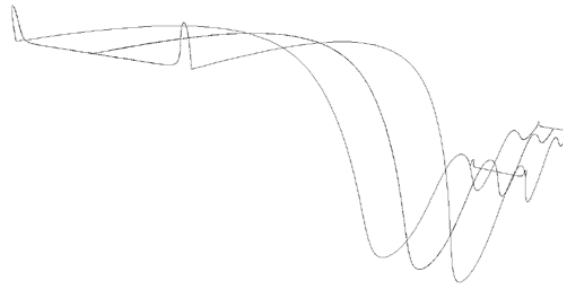
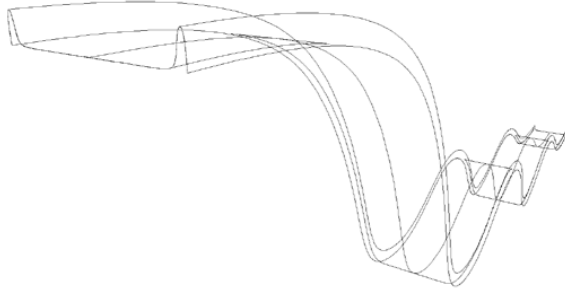
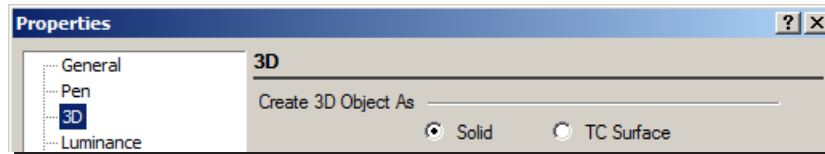
Surface modeling is defining an object's exterior with an infinitesimally thin skin. This skin is created by lofts, sweeps, and NURBS curves - i.e. sculptured surfaces with lots of curvature. The surfaces are either defined by poles or guide curves. A surface is considered a solid only when it is completely enclosed. It is used to make technical surfaces (e.g. air plane wing) or aesthetic surfaces (e.g. car's hood). It was developed for the aerospace and automotive industries in the late 70s. It is generally considered more difficult than solids modeling, but the models are more robust because the programs aren't generally feature based. Later changes have to modify the existing geometry as opposed to just editing the original feature, which is more difficult but keeps the model from collapsing when one feature interferes with another.

Read the full article: http://fireuser.com/articles/solids_vs_surface_modeling_what_and_why_you_need_to_know/

Meet Colin Finkle: <http://www.finkle.ca/>



But how does this relate to TurboCAD you may be asking, since all objects created in TurboCAD, whether using primitives as a base or sweeping lines or splines along a path still constitute solids when tool Properties are set to be created as Solids (default in TurboCAD Pro).



A Box, a Sweep, an Extrude, a Loft, as well as some others, are specialized TurboCAD objects (still solids) that become ACIS Solids after one explosion and TC Surfaces after two explosions.

Vladimir Veselov , one of the TurboCAD programmers, had this to say when asked about Solids and Surfaces within TurboCAD...

