AUTODESK UNIVERSITY 2014

Rendering and Animation for Building Design with 3ds Max

Matt Dillon – Enceptia

AB5204 3ds Max Design rendering and animation software is extremely powerful. It can also be intimidating and overwhelming for the novice or casual user. This class will show you the specific workflows and tools you need to quickly and effectively create still images and animated sequences for visualizing building projects. We will cover specific settings to control both interior and exterior lighting (including night scenes), and easy yet effective methods to create animated walk-through sequences of a building. Stop getting lost in the miasma of tools that are unnecessary for building animation, and stop going down blind alleys. This class will focus strictly on the tools that you need to do your job.

Learning Objectives

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

- Effectively use File Link Manager to import geometry, materials and cameras from Revit
- Fine tune the scene with exposure settings, 3ds Max Cameras and lighting
- Control exposure, global illumination and render settings for still image renderings
- Use Keyframes, RAM Player and Video Post to create compelling animation sequences

About the Speaker

Having been a registered architect with over 25 years of experience in Autodesk® architectural applications, Matt has worked with AutoCAD® Architecture since its initial release and Revit® Architecture since its purchase by Autodesk. Matt is an Autodesk Certified Instructor at an Autodesk Authorized Training Center. In addition to assisting customers in implementing Revit platform products, he has also consulted with Autodesk development staff in product design and usability forAutoCAD Architecture. He co-authored Architectural Desktop 2007—An Advanced Implementation Guide (Second Edition). In 2010, Matt was one of the recipients of Autodesk's Distinguished Speaker Award and has consistently been a highly-rated instructor at Autodesk University since he began presenting in 2000.

mattdillon@enceptia.com

Introduction

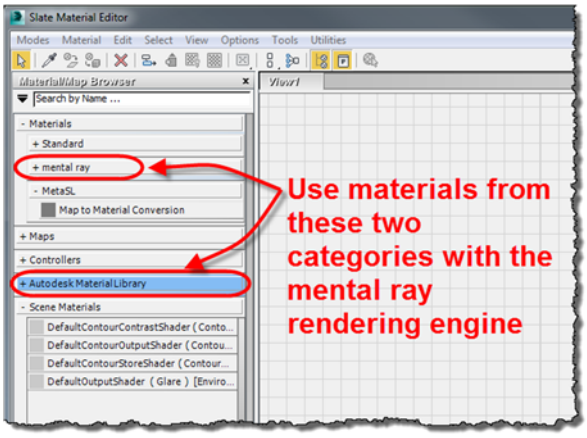
Before beginning it is assumed that you are already generating the majority of your model geometry in Revit and that the materials are being assigned there as well. We will not be discussing the creation or editing of materials in 3ds Max Design. It is also assumed that you already understand the basics of working in 3ds Max Design (interface, basic workflow, etc).

mental ray Rendering Concepts

3ds Max Design has several built in rendering engines. The Scanline renderer is the legacy engine that has been around since the days of 3D Studio, which was the pre-cursor to 3ds Max and 3ds Max Design. There is also the iRay Renderer, the Quicksilver Renderer and the VUE File Renderer. This document will focus solely on the NVIDIA mental ray rendering engine however, since that is the rendering engine that is common to 3ds Max Design, Revit and AutoCAD.

Choosing your rendering engine is the most critical step in generating your still images and animations. The rendering engine you choose will determine which material types and lighting types you should use to get the best quality images. The mental ray engine uses real-world physical lighting characteristics, which means that in order to get the image quality that you desire you should be using mental ray materials and photometric lighting.

The materials and lights that you import or link into 3ds Max Design with your Revit models are both mental ray compatible and photometric. If you choose to utilize materials in 3ds Max Design to substitute for some or all of the materials that came over with the Revit model make sure that you use materials from one of the provided Autodesk material libraries. If you create your own make sure that they are based on one of the “Arch & Design” material templates. These mental ray materials have the proper attributes for reflecting, refracting and absorbing light rays according to real-world physical properties.

