



From BIM to Beautiful: Utilizing Revit Models for Architectural Visualization

Daniel Dixon – The Beck Group

AB5296 Learn to combine logical modeling practices with the powerful FBX file interface, and discover the potential of your Revit software models in 3ds Max software and real-time environments. In this class we will explore the benefits of the Revit software feature set—such as level of detail, material appearance, element IDs, model categories, and many more—to create visualizations in external applications using the FBX file format as our main pipeline. Our journey will begin in Revit, followed by 3d Studio Max, and finally the Unity3d game engine. Examples will include a small standalone project as well as a large athletics complex.

Learning Objectives

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

- Learn how to establish logical strategies for structuring model information.
- Learn how to use the FBX format to export models to external applications.
- Navigate the model structure to modify materials and elements.
- Learn how to update design changes on demand for static and/or real-time.

About the Speaker

Daniel Dixon has an expansive background that combines engineering, architecture, 3D visualization, and digital fabrication. He began exploring real-time architectural visualization in 2010 while working as a research assistant at Georgia Institute of Technology, and he has been using a variety of Autodesk, Inc., products for the past 13 years in both academic and professional settings. He currently coordinates design, Building Information Modeling (BIM), and visualization at The Beck Group's regional office in Atlanta. Daniel holds a Master of Science degree in architecture from Georgia Institute of Technology and a Bachelor of Arts degree in architecture from Florida International University.

Part 1: The Revit Model

Better models, better results. Period.

The first important tip in this workflow is that the better you model is, the better your results will be (not to mention time-consuming). Below are a few ways to improve your model's functionality both in and out of Revit.

Develop good naming conventions

Having good naming standards is not only crucial to organizing models, but also for keeping track of information through the fbx pipeline. Try to avoid generic names and be somewhat descriptive. Throughout the model each family's name, type and materials will transfer with the fbx.

Use Level of Detail in Families

Revit is capable of displaying content at different levels of detail (LOD). This allows Revit to display the same family (Window, Curtain Wall, Door, Louver System) differently depending on how much visual detail each drawing needs. Not only is this helpful for documentation, but it can be a great ally when exporting models. For example, you may only want a curtain wall close to the camera to display detailed mullions, while other farther away can be simple rectangular extrusions, reducing poly count and overall rendering performance. You can read more about LOD [here](#).

Focus on Appearance Settings

Revit and 3d Studio Max have different ways of handling material information. In Revit, there are a few different ways of understanding a material. The “**Identity**” tab in the material editor contains overall properties, such as name, type mark, description. The “**Graphics**” tab determines the default graphical display (color, line work, hatch patterns, etc) in drawings as well as conceptual 3d views. The “**Appearance**” tab controls all of the realistic visual properties of the material. These properties will be the ones transferred to 3ds Max. The settings don't have to be perfect, but having good textures in Revit will greatly help down the road. You can read more about material browser [here](#).

Beware “free” Revit content.

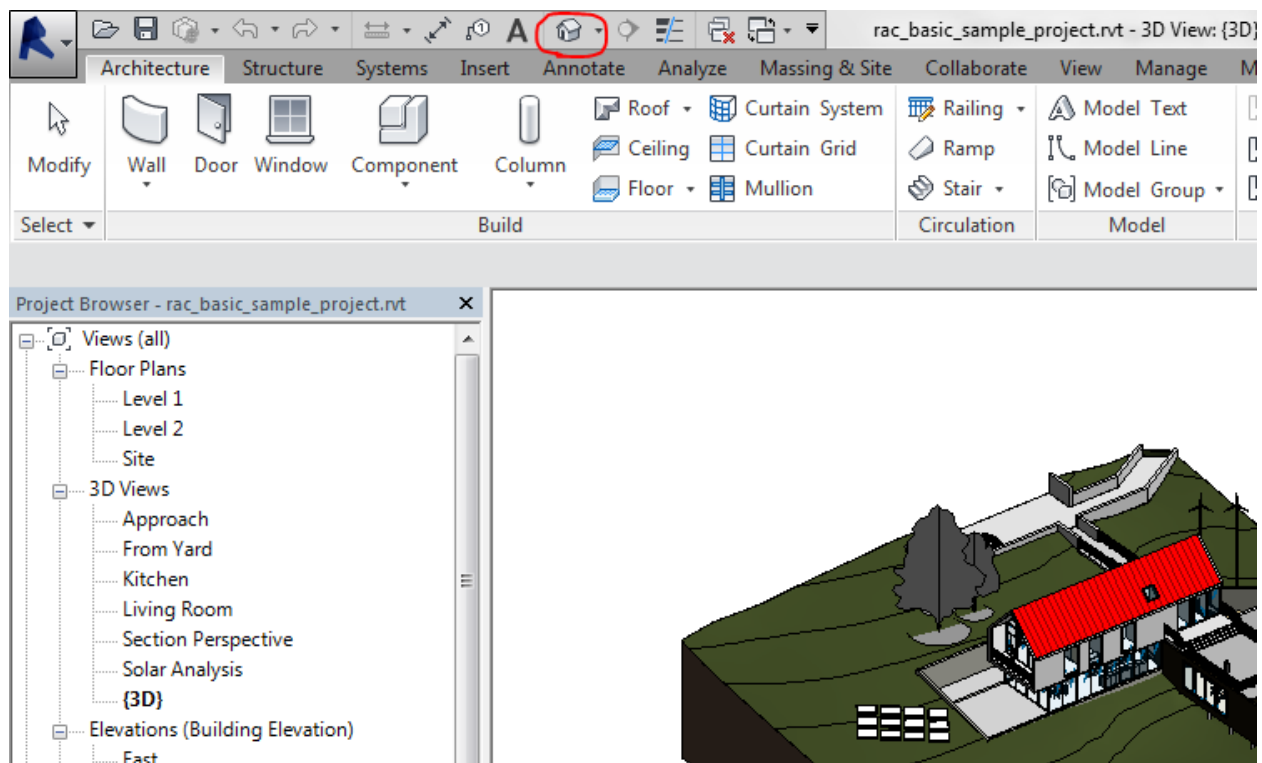
Generally, paid content from reputable websites is better quality than unpaid content. Revit families are no exception. If you cannot create your own content in-house, you're likely better off buying it. The content from free sites is usually uploaded by a wide range of users with different modeling methods and there is usually little or no quality control. Content may look nice at first glance, but could slow your file performance or even corrupt it (which costs you time/money in the long run). Paying for content means consistency and generally better quality. Also, buying good content means you can often re-use it across multiple projects, so it's a great investment. Make sure you understand the licensing terms as well.

Part 2: The FBX Pipeline

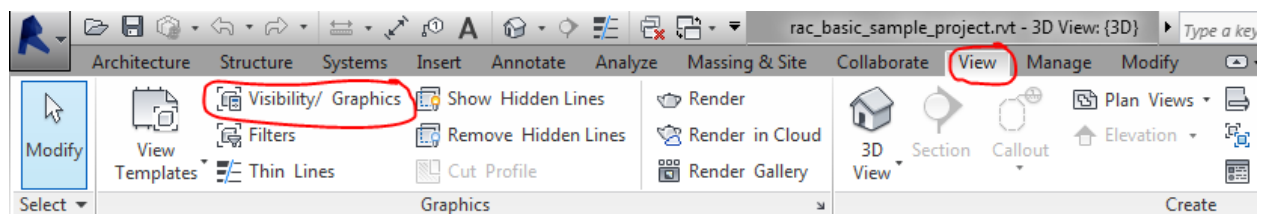
Exporting from Revit

Setting up your view

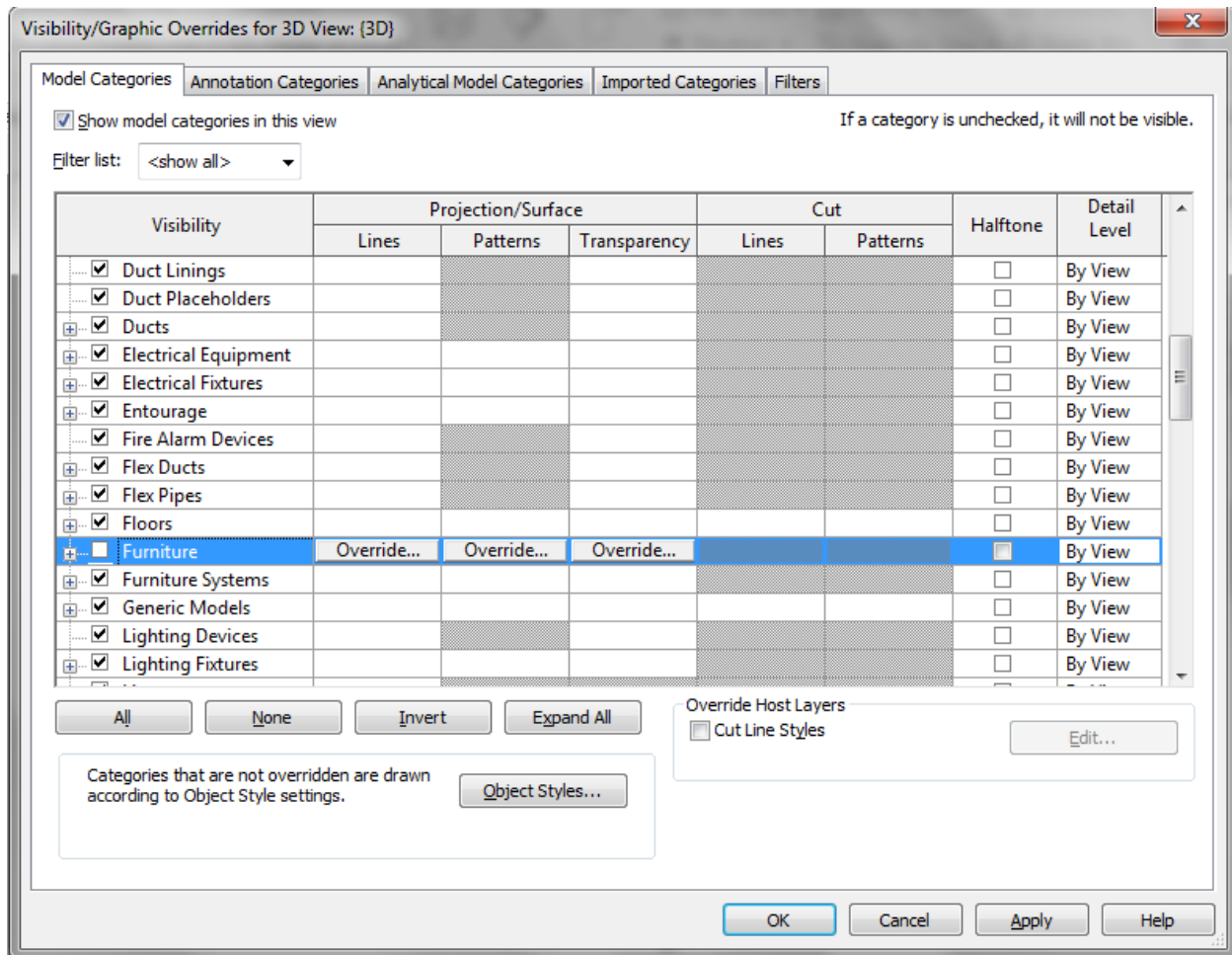
First, select a 3D view in the project browser. You can also create one by clicking the house button on the top ribbon. The FBX exporter will only work in a 3D View (plans, sections, or other 2D views will cause the option to gray out).