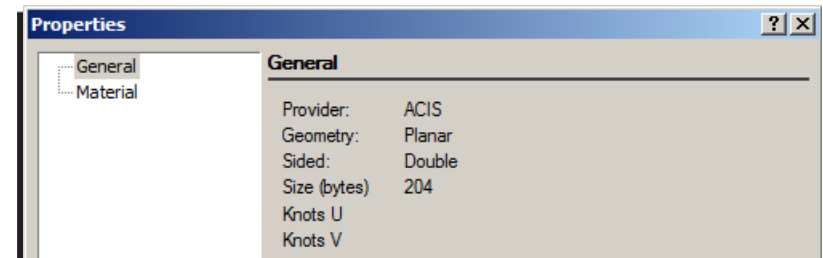
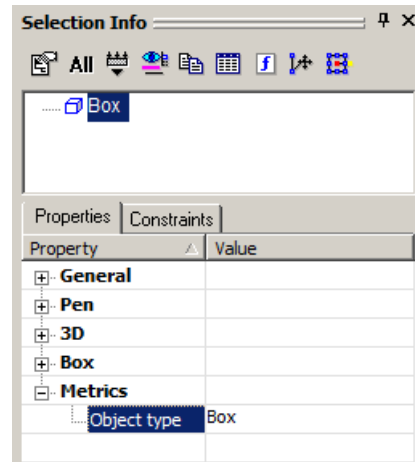
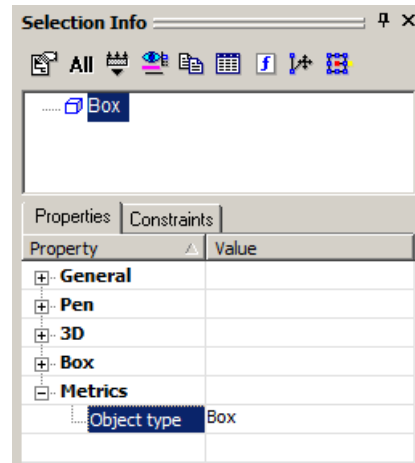
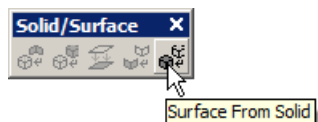
1. Conflict of Terms

Originally the term Solid was taken from the ACIS kernel (<http://doc.spatial.com/index.php/Body>) and designated:

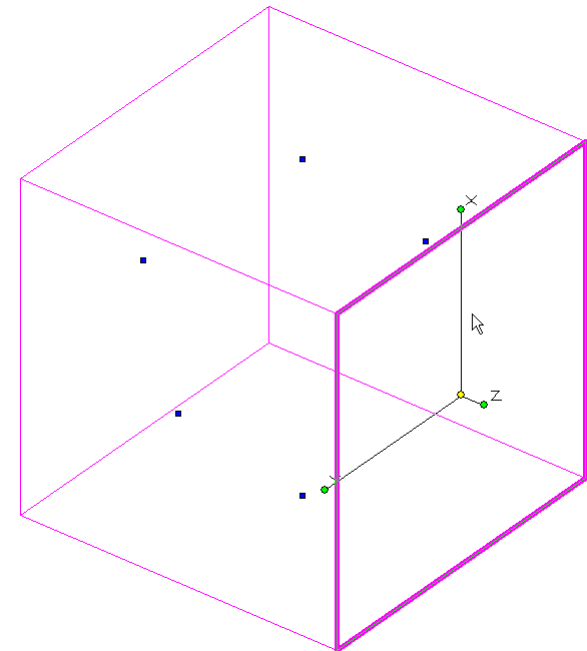
- A) Closed body having a non-zero volume
- B) ACIS object

At this point the term 'Solid' is used in a broader sense - only ACIS object. That is Solid = ACIS, which created confusion and dualism in the names of Solid / ACIS. (The situation is similar to the terms Work Plane / UCS).

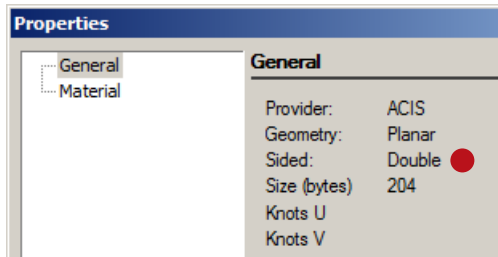
For example, if you take a Box and perform a 'Create Surface \ From Solid' you get a 'Solid' object (in terms of TurboCAD), but this is not a closed body as you can see when you look through Facet Editor properties on any side of the cube.