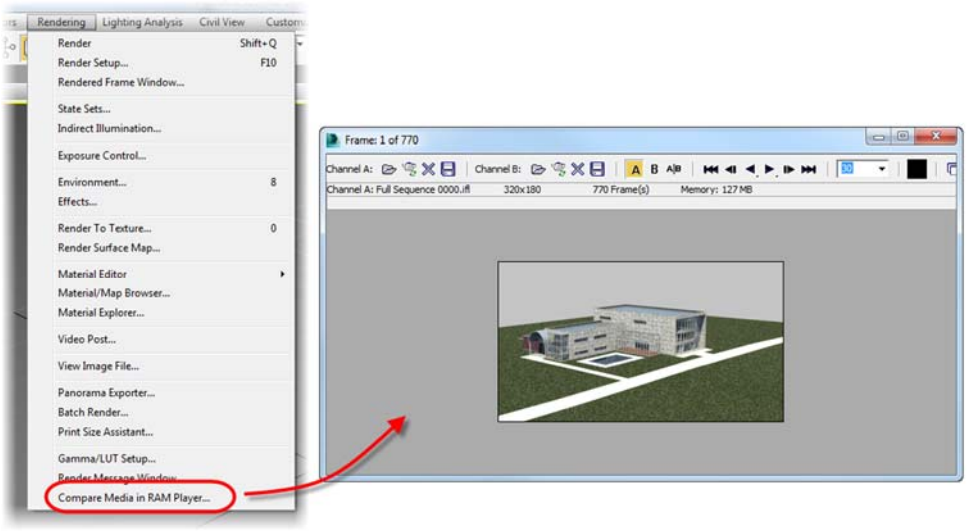


Use existing materials from the Autodesk Material Library, or create new materials using the templates found in the “mental ray” category for compatibility with the mental ray rendering engine.

Ram Player

A critical component in the processes described in this white paper is the *RAM Player*, found on the Rendering pull-down menu in 3ds Max Design. The RAM Player performs two vital tasks for rendering and animation:

- You can open the last still rendering performed in your 3ds Max Design session in either Channel A or Channel B. By first storing a rendering in Channel A, then modifying your lighting (or materials), rendering again, and loading in Channel B, you can easily compare the two versions, “before” and “after” to see the changes between the two images, which can sometimes be subtle. This is invaluable for tweaking your lighting, especially indirect lighting settings (Global Illumination).
- Using the RAM Player you can load an animation sequence that has been output as single frame images, play it back and if desired save to a video format such as AVI or MOV.



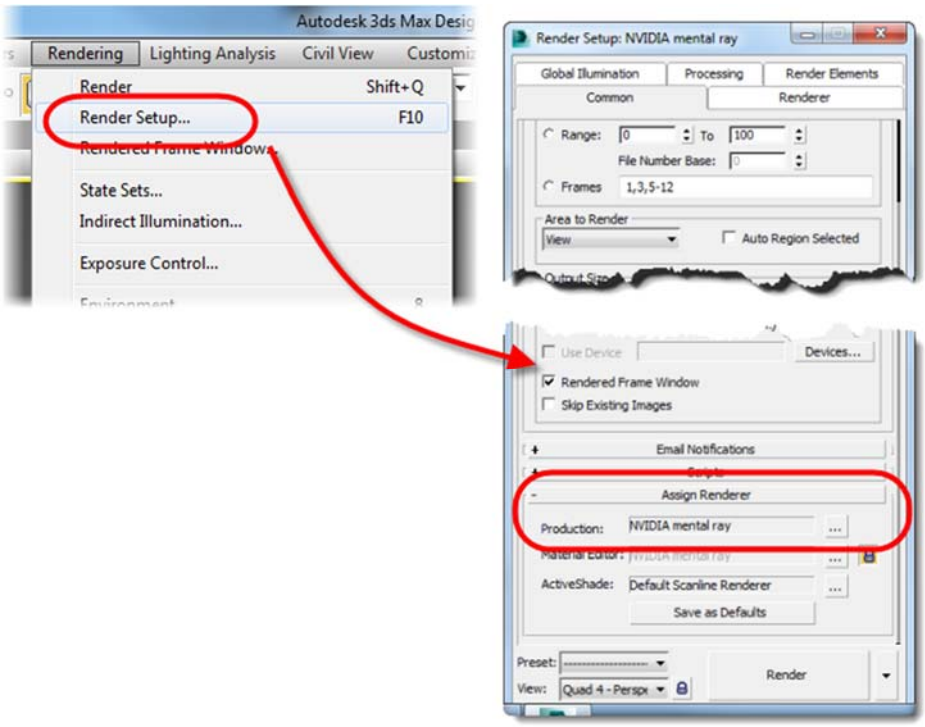
The RAM Player allows you to compare two still image renderings side by side as well as load an animation sequence, play it back and save it to a video format.

Preparing the 3ds Max Design Environment and Using File Link Manager

Assigning the Renderer

Because so many things are dependent upon which rendering engine you are set up for, you should make setting/confirming your rendering engine one of the first things you do in your scene. To set the rendering engine use the Render Setup dialog box. The option to assign your renderer is located at the bottom of the “Common” tab. Set the Production renderer to “NVIDIA mental ray”. Note that the ActiveShade renderer can stay at “Default Scanline Renderer”. This is

the engine that controls the shading of viewports, which neither requires nor supports physically accurate lighting.



