



Speeding Up Visualization Workflow with Autodesk® 3ds Max® Design

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AV2592

While architecture and engineering professionals should always focus on making the best design for the project, workflows designed to produce plans and intelligent models are often missing vital steps for the visualization at the end of the cycle. These steps are easy to add to your workflow once you know what they are. Learn how to speed up the visualization process with small adjustments to your Autodesk® AutoCAD® or Autodesk® Revit® software workflow and with 3D modeling standards that can be checked for and corrected with tools built into Autodesk 3ds Max Design software. For visualization professionals, we look at how to create or select 3D models of environmental elements that slip easily into your pipeline without adding extra correction work or long render times. We also look at the vocabulary and tools that you can use to communicate with designers about your workflow needs.

Learning Objectives

At the end of this class, you will be able to:

- Explain AutoCAD and Revit best practices for visualization later down the pipeline
- Create or select additional visualization elements (e.g., people, cars, trees) that help rather than hinder visualization
- Test a 3D model for visualization readiness with 3ds Max Design
- Communicate with designers and engineers about visualization needs

About the Speaker

Michele Bousquet is a member of TurboSquid's CheckMate Advisory Board, a group of industry professionals devoted to developing and documenting standards for 3ds Max Design and Revit Architecture. In her 22-year career with Autodesk products, Michele has authored more than a dozen books from "AutoCAD 3D Design and Presentation" in 1991 to the recent "How to Cheat in 3ds Max" series. With a bachelor's degree in Math and Computer Science from McGill University, she has taught 3D modeling and visualization at the Art Institutes of Boston and San Francisco and the New England Institute of Art. Michele has enjoyed participating in the evolution of 3D visualization from primitive AutoFlix fly-throughs to short films that rival Hollywood productions.

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Best Practices for Exporting

From AutoCAD

Some AutoCAD features result in poor imports to 3ds Max Design.

- Unexploded blocks do not import at all, or import as unusable objects.
- Booleans tend to import as highly triangulated meshes, which are difficult to edit and texture. If the Boolean object has a simple material with no texture maps (such as metal) then it's usually not a problem, but you should try to use other techniques as often as possible.

From Revit

Don't apply materials in Revit. If you do so, when you export to 3ds Max you will get all the objects with the same material lumped together as one object, which you then have to break apart if you want to edit the materials. A better solution is to export to DWG (which will not carry the materials) and then import into 3ds Max.

The downside of this approach is that you'll get a large number of individual objects, many of which you don't need. However, it is usually easier to delete extraneous objects and attach objects together than it is to break them apart.

- Delete polylines (called *splines* in 3ds Max) as these are not necessary to the geometry.
- Delete layers of objects not needed such as plumbing or electrical information.
- Then attach or group together all objects of the same type as you like. For example, you might want to attach all the glass or metal together so you can easily apply a material to all these elements at the same time.

Importing to 3ds Max Design

When importing files created in AutoCAD or Revit to 3ds Max Design, you will sometimes see various problems with the imported mesh. These problems are not always obvious right away, but will rear their ugly heads only when you try to render the scene.

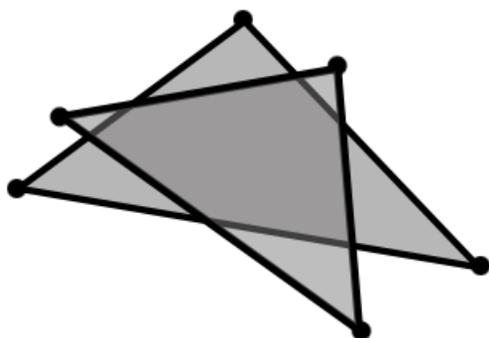
Let's look at some common problems you'll encounter with imported meshes, and how to solve them.

Coincident Faces

Depending on the method used to create the objects in the scene, they might import with coincident or overlapping faces.

Coincident faces - Faces defined by vertices and edges that occupy exactly the same coordinates.

Overlapping faces – Faces where all or part of each surface occupies the same surface plane. Overlapping faces can have different vertices and edges defining them, but all or part of the surface planes occupy the same space.

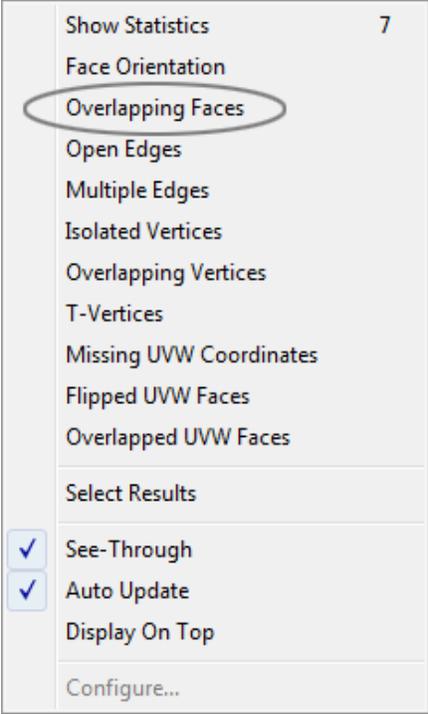


You can tell if you have coincident or overlapping faces only when you make multiple renderings. If you're rendering stills, a face will have one color in one rendering and a markedly different color in another. If you're rendering animation, the face will "flicker" (change color) from one frame to the next.