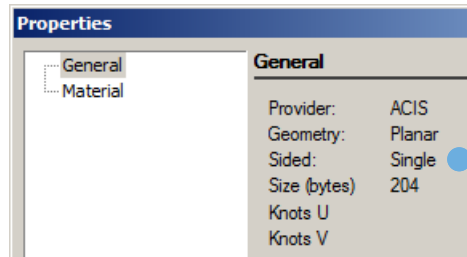
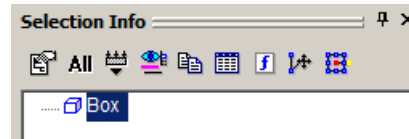
Sided = Double (must be single for true 'solid')



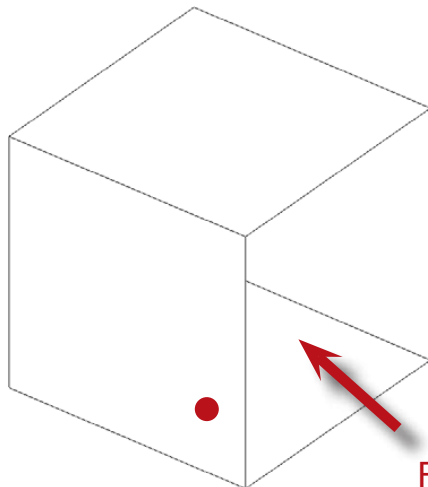
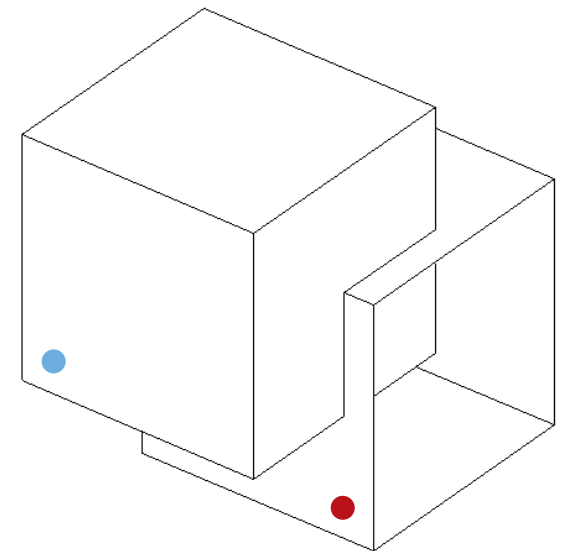
In this form any part of the object (a face of the cube in this case) can be removed using the Facet Editing tool.



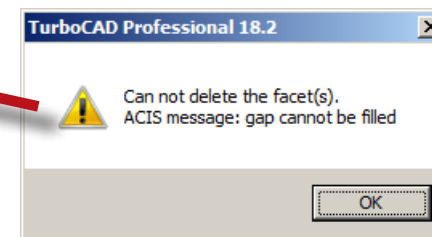
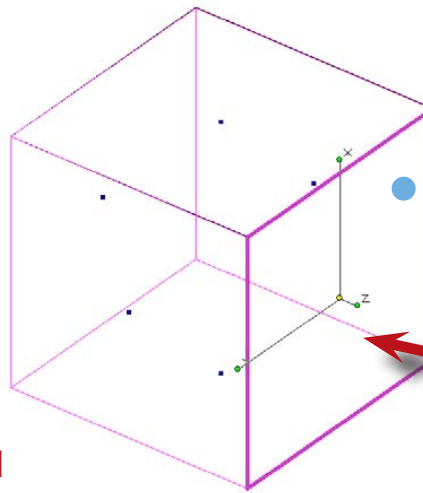
For a true 'solid', this operation is impossible.



In TurboCAD using Boolean operations can make a hybrid of two such objects.