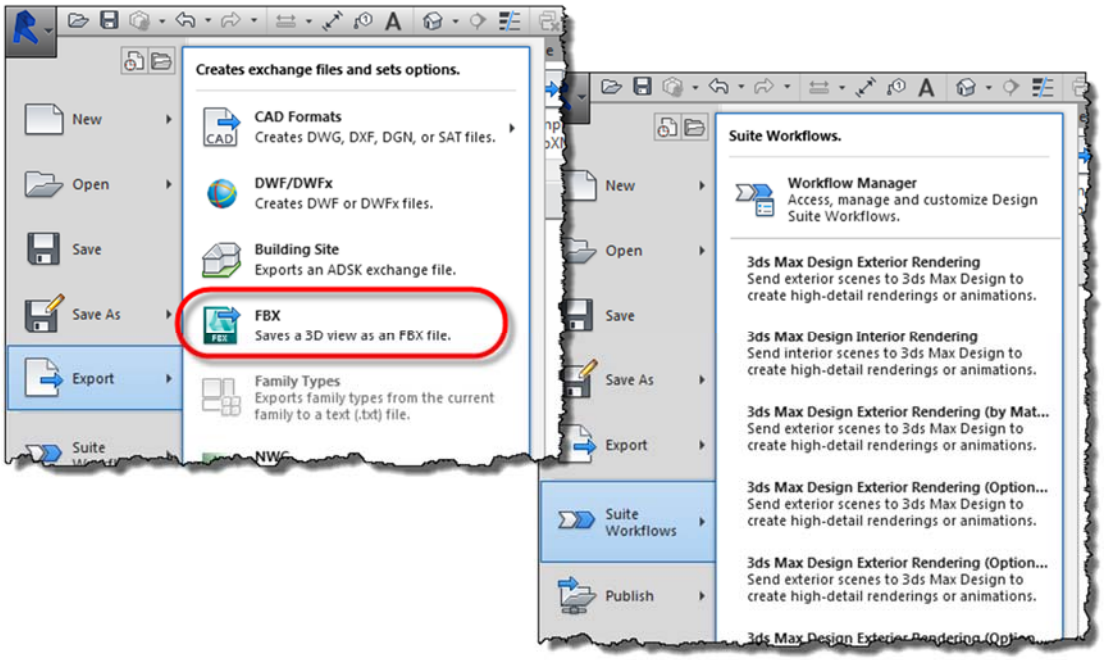
Setting the Rendering Engine to NVIDIA mental ray.

> ***Note:*** It is important to remember the renderer is saved with the file – it is not a global setting for 3ds Max Design.

Linking the Building Model

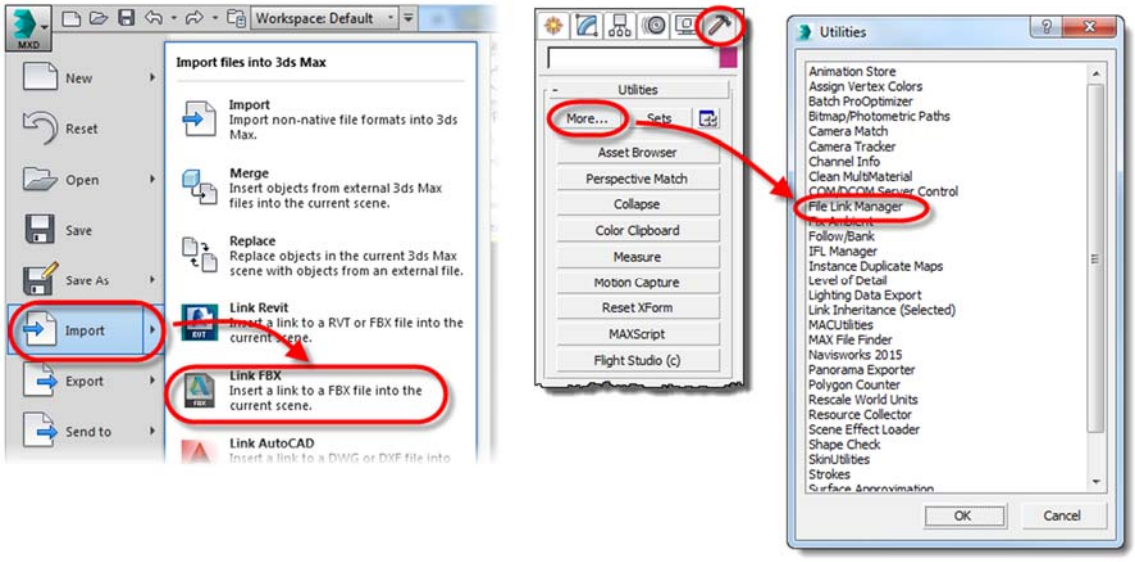
You can either import or link your building model into 3ds Max Design. It is recommended if possible that you use the link option – that way if you make changes to the building model you can update the link without starting completely over in 3ds Max Design. Whichever method you choose you can either link the Revit file directly, or export to FBX from Revit first, then link the FBX file into 3ds Max Design. While linking to the Revit file directly may seem like the obvious best choice, you will probably find that exporting to FBX and then linking the FBX file might be a bit faster. Regardless, the end result will be essentially the same.