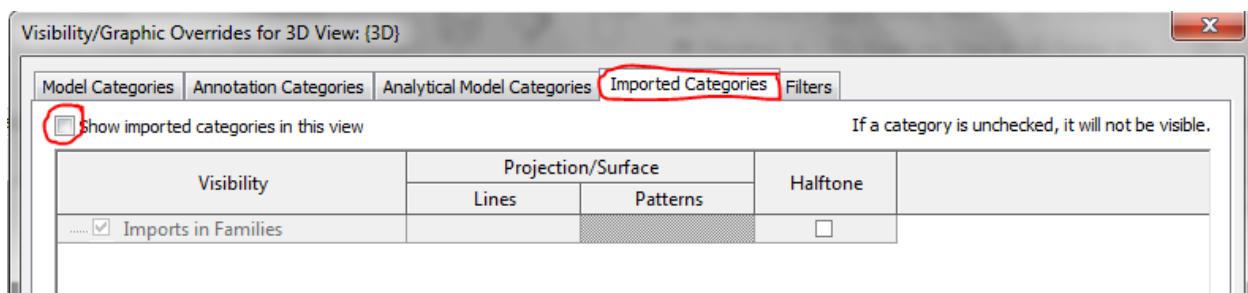
Use **Visibility/Graphics** to turn on all model categories. You can reach this from the “View” ribbon or by typing **V G** (or **V V**) on the keyboard.



Once turned on, un-check everything you do not want to export. In the example below, we’ve turned off furniture. Use the same procedure for filters. You can read more on controlling visibility [here](#).

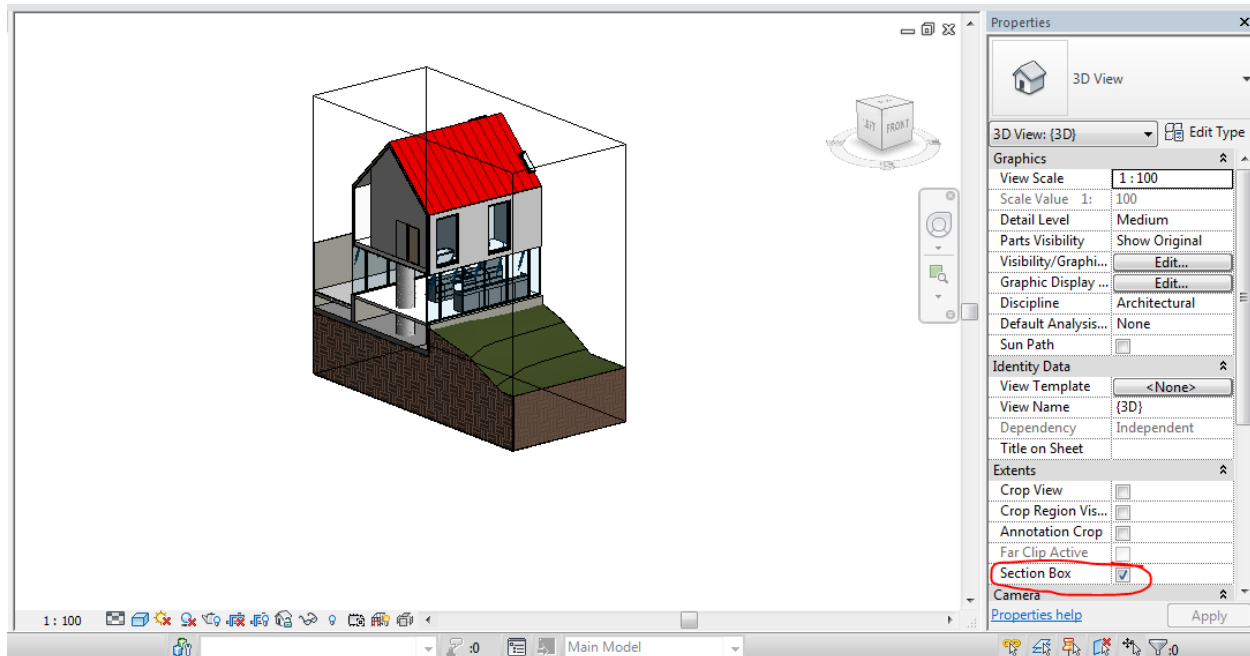


Be sure to turn off imported categories as well (un-check the box under the “**Imported Categories**” tab; they could increase file size (often with un-needed information).



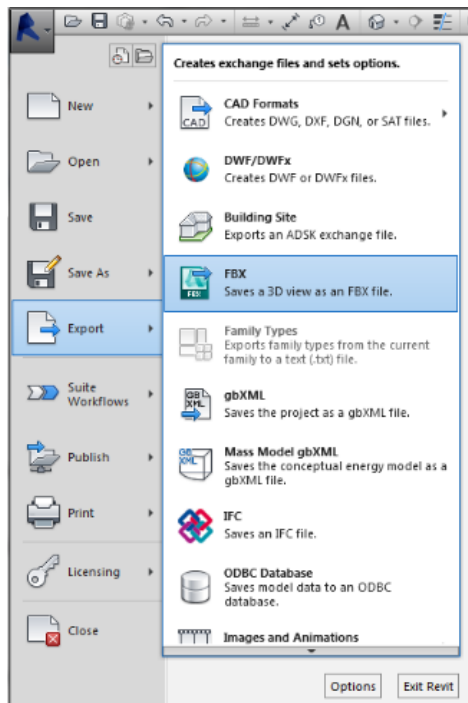
Be sure to export model links separately to reduce file sizes where possible.

If you only need a portion of the building, turn on the section box and crop the 3d model to size first. This will reduce the amount of information exported this keeping file size down. I recommend this approach wherever possible for interior renderings, especially in repetitive projects such as high rises.



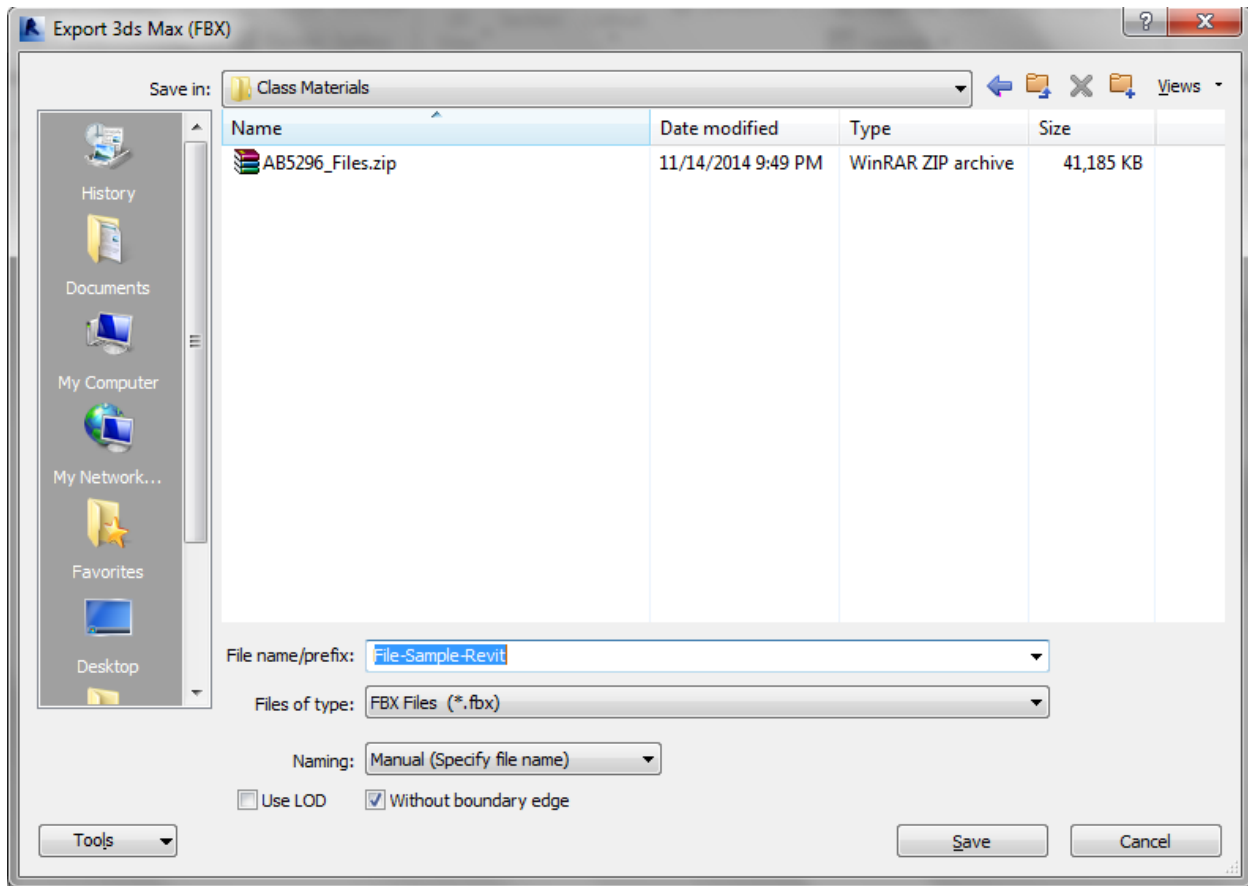
Export Settings in Revit

The settings in Revit exporter are very simple. Start by Clicking the Revit logo in the top-left corner of the Revit window, scroll down to “**Export**”, then select “**FBX**” from the list.



Once the dialogue box appears, browse to a location to save your files.

There are two options in the box. Leave them both un-checked. **“Use LOD” does not refer to the LOD in Revit.** It is a different way of interpreting the exported geometry. **“Without boundary Edge”** will generally appear better in 3ds Max. It will cause Revit to exclude edges between adjoining objects. I recommend turning this on.



Once you choose a file name, click “Export”.

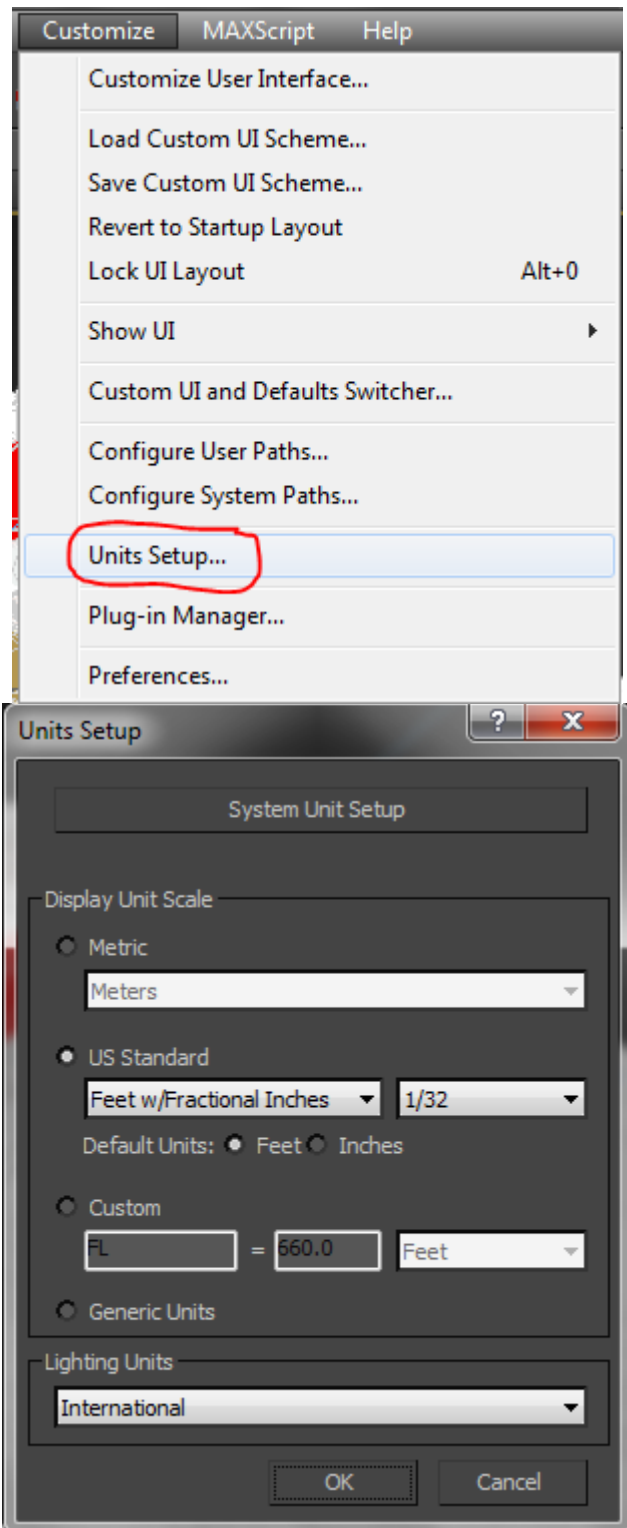
Tip: Add the name of the program you’re exporting from to the file name. This is especially helpful when exporting files from multiple programs and will help prevent you from over-writing the wrong one later.