Solution

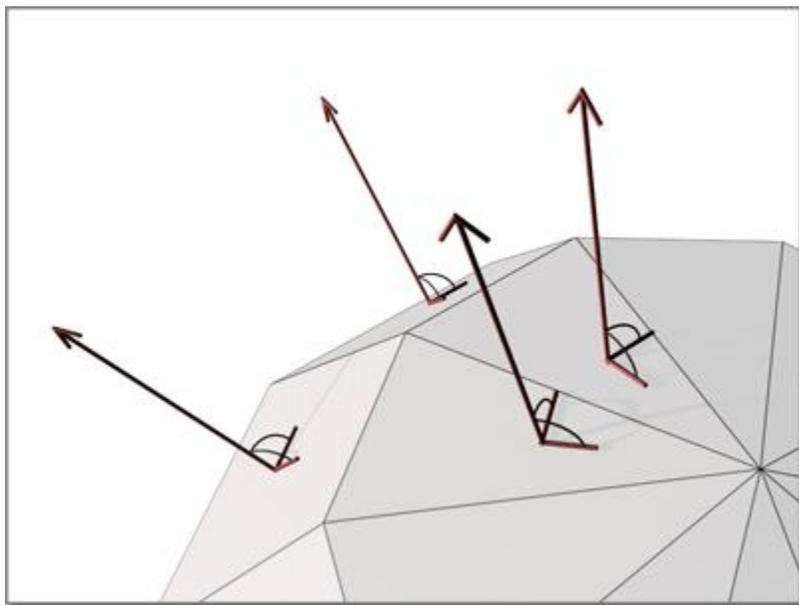
3ds Max Design includes a tool called XView that detects coincident faces and selects them for you. This tool is available in versions of 3ds Max Design from 2010 forward. XView detects a number of problems including isolated vertices (vertices out in space, not connected to anything).

Speeding Up Visualization Workflow with Autodesk 3ds Max Design

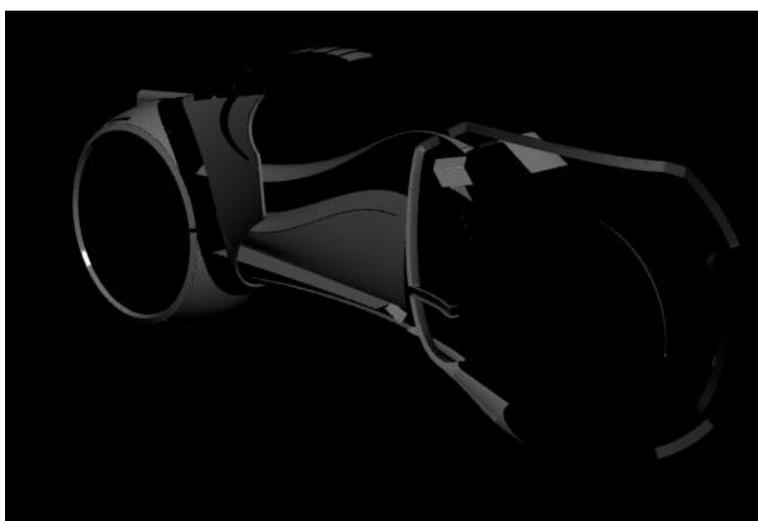


Flipped Faces

3ds Max Design uses a system of *face normals* to determine the “outside” direction of faces. A *normal* is an arrow (generated internally to the software) pointing outward from the face to indicate the outside direction. A *flipped face* is basically a face with its normals flipped inward, meaning the face does not render.