The best way to export to FBX from Revit may not be obvious. Choosing “Export”, then “FBX” from the Application menu (shown below) is the fastest and most efficient way to create an FBX file for use in 3ds Max Design. There is another option – one of many “Suite Workflow” choices off of the same Application Menu, however those can take significantly longer to export than simply choosing the stock FBX option, and again, the end result is essentially the same.



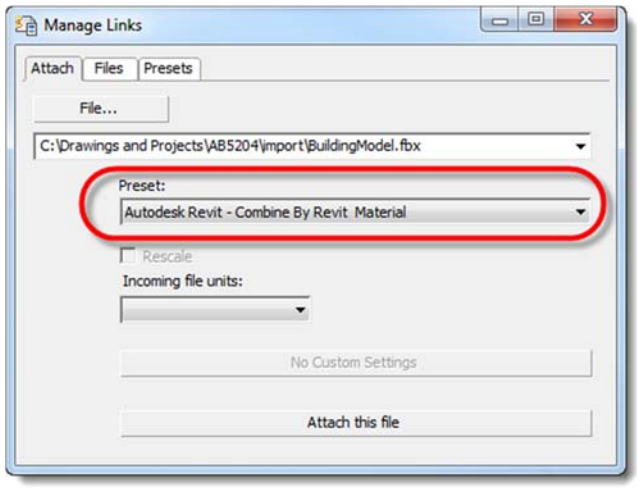
Note: Make sure you are in a 3D view when you export your FBX file from Revit.

Once you have created the FBX file, you can use File Link Manager to link it into your 3ds Max Design scene. This can be done from two places: the 3ds Max Design Application Menu or from the Utilities command panel, shown in the image on the following page.



Link the FBX file using the Application Menu or the Utilities Command Panel.

If you launch File Link Manager from the Application Menu you will first be prompted to select an FBX file, after which you will be presented with the File Link Manager dialog. If you launch from the Command Panel you will be taken to the File Link Manager dialog directly and you will need to choose the "File" button on the "Attach" tab of the dialog box and select the FBX file you want to link. You will also need to choose a preset. The "Autodesk Revit – Combine by Revit Material" is the default, and in most cases is the best one to use. All objects that are assigned the same material will be a single object in 3ds Max Design. There are other presets available that give you more granular control of objects, but the more objects you create in 3ds Max Design, the bigger the impact on performance and the more challenging the task of managing your scene.



The File Link Manager dialog

Once you have chosen the file, the preset and selected the "Attach this file" button, the FBX file will be linked into your current view. A camera representing the 3D view that was active when you exported from Revit will be created, as well as a Daylight System based on the sun settings that were effect in that view. You can either use these or delete them and recreate your own in 3ds Max Design.

> ***Note:*** A thorough discussion of File Linking in 3ds Max Design is beyond the scope of this class – you should consult the Help file for more of the particulars.

Depending upon your current exposure controls in 3ds Max Design you may get a dialog box asking if you want to set your exposure value to mr Photographic Exposure Control with an initial value of 15. You should let it create this setting. You can adjust the value later, but you need to make sure you have mr Photographic Exposure Control enabled whenever you are working with a Revit model. The value for Exposure Control will depend upon whether you are generating an exterior or interior rendering and the time of day. We will look at exposure settings in more detail in the next section.

Understanding 3ds Max Cameras, Exposure Control and Lighting

After you have linked the file, you need to decide whether or not you want to use the camera and the daylight system that were imported or create a new camera or Daylight System in 3ds Max Design.