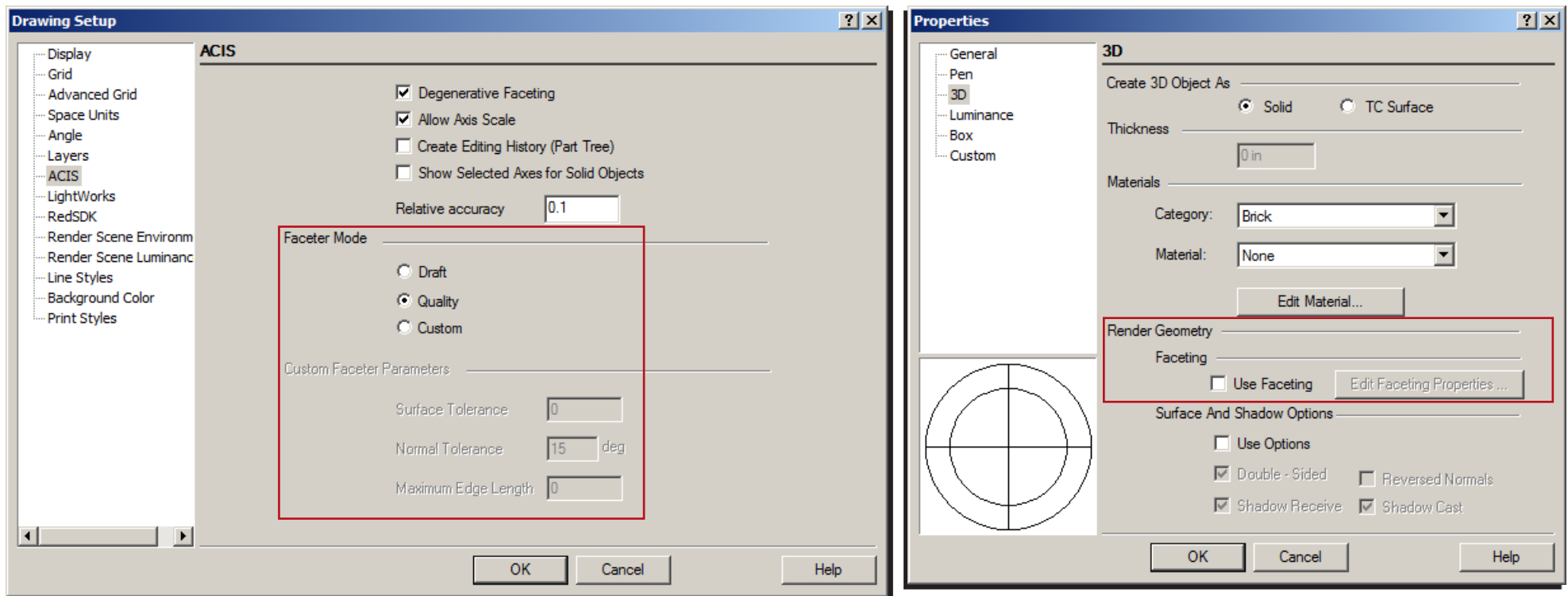


Face selected and deleted



2. Visualization of TurboCAD Solid objects

Visualization of objects is controlled by TurboCAD Solid ACIS settings as seen in the dialogues 'Options \ ACIS' and 'Properties \ 3D \ Faceting'.

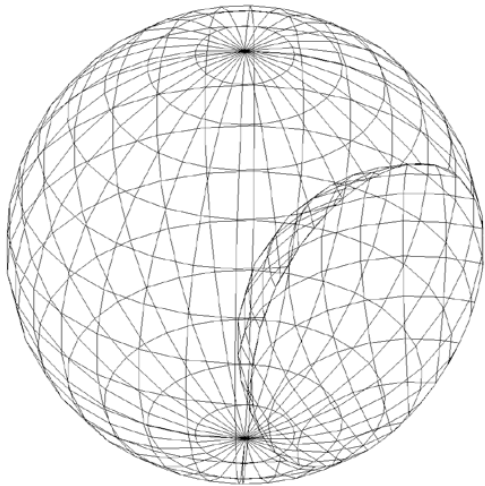


To visualize the objects the TurboCAD Solid routine starts faceting (see: <http://doc.spatial.com/index.php/Faceter>, http://doc.spatial.com/index.php/Adaptive_Faceting). Also see TurboCAD Tip #15 - ACIS Faceter Modes for a fuller discussion on this particular topic.