Importing into 3d Studio Max

Setting Up Your Scene Units

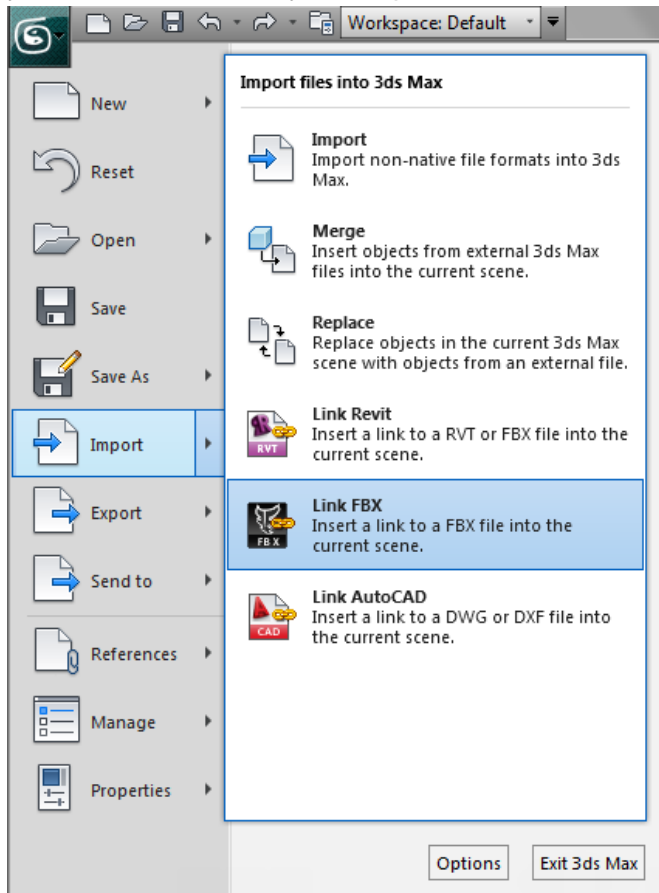
Under the “**Customize**” header, select “**Units Setup**”.

When the dialogue box appears, be sure to set the file to the appropriate units. Use either Meters or Feet. Inches generally will throw off the scale of an architectural model during import.

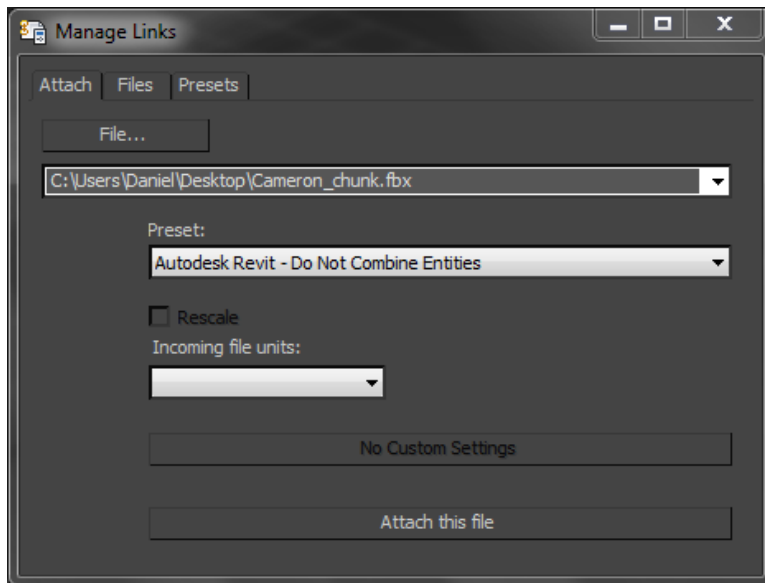


Importing the FBX file

In 3ds Max, click the logo in the upper-left corner, then select, “**Import**”, and “**Link FBX**”. Linking your fbx file will allow you to update the fbx with ease without duplicates.



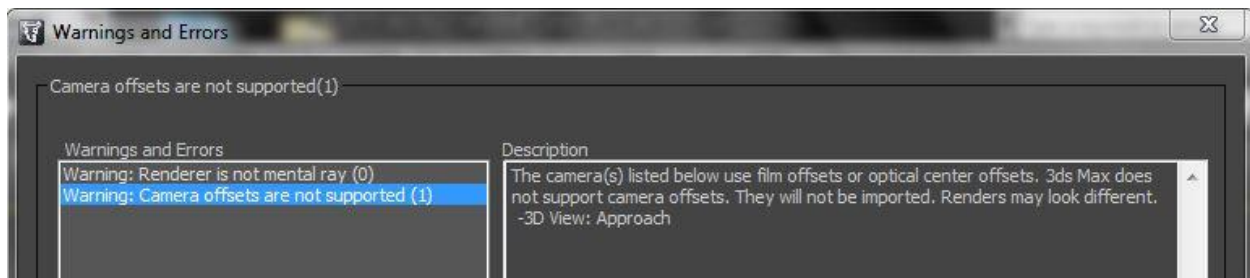
Browse for the file you saved earlier in Revit, and click “Open”.



In the manage links dialog, select “**Autodesk Revit- Do Not Combine Entities**”. Click, “**Attach this file**” and the model will import. Once imported, close the dialog box.

Note: There are some other options that offer greater optimization but less flexibility in editing. You can read more about them [here](#).

You will get an error about the imported camera. Revit's cameras generally do not import properly. If you have not assigned mental ray as your renderer, 3ds Max will give you an error for that as well. You can disregard these for now and continue. If you plan to use mental ray, you can assign it as the renderer after import.



Exporting to Unity3D (from 3ds Max)

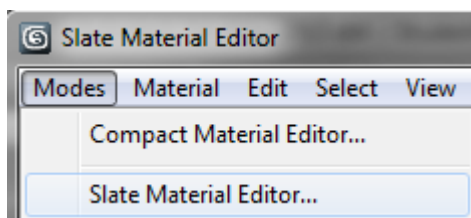
Converting Materials

If you plan on exporting to unity, the Autodesk materials and textures from Revit will not import correctly. You will need to convert them to standard materials first. The best way is to use a

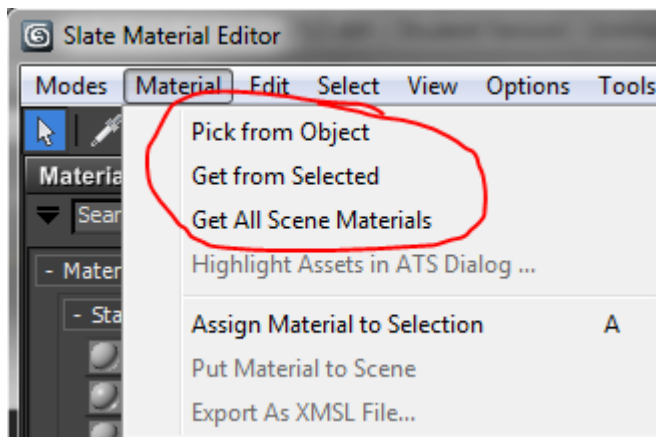
plugin, such as [Autodesk Material Converter](#). This costs some money but is a huge time saver, and will convert between Mental Ray, Autodesk, Vray, and standard materials in just one click.

You can also do this manually in the material editor. Use the slate material editor for this, as it is easier to re-link textures after conversion. Open the material editor by pressing “**M**” once on your keyboard.

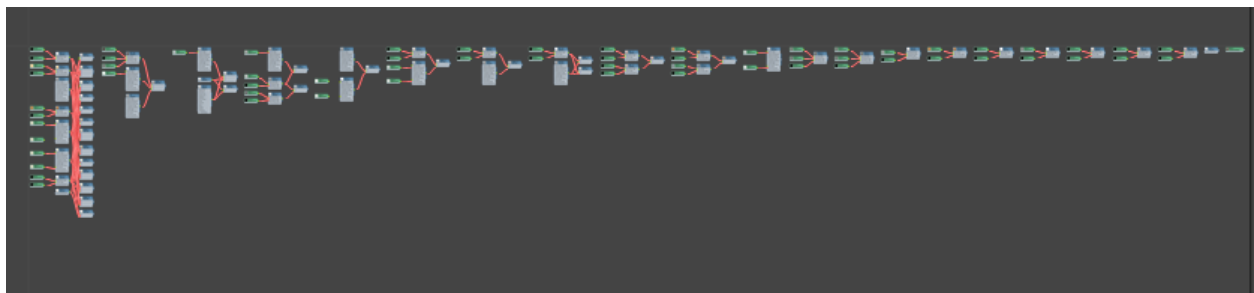
Depending on your settings, the material editor will appear as a large grid area (Slate) or as a palette with sample slots (Compact). To toggle between the two, select “Mode” then “Slate Material Editor”.

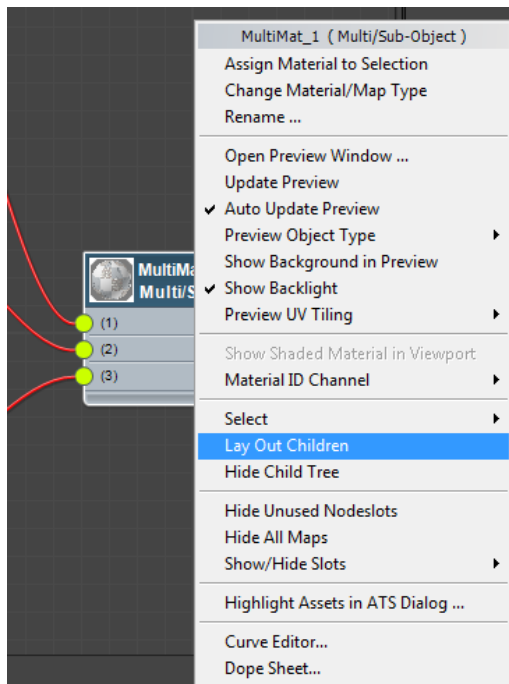


Once in the Slate editor, get scene material by using the eye-dropper tool or get all scene materials.

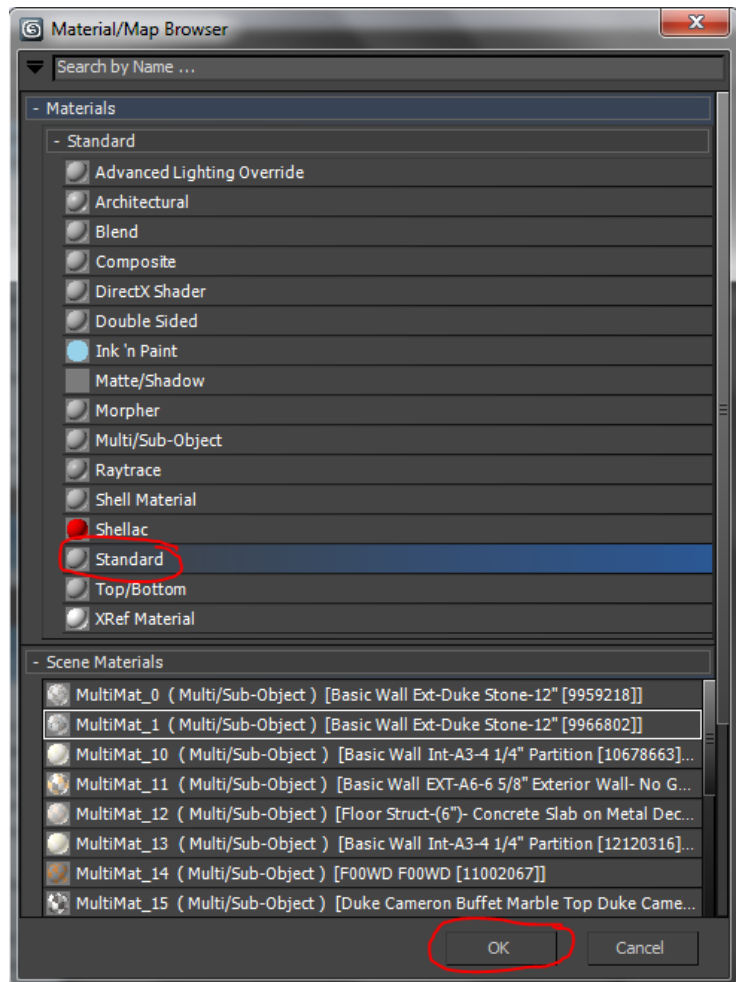


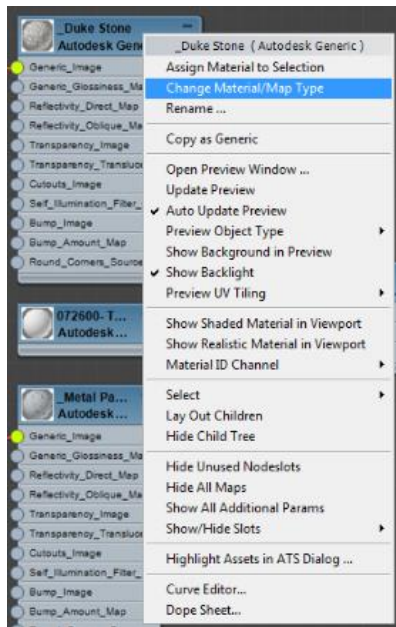
The materials from the linked fbx will populate the scene.