Cameras

There are two kinds of cameras in 3ds Max Design:

- A Free Camera has no target. When created in 3ds Max Design it automatically points in the direction of the view in which it was created. They are useful for 1 point perspectives. The cameras that are imported with the FBX file are Free Cameras, however a Free Camera can be converted to a Target Camera on the Modify Command Panel if necessary.
- A Target Camera has both the camera and an explicit target point. Both can be moved to adjust your view.

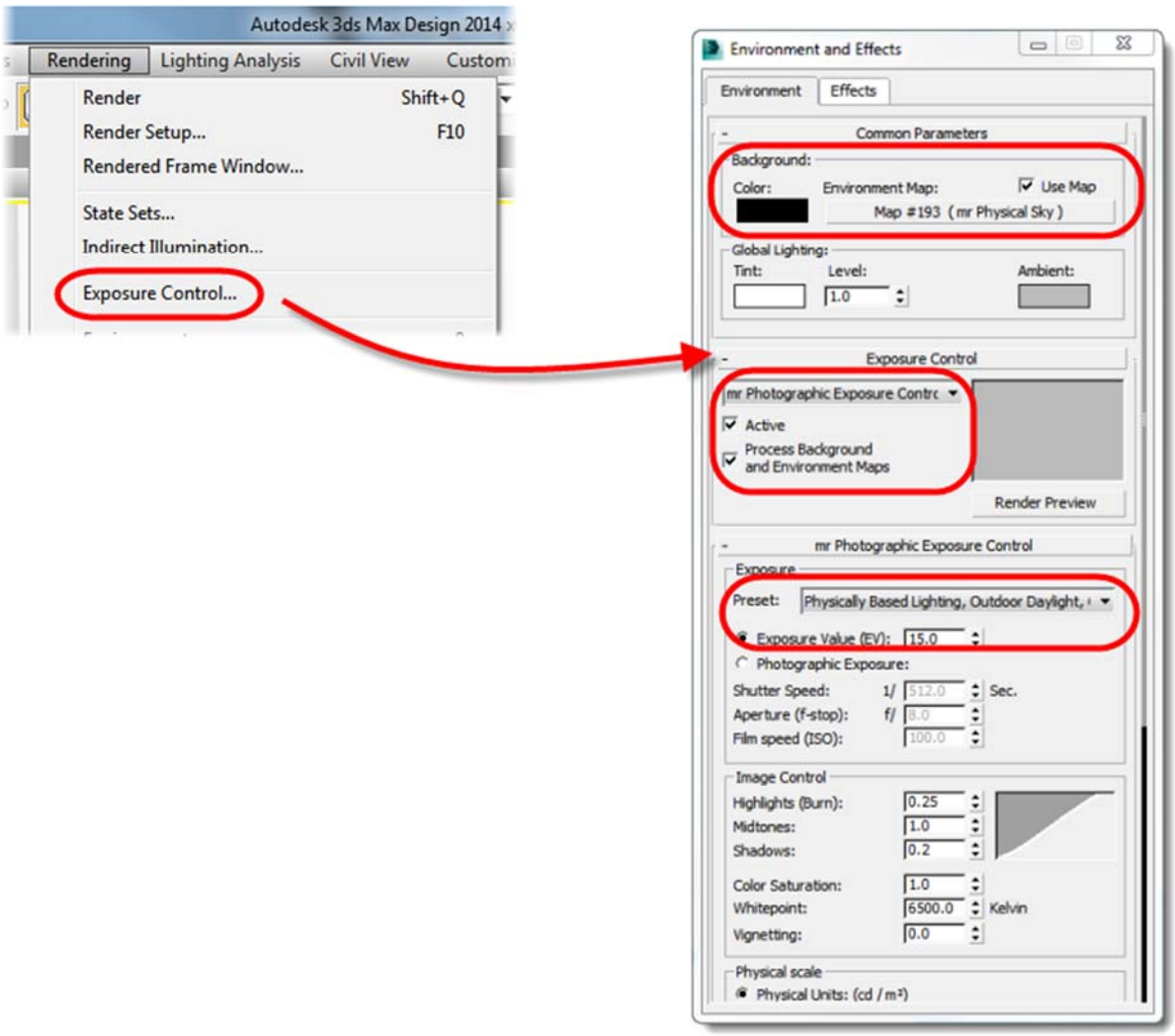
> ***Note:*** Once you have configured a viewport to display the view through the camera, it is a good idea to turn on Safe Frames in the viewport. This will allow you to see exactly what the display extents will be when the image is actually rendered according to the current rendering image size settings in the Render Setup dialog box.