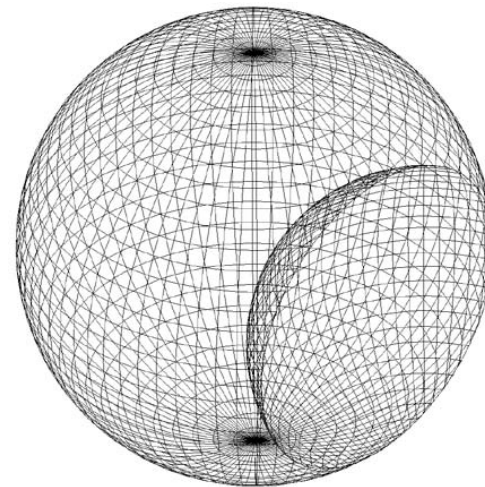
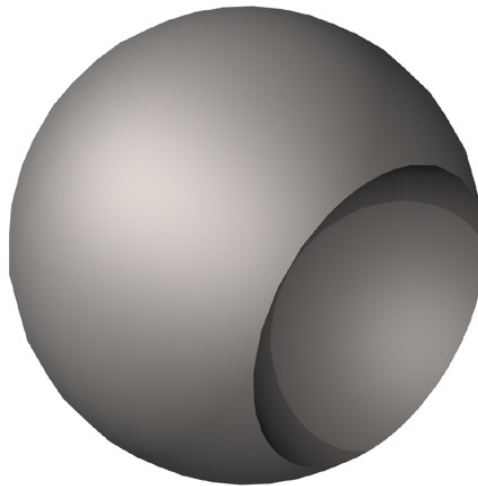
The result of the procedure is a set of objects (lines and TC Surfaces), which are directly drawn in wireframe or loaded into the renderer.

In terms of visualization of ACIS objects, TC Surfaces are cosmetic graphics and are needed for painting, snapping, etc. If you change the parameters of all the ACIS cosmetic graphics they are rebuilt with new installations.

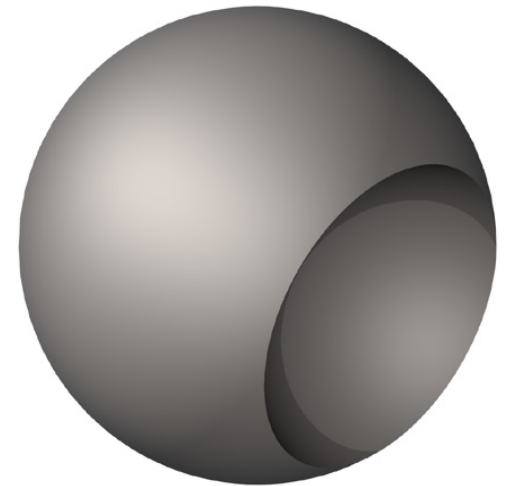
TC Surface to wireframe and TC Surface to render are created with different schemes with slightly different parameters for faceting. Specifically designed for TC Surface wireframe diagrams are stored, and started to render and then are deleted when you close the render.



Draft ACIS



Quality ACIS



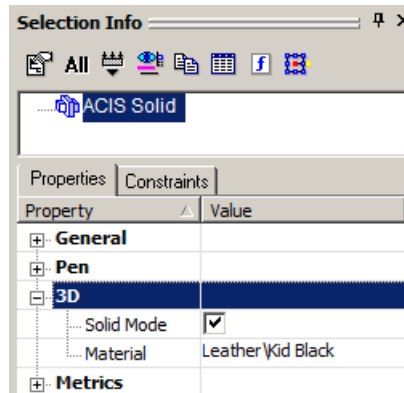
Summary

TC Solid graphics have ACIS data (as hidden child graphics) that allows a user to do Boolean operations, to regulate the quality of visualization, but it requires additional time and memory.

- TC Surface objects are lighter objects to render, but the set of operations with them is limited.

As such, it is the interpretation of Don Cheke that Solids and Surfaces used in TurboCAD are not the same as they are traditionally defined in other programs such as Solidworks, CATIA, and ProEngineer (for solid modeling) or Rhinoceros 3D and Alias Studio (for surface modeling).