Select a material to convert by clicking on it. Sort the children by right-clicking and selecting **“Lay Out Children”** from the pop-up menu. Right click the material convert the material to Standard.

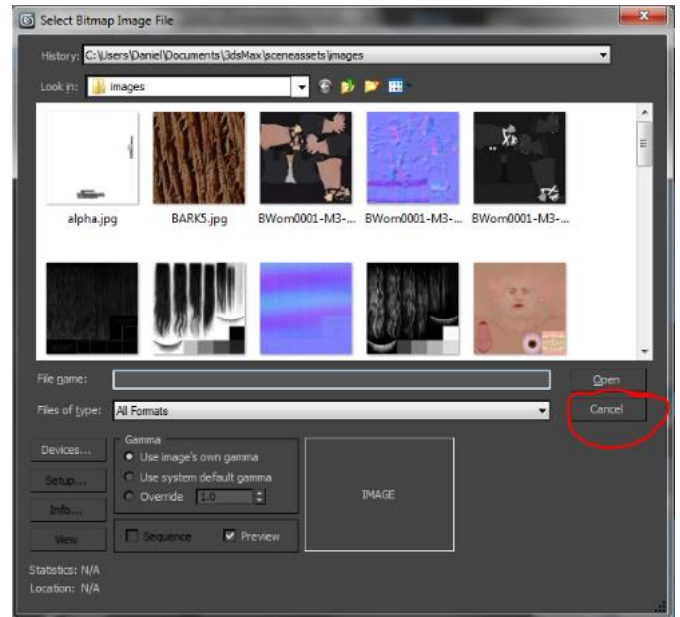
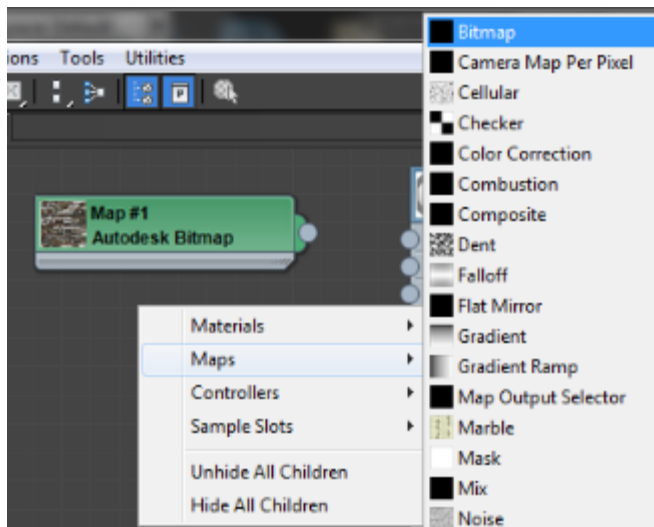




Right click the same material and select “**Change Material/Map Type**”. Select “**Standard**” from the materials type list, and click “**Ok**”.

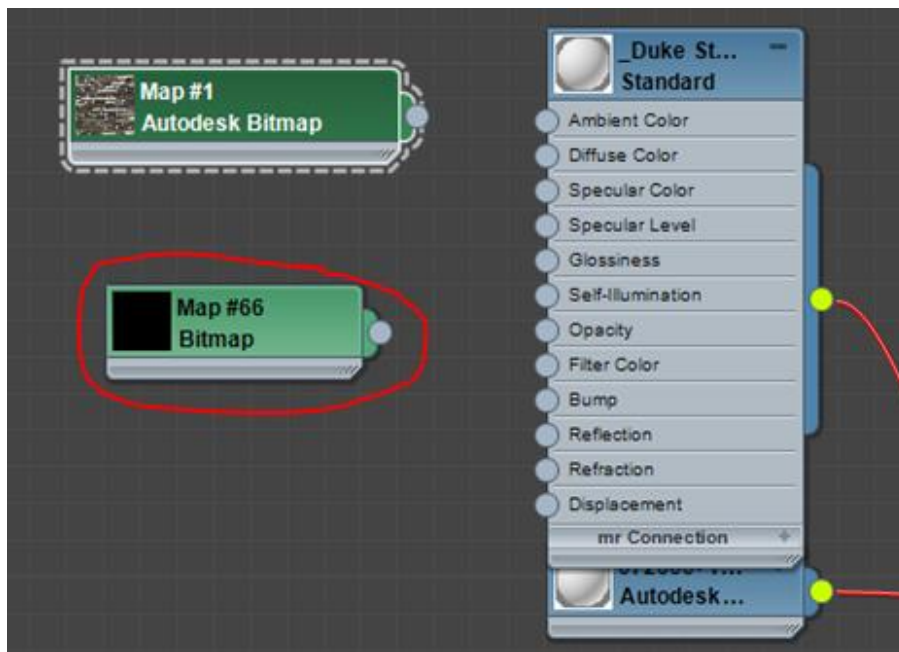
Next, replace the Autodesk bitmap with a standard bitmap.

To add a bitmap, right-click in a blank area and select **“Maps”** and **“Bitmap”**.

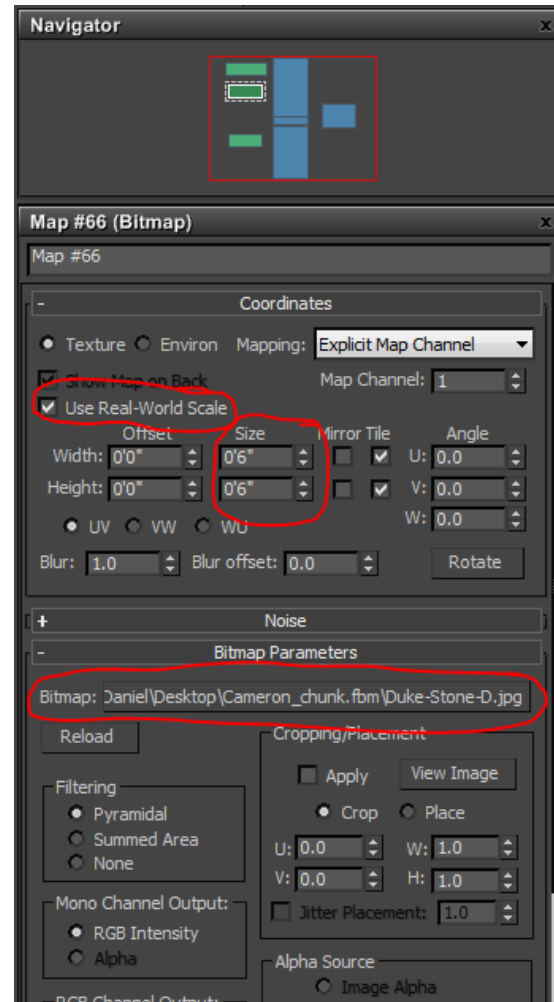
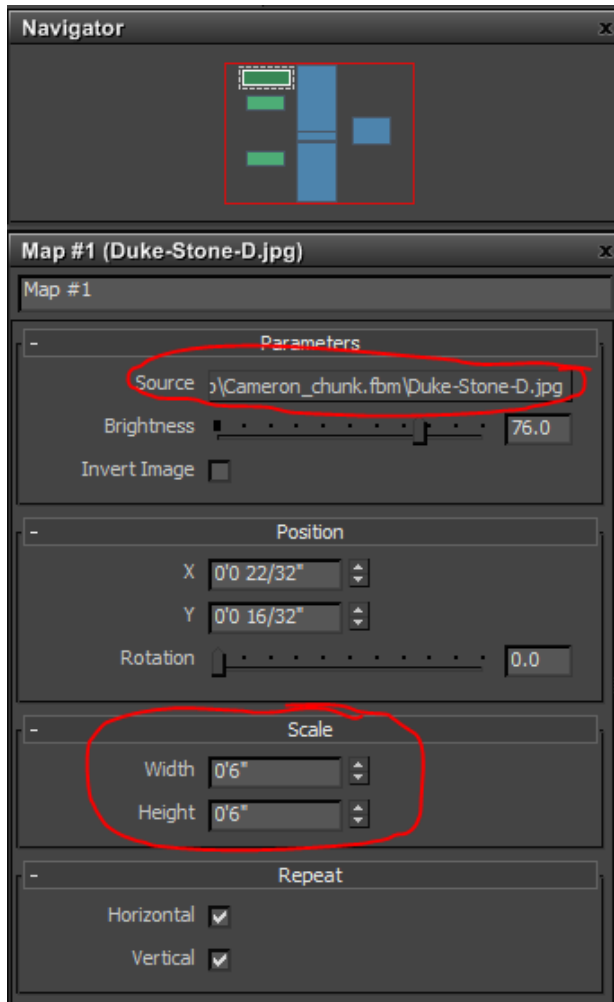


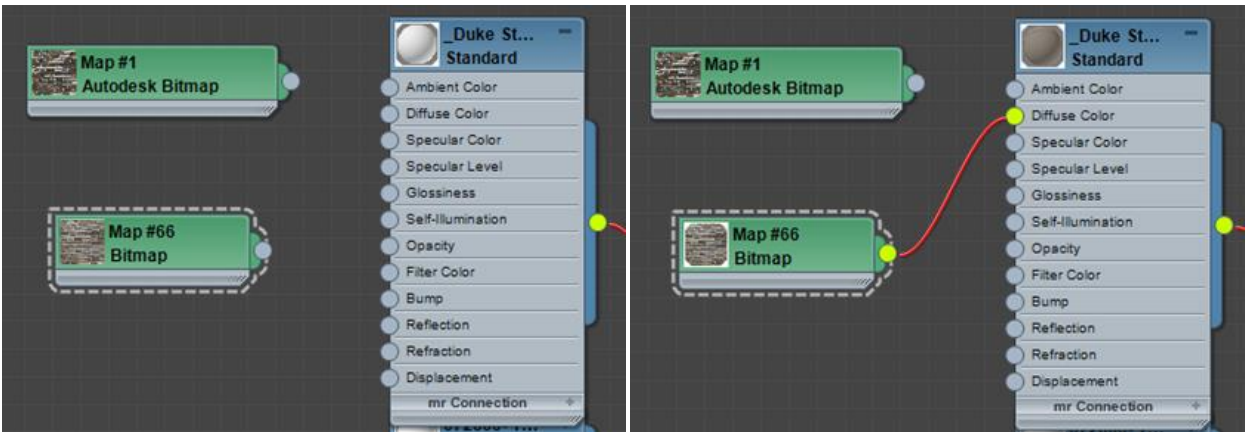
When prompted for a bitmap image, click “cancel”.

A new blank map node will appear on the screen. Double-clicking each bitmap to bring up the properties for each.



Right-click the image reference in the Autodesk bitmap and select **Copy**. Paste into the new bitmap using the same method. Match the scale settings as well (enable “use real world scale” to match units).