Exposure Control

Assuming you have already assigned the mental ray renderer, you should go ahead and establish your initial exposure control. There are several options available to you, however you can take advantage of presets initially. If you are planning on doing any rendering using daylight (whether you intend to do an interior or an exterior rendering) you should have a Daylight System in the scene. Again, if you imported your geometry from Revit chances are that you already have one. Assuming that you do have a Daylight System in the scene, choose "Exposure Control…" from the "Rendering" pull-down menu and make sure that the Background settings are similar to the figure on the following page and that "Use Map" is turned on. Under the "Exposure Control" section set the exposure control to "mr Photographic Exposure Control" if it is not already so and make sure that the "Active" and "Process Background and Environment Maps" is turned on.

Finally, in the "mr Photographic Exposure Control" section, which will only be available if you made the correct settings indicated above, you can use one of the exposure presets. In the example shown, the preset chosen is for an exterior scene using daylight only. This should be considered an initial setting. After generating a preview rendering (also in the same dialog box) you may decide to change the Exposure Value setting from 15 to something else by using the spinner or by entering a value. Larger numbers will give you a darker exposure and smaller numbers will make it brighter. You also have the option to use the settings under "Photographic

Exposure" instead of a preset – these will set the exposure value based on controls analogous to photography.

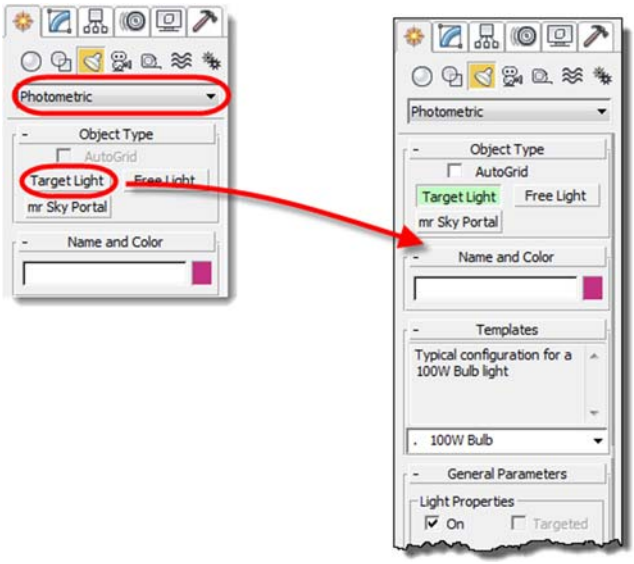


Initial Exposure Control settings for an exterior daylight rendering.

The exposure controls are global to your scene and should be considered the "baseline" for your lighting. The sun position and any artificial lights will work in conjunction with exposure to determine the overall lighting.

3ds Max Photometric Lights

To create photometric lights, assuming that you are either replacing or supplementing the lighting that you are importing from Revit, make sure that you choose "Photometric" as the light type on the Create Command Panel.



Photometric lights are recommended for use with the mental ray rendering engine because they simulate real-world lighting conditions.

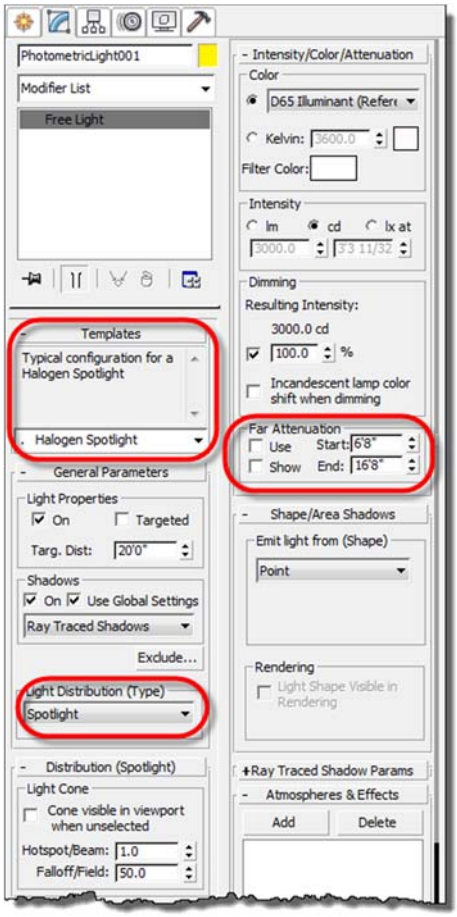
There are three kinds of Photometric Lights:

- Target Lights are similar to Target Cameras in that they have both a light source and an explicit target. They are useful for directional lighting such as spotlights.
- Free Lights will be created without a target, and will cast light in the same direction as the view in which they are placed. They can be converted to Target Lights using the Modify Command Panel
- A mr Sky Portal is a daylight ”amplifier” and can be used for interior scenes when you want to increase the effect of exterior light sources on the interior of a building.