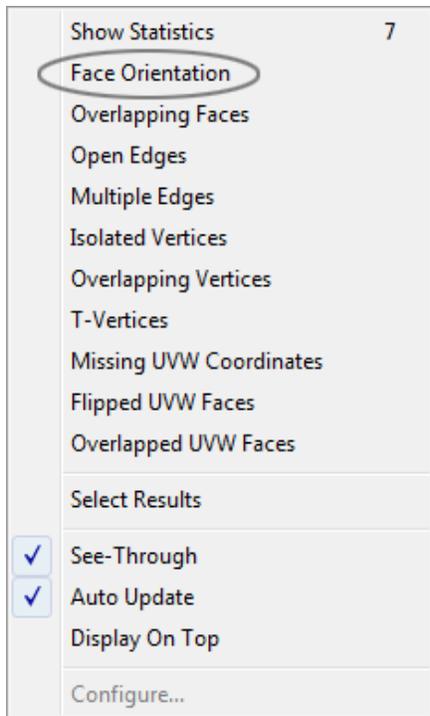


A flipped face manifests as unexpected coloring in the rendering where the face should be, usually black or the background behind the face. If all the faces on the object are flipped, the object will look a little strange in shaded viewports, but if you’re looking only at wireframes you might not notice the faces are flipped until you render.



Rendering of object with flipped faces

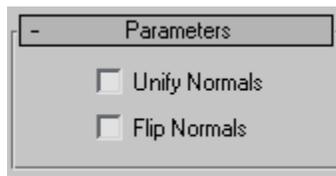
To help you locate flipped faces, you can use the Face Orientation option in XView, which highlights the back sides of faces.



Solutions

There are several solutions to the problem of flipped faces.

All faces flipped - If all the faces are flipped, the solution is easy. Apply a Normal modifier to the object and select the Flip Normals option.



A few faces flipped - If just a few faces are flipped and you can readily identify them, you can select the individual faces and apply the Normal modifier just to those faces.

Many faces flipped - If many faces are flipped and it will take too long to identify and select them, you have several options. I have listed them here in the order in which you should try them.

Apply the Normal modifier and turn on Unify Normals. In my experience, this works about 25% of the time. Try turning Flip Normals off and on to see if one way or the other works better. Note: Unify Normals does not work on Editable Poly objects, so convert any Editable Poly to an Editable Mesh first.

Another option is to turn on the 2-Sided option for the object's material. Note that this increases render time, either a little or a lot, depending on (a) how polygon-heavy the object is and (b) whether the material includes memory hogs like reflection or refraction. In other words, if it's just one relatively simple, non-reflective object that has the problem, then go ahead and use this option. If the material is applied to multiple objects in the scene, you'll need to make a separate copy of the material with a new name, set the 2-Sided option, and apply it to the object. Otherwise, all the objects in the scene to which that material is assigned will render 2-sided, which can really kick up your render times.

At this point, your next option is to redraw the object in 3ds Max Design. For simple objects that correspond to 3ds Max Design primitives (boxes, cones, etc.) or which are pretty quick to make from primitives, this is a viable option.



If none of these options solve your problem, you have no choice but to go back to the source. How was this object created in AutoCAD or Revit in the first place? Was the technique markedly different from what you used to create other scene elements? Add-ons designed to create elements primarily for design or construction do not always create a true 3D object that can withstand export.

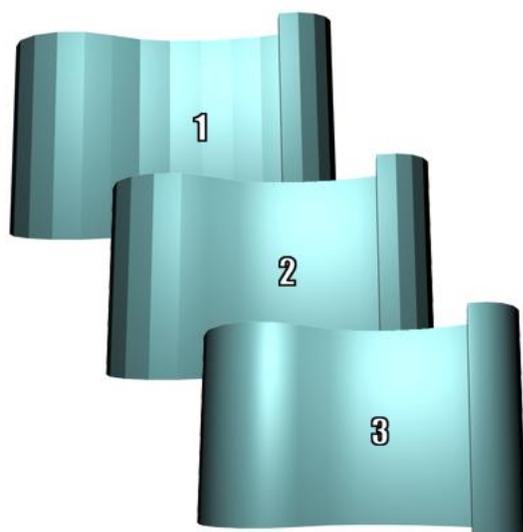
Consider creating a second source document just for export, and replace any unusual elements with similar objects created with known tools. Or, if the element is an entourage-type object, remove it from the source file altogether and add it in 3ds Max Design instead.

Facets

By default, imported objects are treated as faceted objects, not smooth ones. Smoothing out an object can be done in one of two ways in 3ds Max Design

Smooth Modifier

The Smooth Modifier does not affect geometry, but instead interpolates colors across faces to make rounded objects appear smooth. You can set the maximum angle (Threshold) at which face colors are interpolated. 30 degrees is usually a good setting for the maximum angle, but if you aren't getting enough smoothing you can set this number higher.



Smoothing with Threshold 0, 15, and 30 degrees

Adjusting Imported Objects in 3ds Max Design

After you import a scene into 3ds Max Design, it might end up out in 3D space somewhere. It's best to bring your scene back to somewhere near 0,0,0 so you (and others) can work with it more easily.

Organizing your objects is a key part of working in 3ds Max Design. There are several options for doing this. You might find Layers are the most intuitive for you.

You will probably have to scale your imported objects as well to bring them to real-world scale (RWS). RWS is vital for photometric lighting solutions, and it makes it easier to combine scenes.