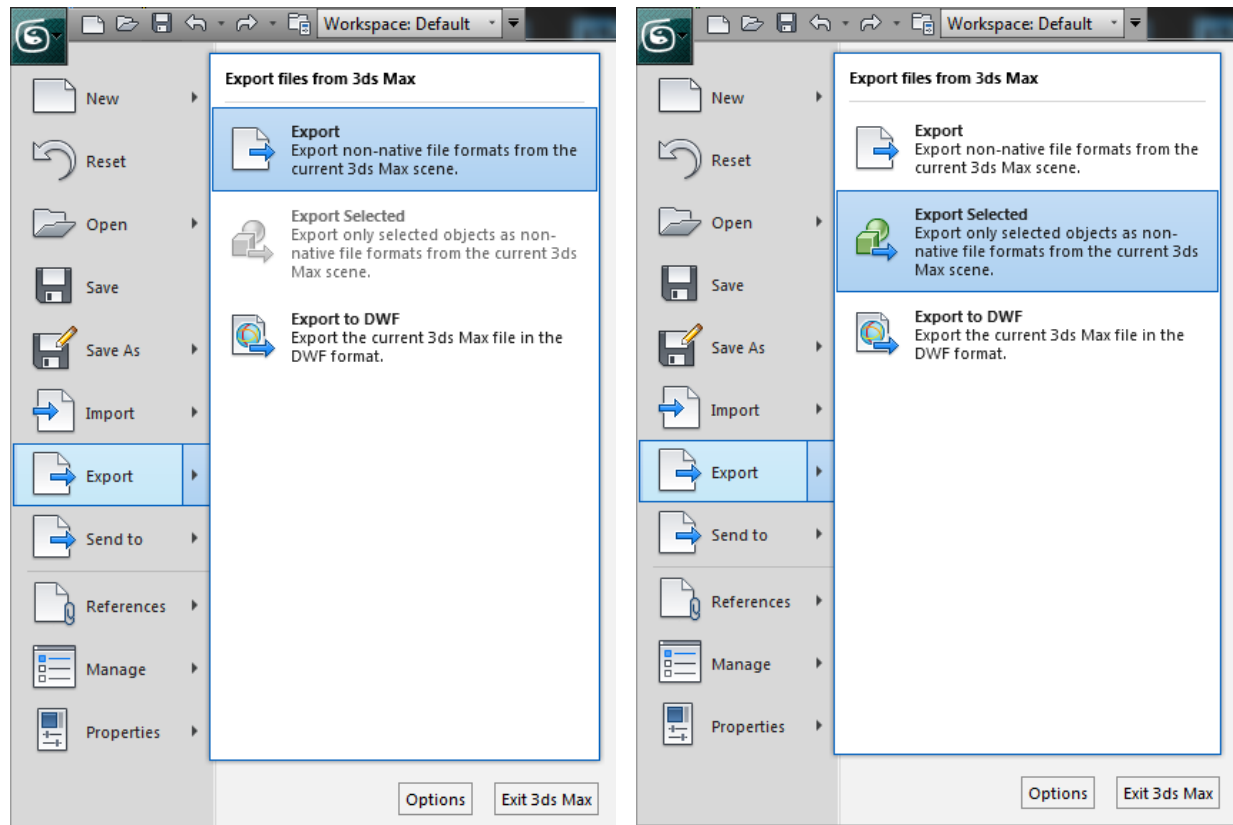


Connect the desired texture maps to the “**Diffuse**” slot by clicking and dragging from the circle on the side and releasing the mouse over the material circle.

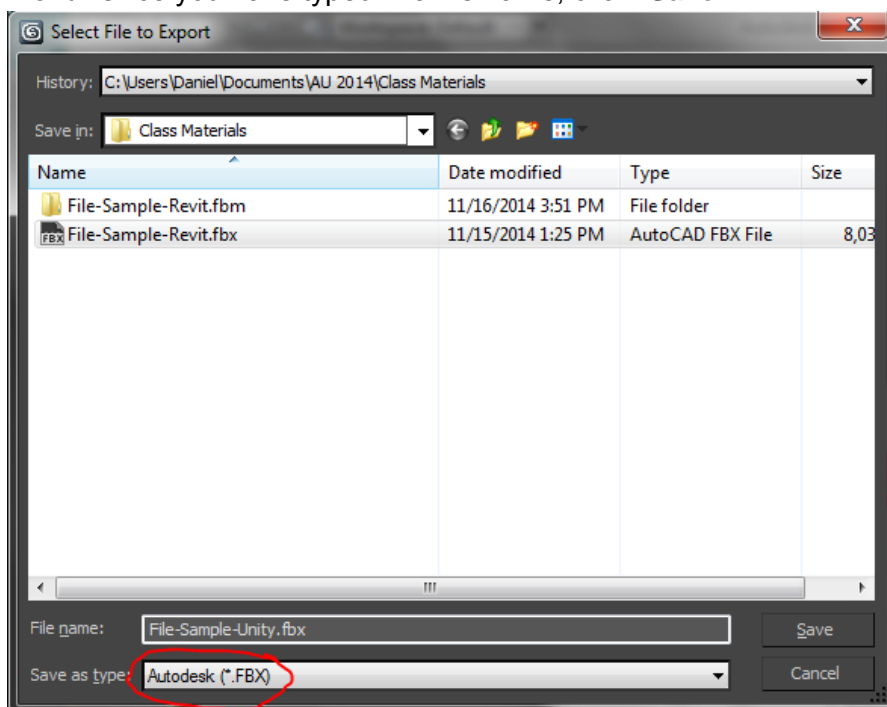
Repeat these steps for each material until you have converted the entire scene. You will only have to do this once for each material.

Exporting the Model

To export the model, click the 3ds Max logo in the upper-left corner of the window. Scroll down to “**Export**”. For the entire model, click “Export”. If you want to export only selected objects, select “**Current Selection**”.



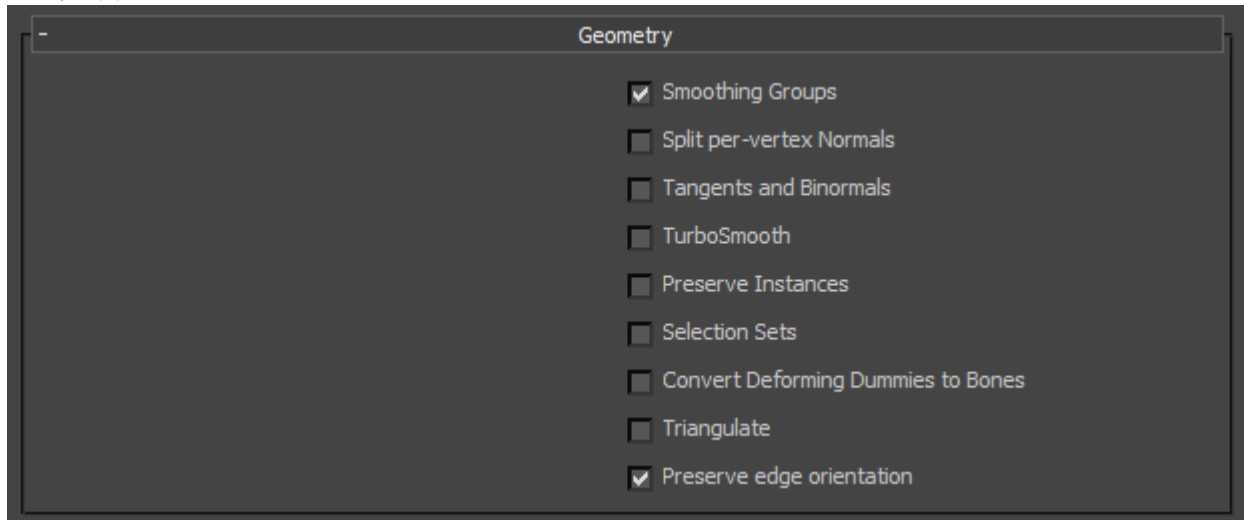
Browse to a folder location and be sure to select **“FBX”** from the **“Save as Type”** drop-down menu. Once you have typed in a file name, click **“Save”**.



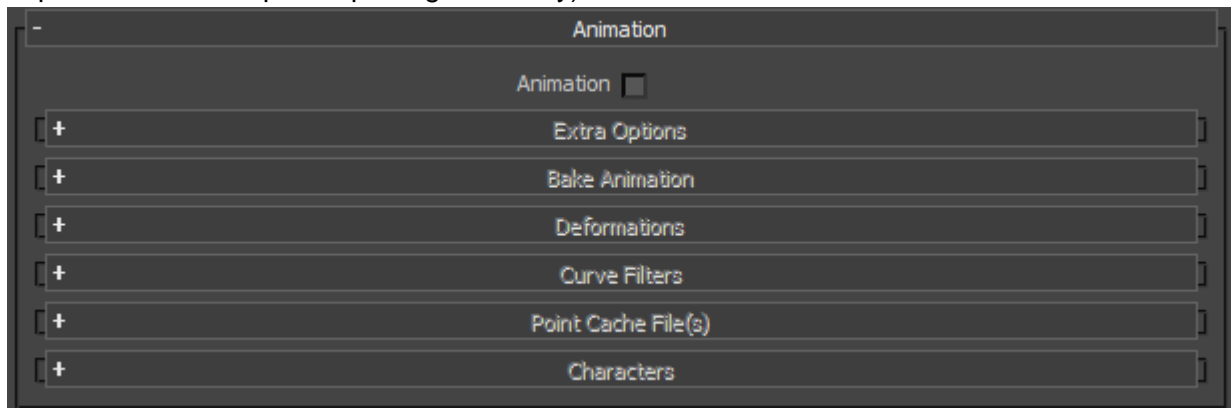
Export Settings

The following settings will allow you to export the scene geometry and materials. You can read the specifics on all export settings [here](#). You may also want to [save your settings as a preset](#) and naming it “Unity3D” or something similar for future exports.

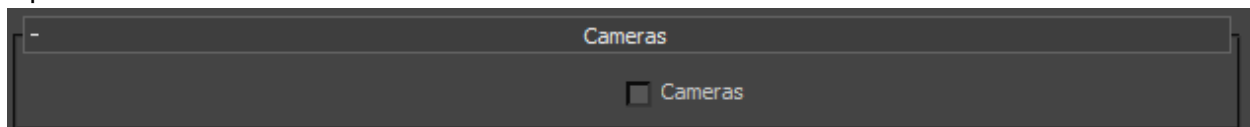
Geometry: Always keep smoothing groups and edge orientation for best results. Though not essential, preserving instances is also a good idea. It will help increase performance in your Unity apps.



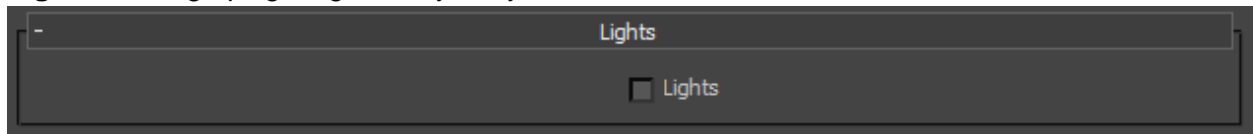
Animation: If you have animated an element in 3ds Max (i.e. a revolving door), export it separately and turn this option on. Otherwise this can be turned on or off (we can choose to not import animations upon importing into Unity).



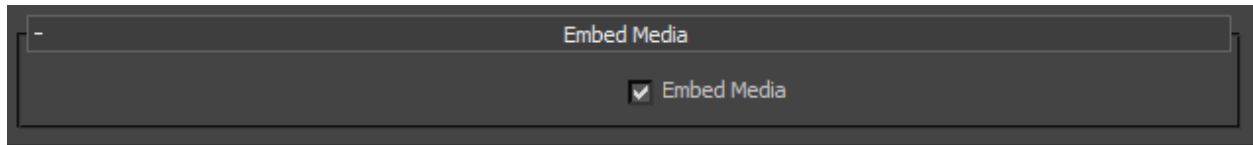
Camera: You will not need static cameras. The camera in Unity will be controlled with the player input live.