If you choose to use the lights that were imported with your Revit model you should realize that they are turned off by default. You will need to select the lights you want to use and turn them on using the Modify Command Panel.

Whether you choose to use the lights that were imported with your model or you choose to create new ones, you will need to set up their distribution types and work with the color and intensity settings. Rather than deal with all of these settings individually, you might find it more effective to use one of many predefined templates available on the Modify Command Panel. Selecting one of these templates will pre-configure the light settings for you.

An effective technique for interior lighting realism is to use attenuation, which causes the intensity of the light to fade from full intensity to zero over distance. This can also be adjusted on the Modify Command Panel, and is *not* preset by any of the templates. It must be enabled manually regardless of the type of light you choose to use.



A “Halogen Spotlight” template applied to a Free Light. Note that the distribution as well as the intensity and color have been preconfigured, however attenuation is left turned off.

> ***Note:*** If you are creating several lights in 3ds Max Design that are meant to act together, you can clone the first light (and subsequent lights) using the “Instance” option. That way any changes you make to one light will be applied to all lights that were cloned.

Working with Global Illumination for Still Images

When generating still images from 3ds Max Design for building design visualization, you can divide them up into two main categories: Exterior and Interior. The exposure control and render setup processes and settings between these two categories are sufficiently different that it is suggested that if you intend to generate both types of images for your project that you save a different scene for each – one for exterior and one for interior. You might even find it beneficial to save different scenes for exterior daytime and exterior nighttime as well as interior daylight and interior with artificial lights only.

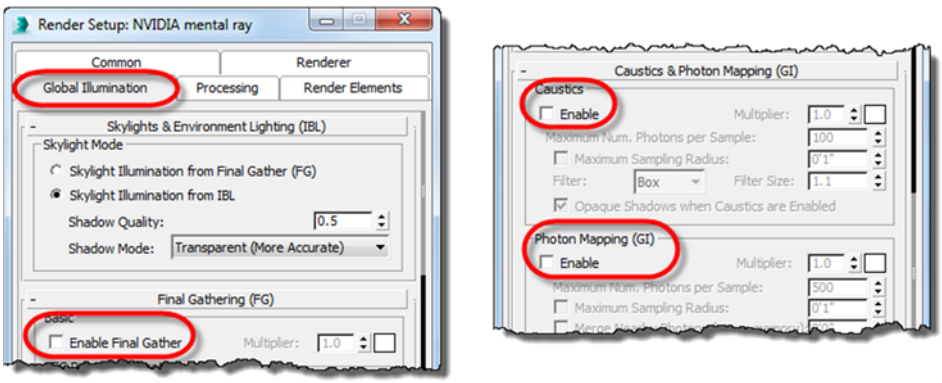
Exterior Images

We'll further divide Exterior Images into two sub-categories: Daytime and Nighttime.

Daytime Images

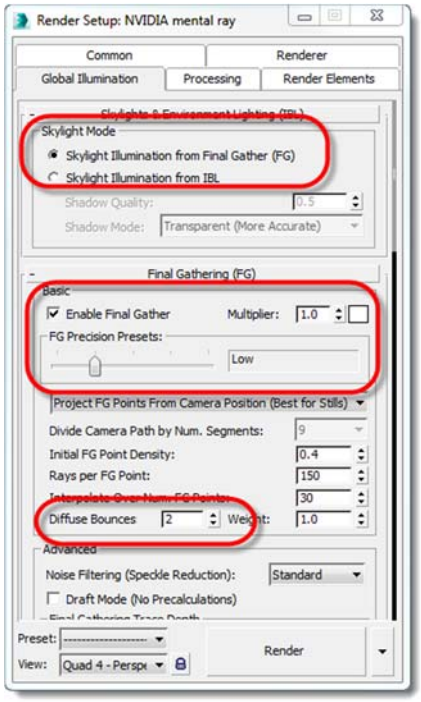
Daytime images are probably the easiest to configure from a lighting and exposure control standpoint. First you need to make sure that you have established and configured a Daylight System. Next your exposure control should be set up as described in the previous section. You might find that setting the exposure value to a value slightly lower than the preset value of 15.0 will give you a bit more realistic image from an overall lighting standpoint, especially if your scene is set in a lower latitude where the sunlight is more intense. You can play with the exposure value after generating your initial render preview and get an instant update in the preview window without having to regenerate it.