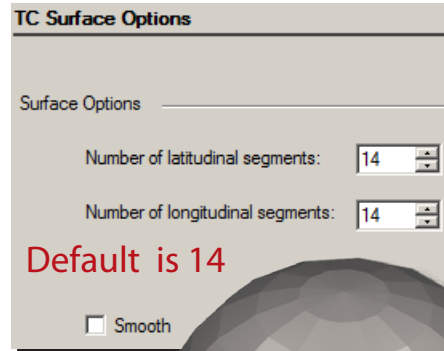
To get the most out of TurboCAD a user should use Solids. Convert only to TC Surface objects when necessary to overcome memory issues (but do so only with a copy of the original file as swapping back and forth between Solids and TC Surfaces is problematic).



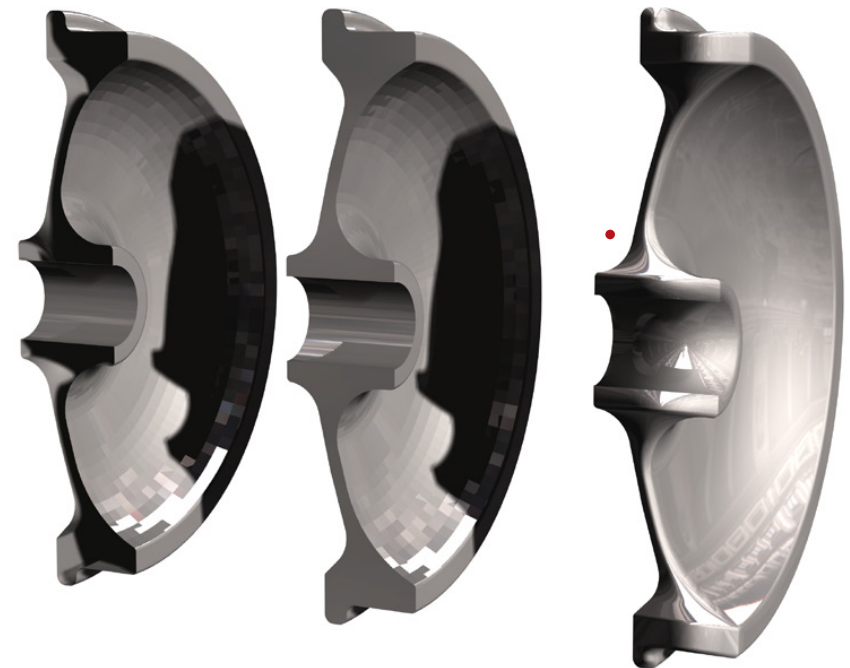
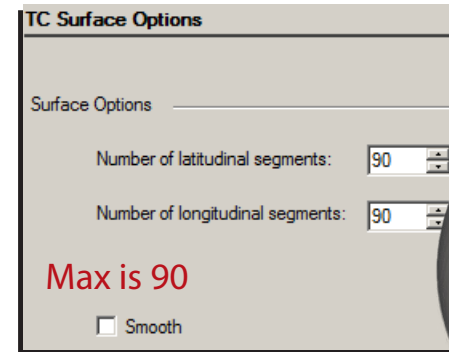
As for TurboCAD Deluxe, a user is confined to simplified geometry (TC Surfaces).

TC Surface objects in Deluxe are limited as to how much faceting is allowed. The smooth option is only helpful to a degree as it does not change the faceting but only the appearance which isn't always appealing.

These TC Surface objects also keep Deluxe users from utilizing all the tools that ACIS Solids in the Pro version allow (filleting, lofting, shelling, etc.). This is one of the main reasons for the large price difference between the Pro version and Deluxe version of TurboCAD.



Whether an opened profile creation (resembling a sheet) or an closed profile creation (resembling a solid) both remain TC Surface objects in Deluxe and are segmented due to the limited faceting.



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