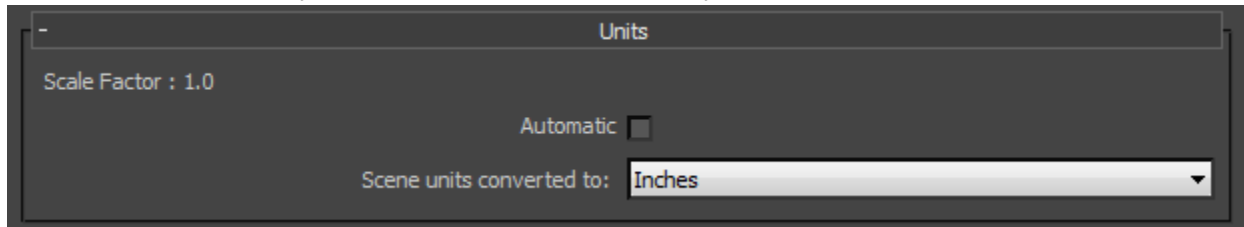
Lights: Setting up lighting in Unity will yield best results.



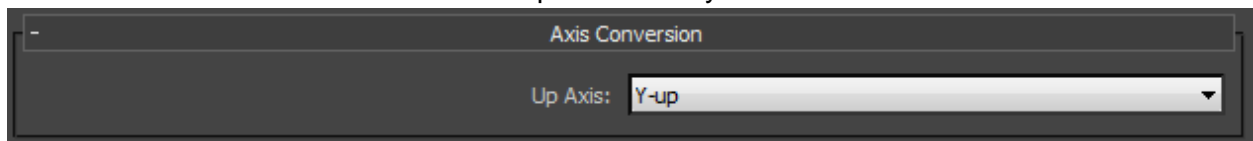
Embed Media: This will export all of your updated textures, so always turn this on.



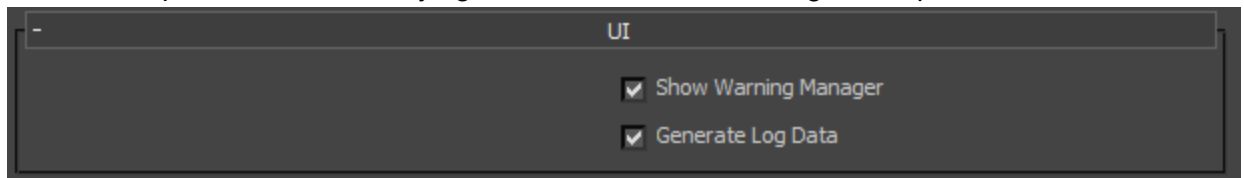
Units: Make sure that your units scale factor is 1.0. If you are in Feet and Inches



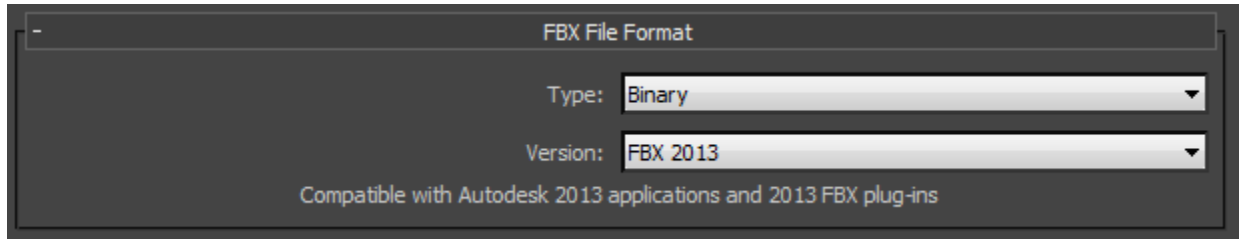
Axis Conversion: The Y axis is be the up axis in Unity.



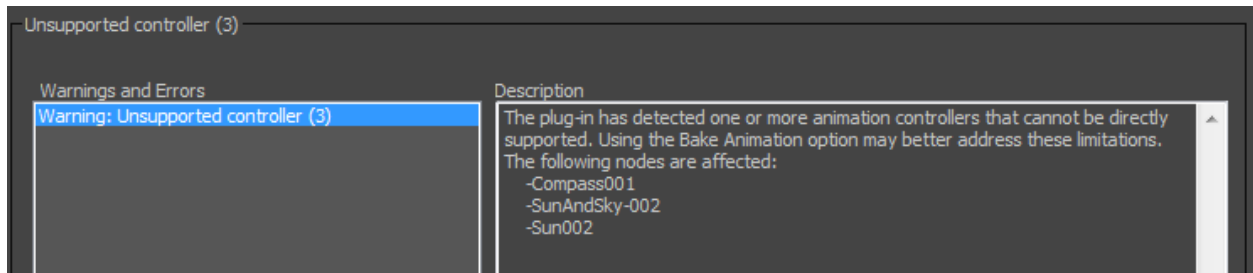
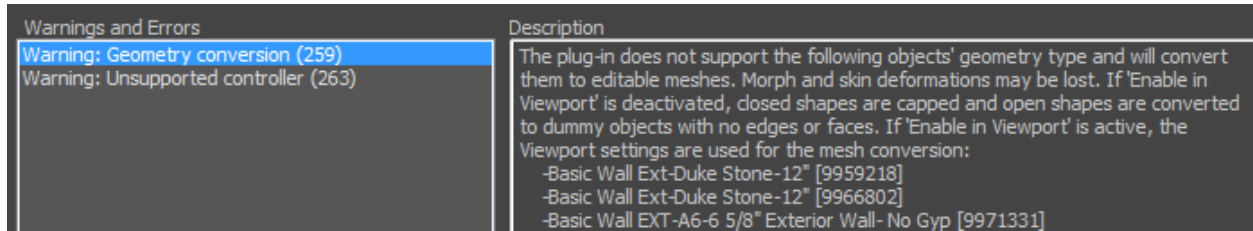
UI: This is optional, but it's always good to know about warnings on export.



FBX File Format: Choose the latest compatible version with Unity.



You may receive some errors below. You can simply ignore these and continue.



Importing into Unity3D

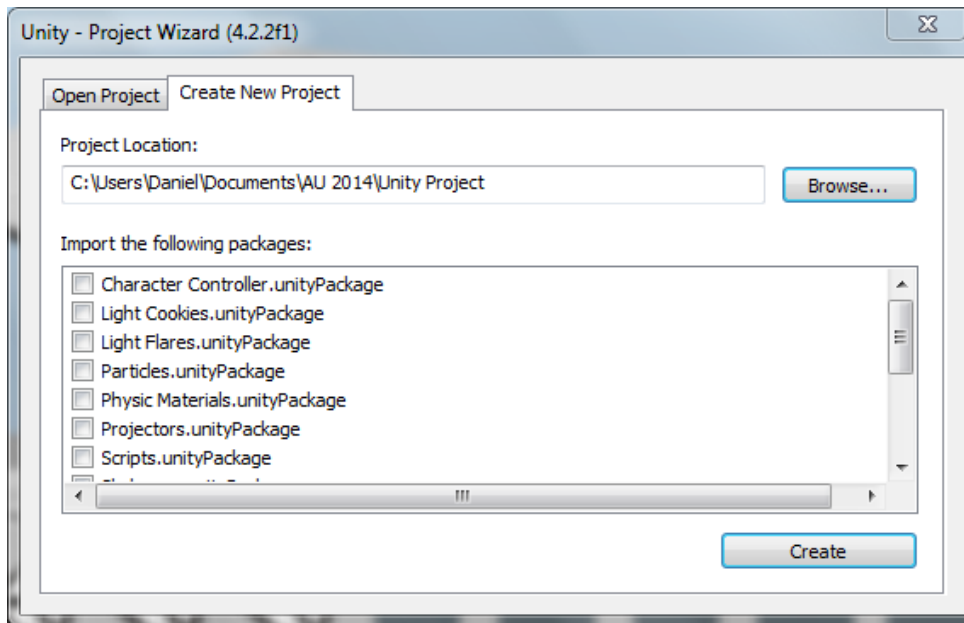
Starting a Project

Open Unity, then select "File", "New Project". Select the location of the project and create a new folder to use as your source folder. For all assets (working project files). You can also import these later if need be.

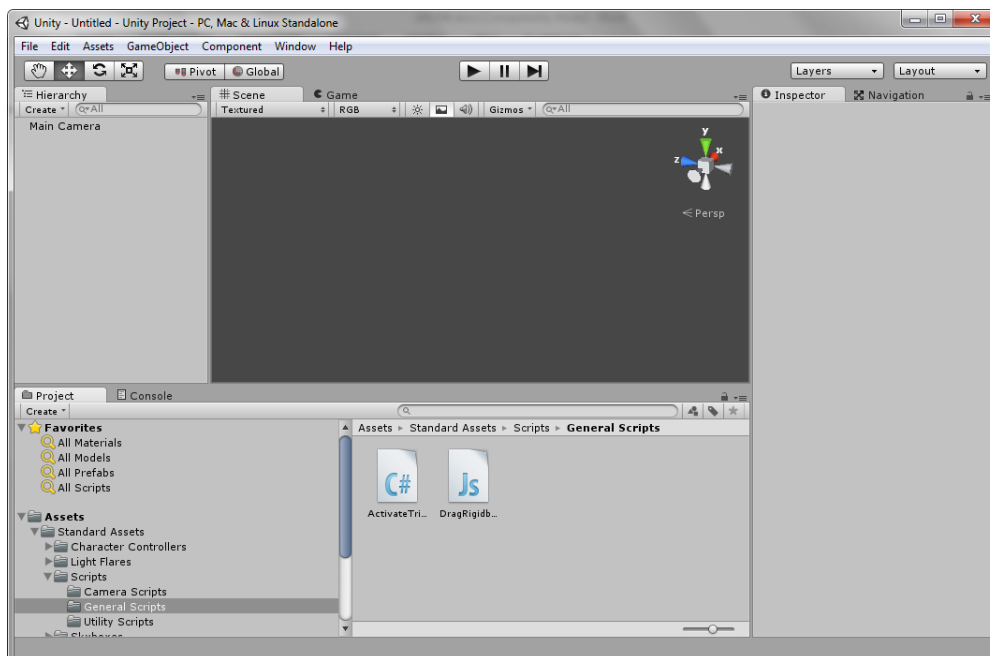
I recommend importing the following:

Character Controllers
Light Flares
Scripts
Skyboxes
Standard Assets (Mobile)

A dialogue box will appear giving you the option to import standard packages. These are assets which come bundled with the program to help you get started. Select the ones you want and click "Create".



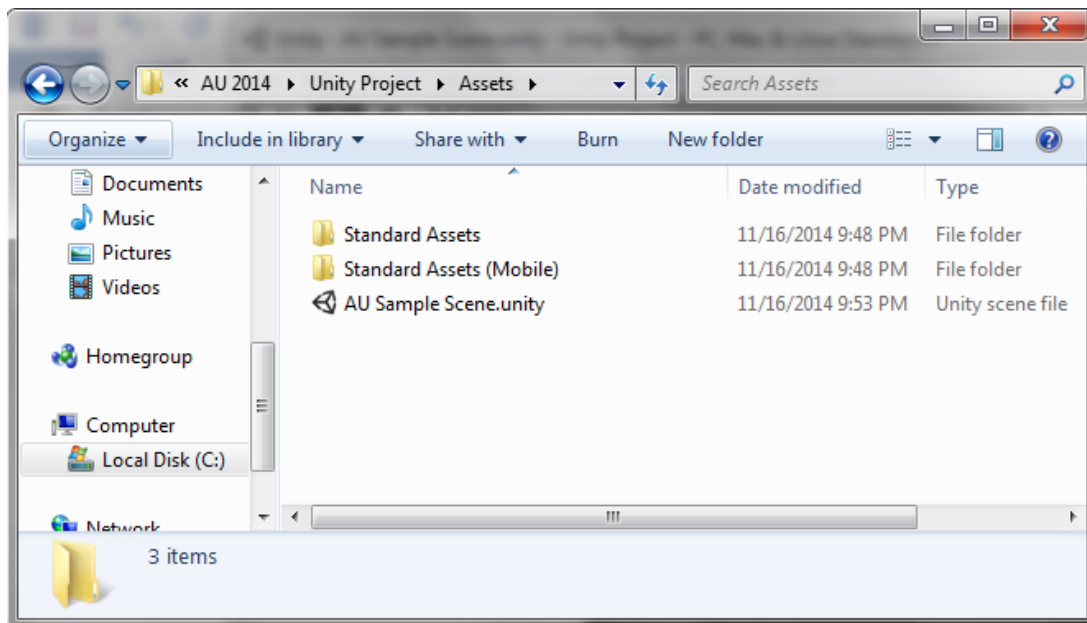
A scene will be created for you and your first project has now been set up.