For scaling in 3ds Max Design, it's fine to use the Scale transform as long as the object will not be linked or animated later. If the object is going to be linked or animated, you'll need to use a scaling solution other than the Scale transform such as Reset Xform, or scaling at the sub-object level. Otherwise, the object will skew when animated.

Selecting Entourage

As the definition of Entourage, the Revit Architecture help says: *Entourage includes the landscaping and other environmental features shown in a rendering of a building. For example, entourage can include plants, trees, people, cars, signs, and office clutter (such as picture frames and computers).*

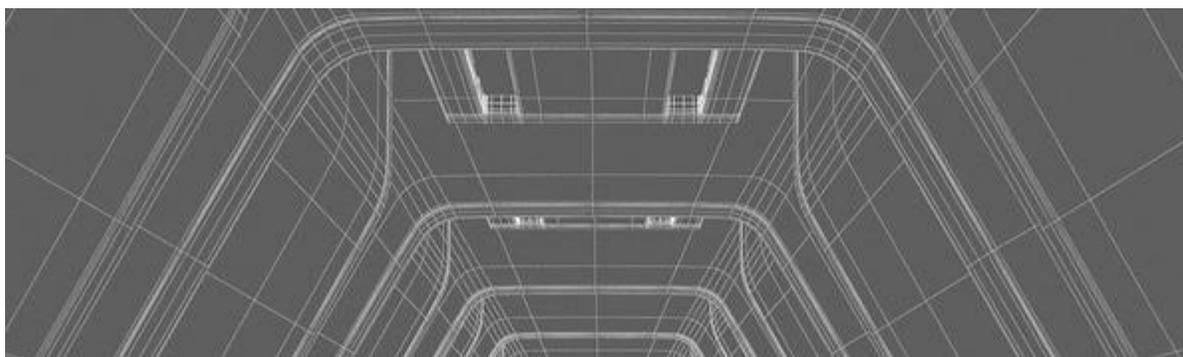
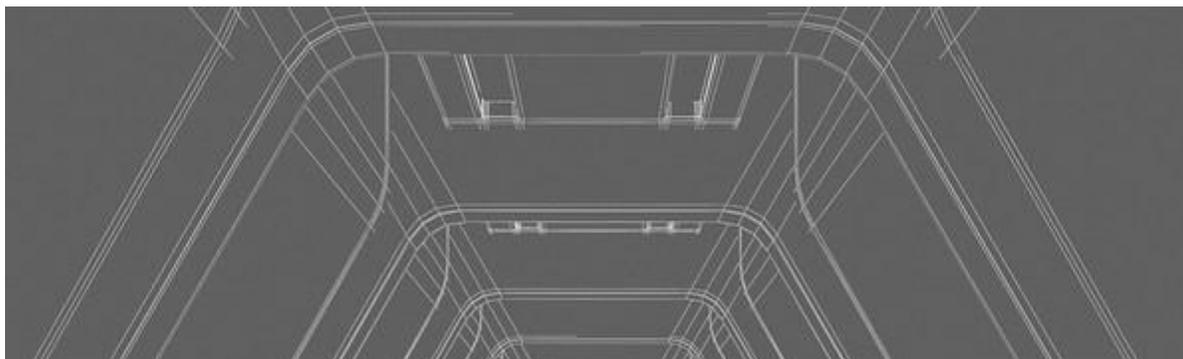
If you're going to use 3ds Max Design for rendering, consider adding all the entourage within that program. This will help ensure all the elements are optimal for rendering.

Whenever possible, entourage content should have the following attributes:

Quad topology. This type of grid-based geometry forms objects that are easy to edit, re-texture, and animate.



Holding edges and good edge flow. Objects with these attributes respond well to subdivision (automated addition of detail) for close-ups. If you need to do close-ups of your design, you might consider replacing some of your imported AutoCAD or Revit elements with modeled 3ds Max Design objects that have holding edges. Then you can subdivide and get in as close as you like.



Real-world scale. This is important so merged objects come into the existing scene at the right scale.

And of course, you should check for isolated vertices, coincident faces, etc. in all your models and clean them up before using them.

CheckMate Pro Standard

TurboSquid developed the CheckMate Pro standard to flag models that meet the requirements above. You can browse the wireframes of CheckMate Pro models at the [TurboSquid website](#) to get an idea of best modeling practices.

You can use the terminology above to communicate to your 3ds Max Design artists. TurboSquid also has numerous free help articles and training videos that you can ask them to look at, to ensure the content they make adheres to these standards.

TurboSquid also has free tools for checking models for CheckMate Pro attributes, available at [TurboSquid.com/CheckMateTools](https://www.turbosquid.com/CheckMateTools). You can download these tools and use them as you like to check your own in-house or contract models.