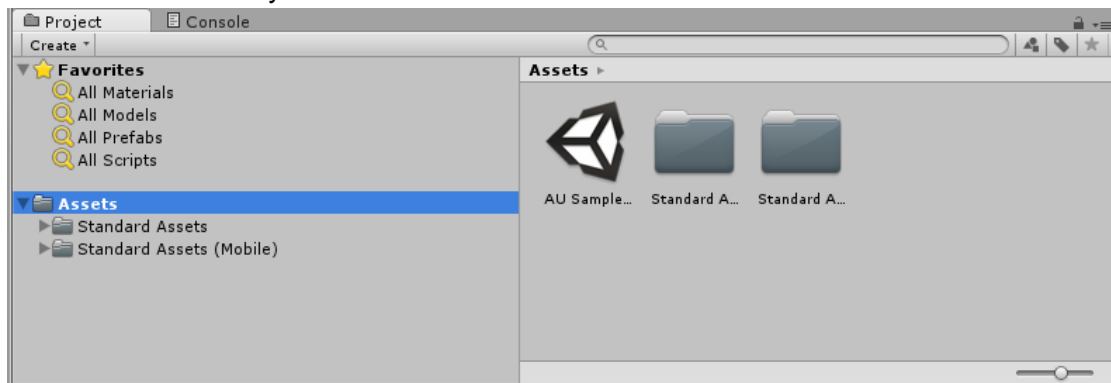
Importing the FBX Assets

Before importing the model, make note that the Assets folder in Unity application mirrors your Assets subfolder in your Unity Project on your hard disk.

Assets folder in windows....



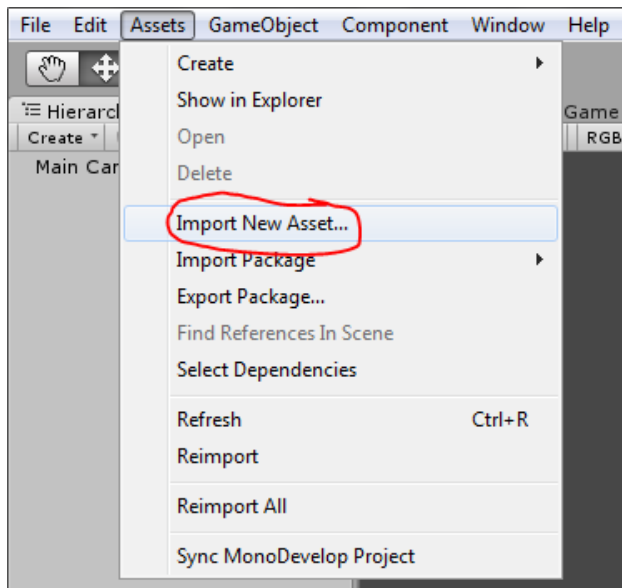
Assets folder in Unity



There are a few ways to import assets (project files) into your Unity project. The most common is to browse to the file in Windows Explorer then click & drag it into the Unity assets folder.

Alternatively you can copy the fbx file to your Assets folder in windows and Unity will update its browser and import the file automatically.

Finally, you can always browse for the file by selecting "Import Assets" from the "Assets" menu (top of the window), or by right clicking anywhere in the file browser (bottom by default).



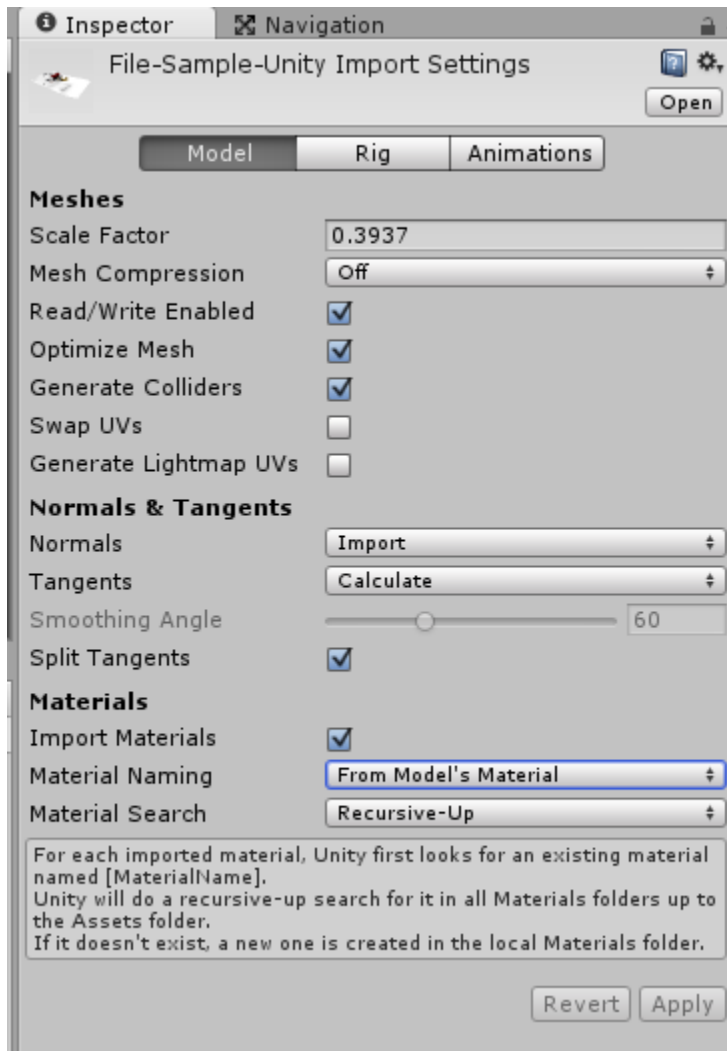
Save the scene by pressing CTRL+S or by clicking “File” the Save Scene”.

Two folders will import. The fbx file, and a folder for materials. If you want textures, copy in your **fbm folder** and rename it “**Textures**” in the browser. The textures you have assigned will automatically import.

Once you have imported the fbx file, select it in the browser. The **Inspector** tab (on the right by default) will work similarly to the **Revit** Properties window. This is where settings are modified for each object in the project. Once you click on the file in the asset browser, the import setting will show in the inspector.

Import Settings

The following are recommended settings for importing.



There are a few important options to note when importing.

Scale Factor: Unity does not have an official unit system, but it functions in meters. If your model was in Feet & inches in 3ds Max, use a scale factor of .3937. If your model was in meters, then you can keep it at 1.

Generate Colliders: This must be turned on in order to navigate the model during a walkthrough. Without them, you will fall through the floor (literally) on runtime.

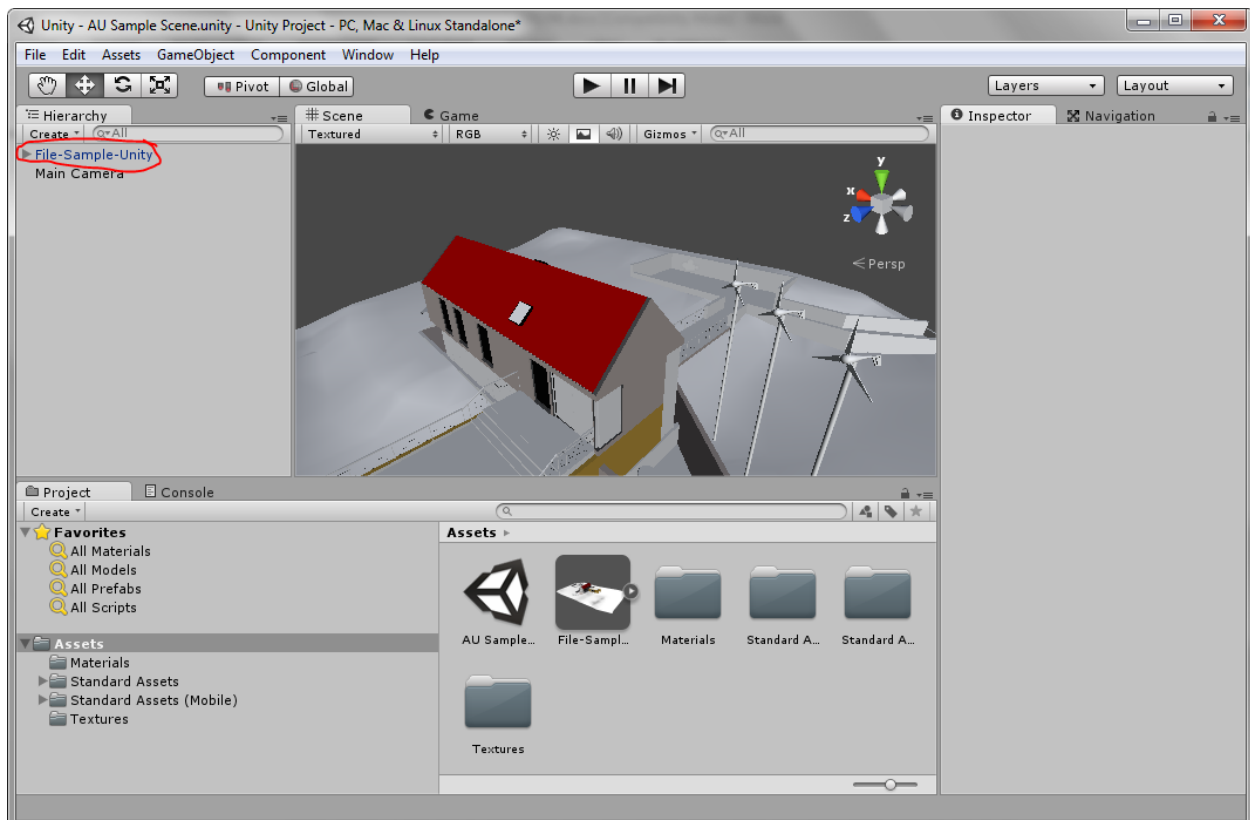
Generate Lightmap UV's: This option is great if you don't have interactive lighting conditions. It will allow you to bake light maps on your models in Unity. It's a great feature for and is very effective in both improving light/shadow quality and optimizing your game application.

Materials Search: Recursive Up is the most ideal for updates, because Unity will first look to see if there are any new materials before importing others. This is especially helpful when you are bringing in a model in pieces from 3ds Max.

Click **“Apply”** at the bottom once your settings are revised.

Placing the Model in the Scene

To place the model in your scene, simply click and drag it from your asset browser to the **“Scene”** tab (left panel by default). Your model will appear in the viewport and in the **“Scene”** tab.



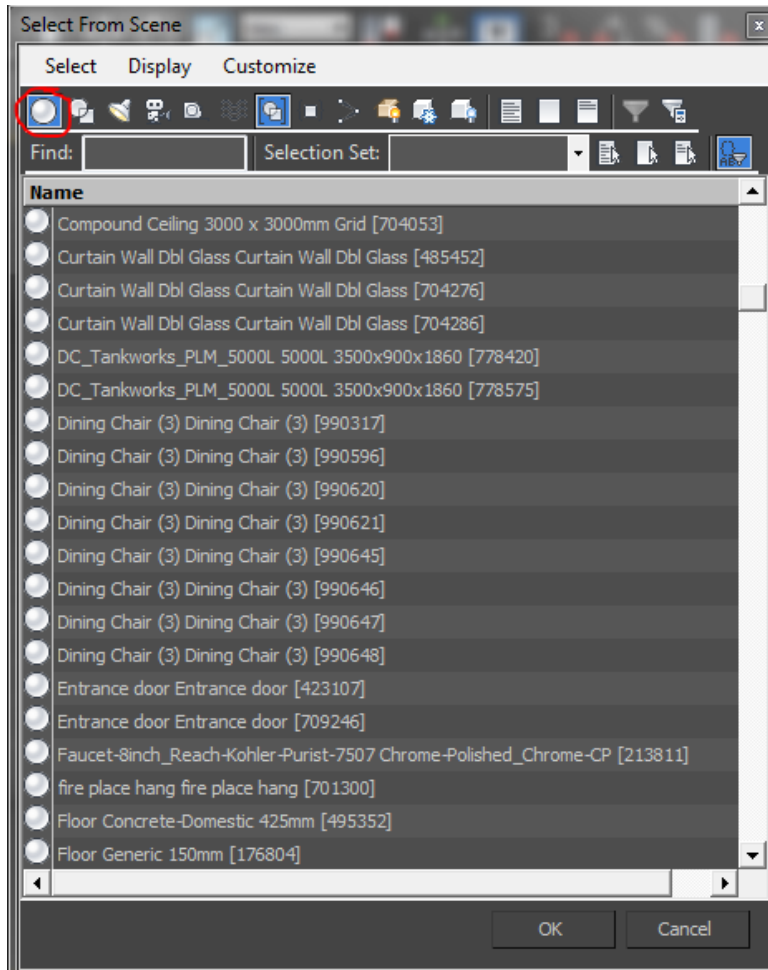
Part 3: Navigating/Modifying the Model

Your Model in 3ds Max

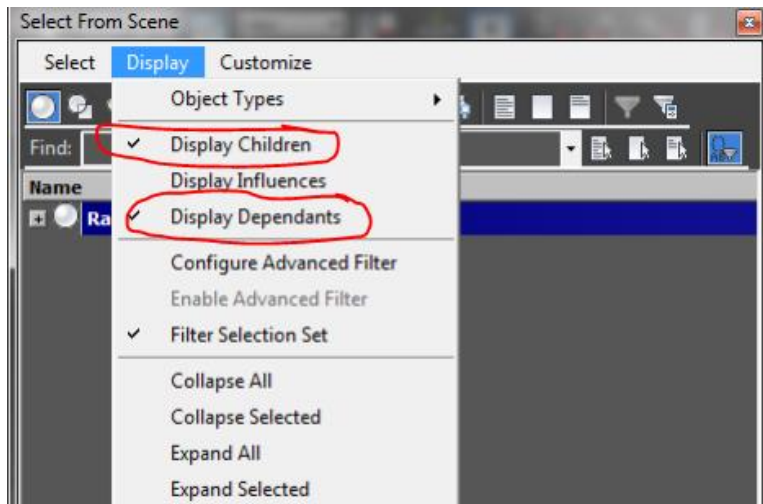
Elements by Name

To find the element in the scene, you can use the **Select from Scene** Dialogue by pressing **“H”** on your keyboard. A pop-up will appear with a list of all objects currently in the scene as well as advanced selection controls. To select only geometry, toggle the buttons by clicking them until

only the circle symbol is selected (see image below). The symbol in brackets will leave groups turned on as well.



Another helpful tool is to enable the display of children (sub-families) and dependents (instances). Click “Display” at the top of the window and click each option to toggle it on. This will allow you to better understand the model’s hierarchy.



Notice that each object has retained its family information. The object is named based on the following format:

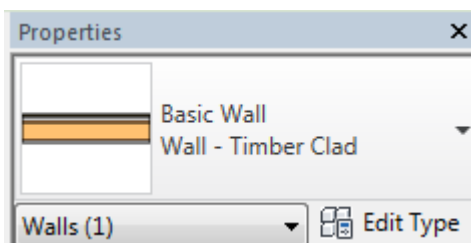
For system families: **System Family Name** **Family Type** [Element ID]

For loaded families: **Family Name** **Family Type** [Element ID]

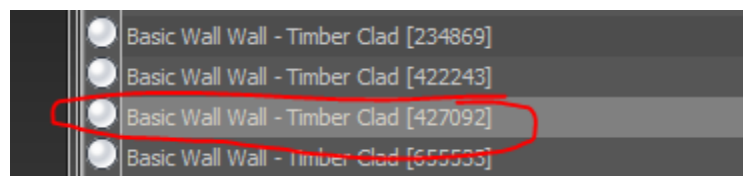
Example 1

A system family such as a wall, will be named as follows:

Basic Wall **Wall -Timber Clad** [427092]



A wall in Revit

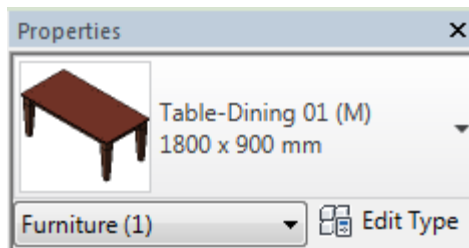


The same wall in 3ds Max

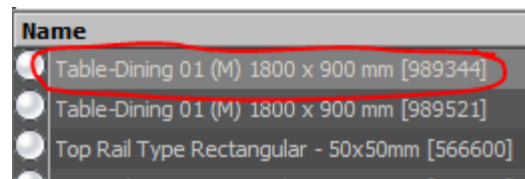
Example 2

A loaded family such as furniture, will be named as follows:

Table-Dining 01 (M) **1800 x 900 mm** [989344]



A table in Revit



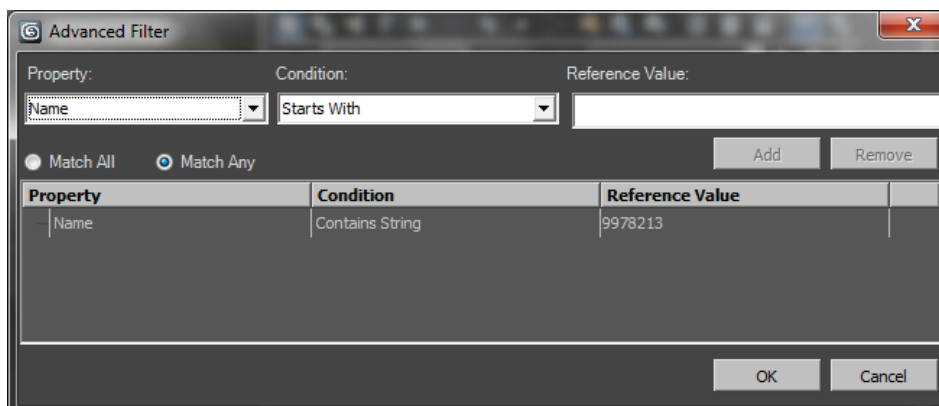
The same table in 3ds Max

You can also search by any of the key words using a custom filter. To do this, begin by clicking the funnel symbol on the top-right of the selection list window.

Elements by ID

You can use an element's ID to find an object in the scene. First, obtain the element ID from the Revit model. If you are a consultant you can contact your client and have them look up the ID in the model. Do this by clicking an object in the Revit view and selecting "**IDs of Selection**" under the "**Manage**" ribbon.

To select individual objects by ID in 3ds Max, use the filter option and simply type it into the custom filter (remember to select "contains string"). It will select the object that corresponds to the Revit ID.



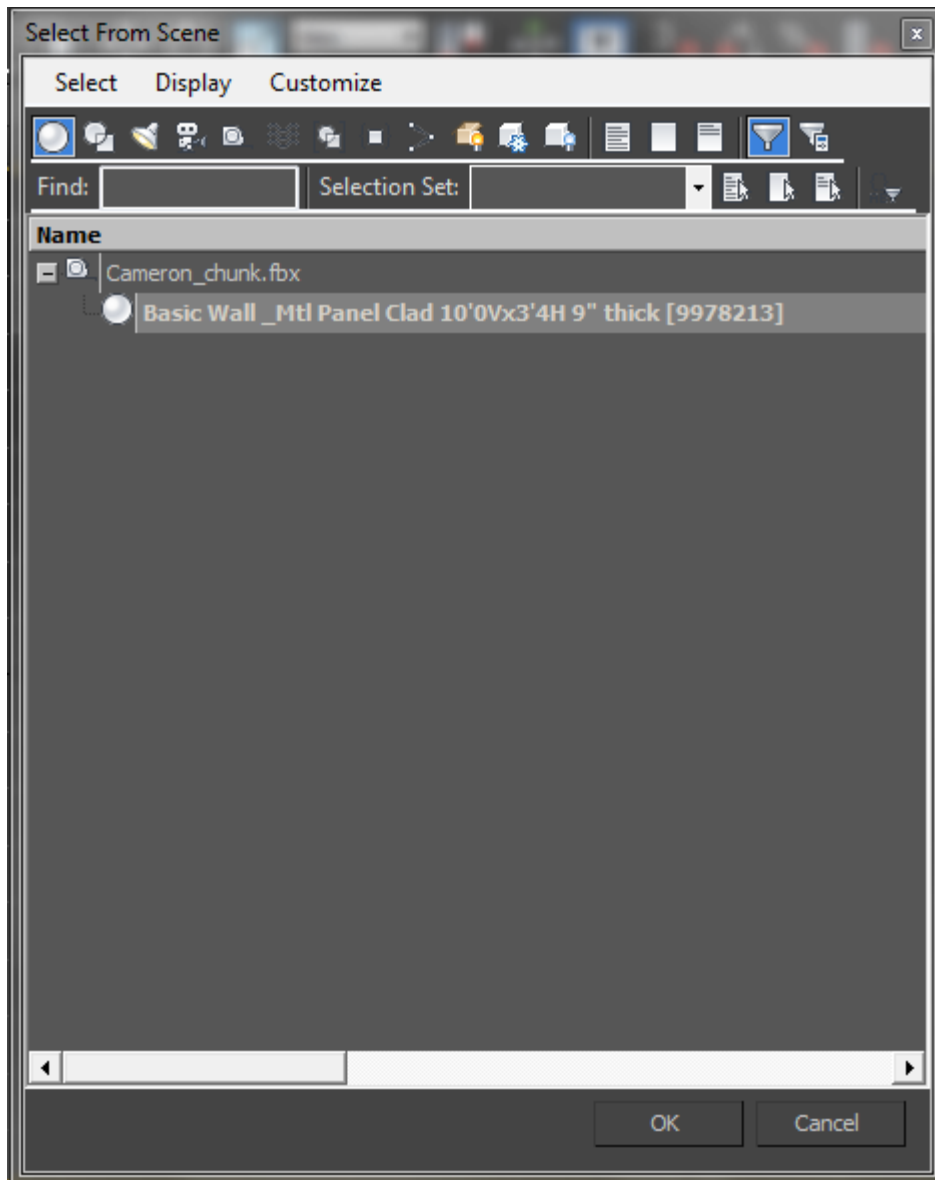


Image References

When an fbx is imported, a folder with all associated textures is created called "[File Name].fbm". There will be one for 3ds Max and one imported into Unity.

Your Model in Unity3D

Elements by Name/ID

To find any object in the scene, type in the search box at the top of the "Scene" window. You can type any word, part of a word, or the element ID number and results will immediately appear for selection.

Materials

Materials will take on the same base color, texture, and naming as the materials from Revit/3ds Max. They are editable from here. You can easily change the material from standard “Diffuse” to Bumped Diffuse”, “Transparent”, “Reflective” and more here.

Image References

When an fbx is imported, a folder with all associated textures is created called “[File Name].fbm”. One will be created when the model is imported into the Unity **Assets Folder**.

Part 4: Updating Design Changes

Revit to 3ds Max

What gets replaced

All materials, geometry, lights, and the current view camera will be updated upon reloading the fbx link in 3ds Max.

Updating the model

Updating the model is a simple process. Open the manage links dialogue and select the link to update. Opt to preserve material parameters from 3ds max, and click “reload”. Notice that when you open the material editor your changes have been preserved. Check for any new materials/bitmaps in the scene and convert them as needed.

3ds Max to Unity3D

What gets replaced

All geometry will be updated upon reloading the fbx link in Unity. New materials will be added but as long as you chose “Recursive Up” on the import settings, your materials that you modified in unity will be unaffected and still applied to the correct surfaces.

Updating the model

Locate the fbx file in your assets folder. Right-click the file and select “Re-import”. Your import settings will be the same as before. Your model will be up-to-date again and ready to go.