Once your exposure control and daylight system have been established, you can perform a test render. You may not need to worry about global illumination for an exterior scene. Check your Render Setup dialog under the "Global Illumination" tab and make sure that "Caustics", "Photon Mapping (GI)" and "Final Gather" are turned off as shown in the following image.



Disable Global Illumination in the Render Setup dialog to speed up your exterior image output.

After performing your test render with Global Illumination disabled as shown above, try another test rendering with Global Illumination set to a minimal value: enable Final Gather with precision set to "Draft" and 0 bounces. Set "Skylight Mode" to "Skylight Illumination from IBL" and perform a test render, then set "Skylight Mode" to "Skylight Illumination from Final Gather (FG)" as shown in the following image. Use the RAM Player to compare the images with each other as you make changes to your settings. Choose the effect that looks the best for your final rendering.



Setting Global Illumination for an exterior daylight scene as a comparison test.

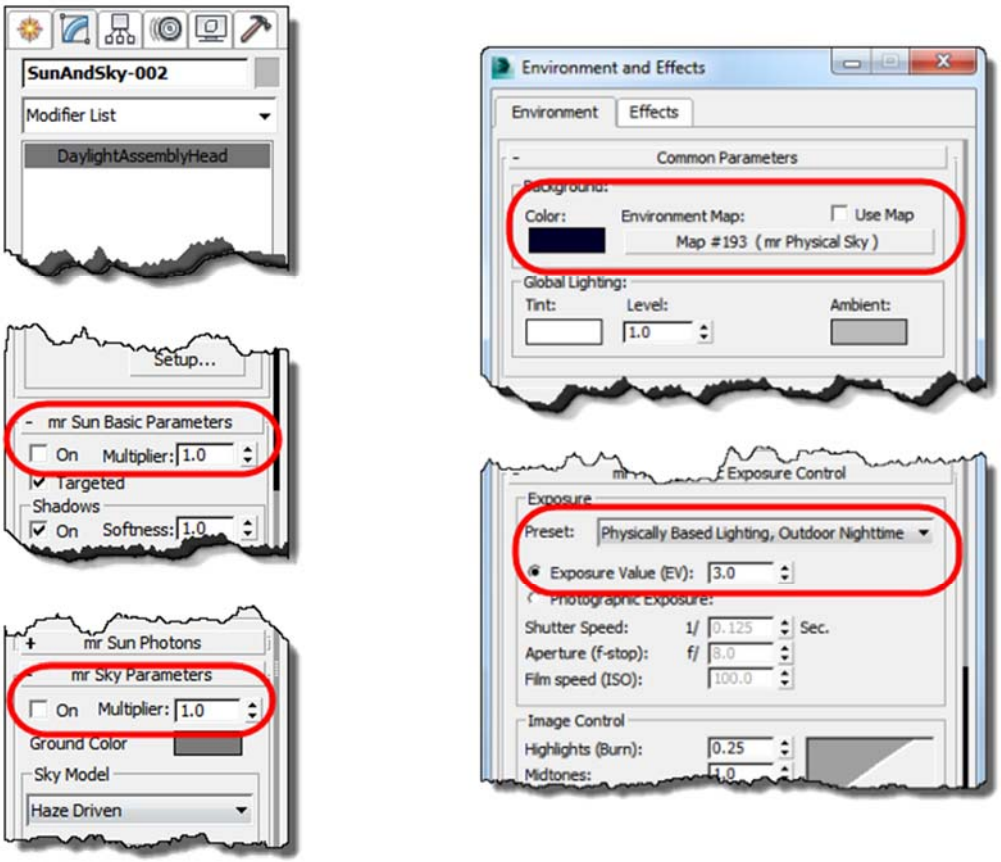
The following image was rendered using the settings shown on the previous page (Global Illumination disabled) with the exception of the Exposure Value. The preset for an exterior daylight scene is 15.0, which is a bit darker than one would expect for the location in which the scene is set: San Antonio, Texas in early summer, mid-day. In this example the Exposure Value was set to a value of 12.0 instead.

An Exterior Daylight scene rendered with no Global Illumination enabled.

Nighttime Images

Exterior nighttime images are a bit more complex than daylight images in that you need to simulate a nighttime sky and your lighting may need a bit of tweaking. You will also need to enable Final Gather.

Your Exposure settings will vary greatly from the daylight scene. While it is theoretically possible to change the settings for your daylight system to position the sun below the horizon and to have the sky simulate night-time lighting conditions, you will most likely find that the results are undesirable to say the least. You will probably find it more effective to disable the Sun and Sky lighting from the Daylight System altogether on the Modify Command Panel as shown in the image on the following page.

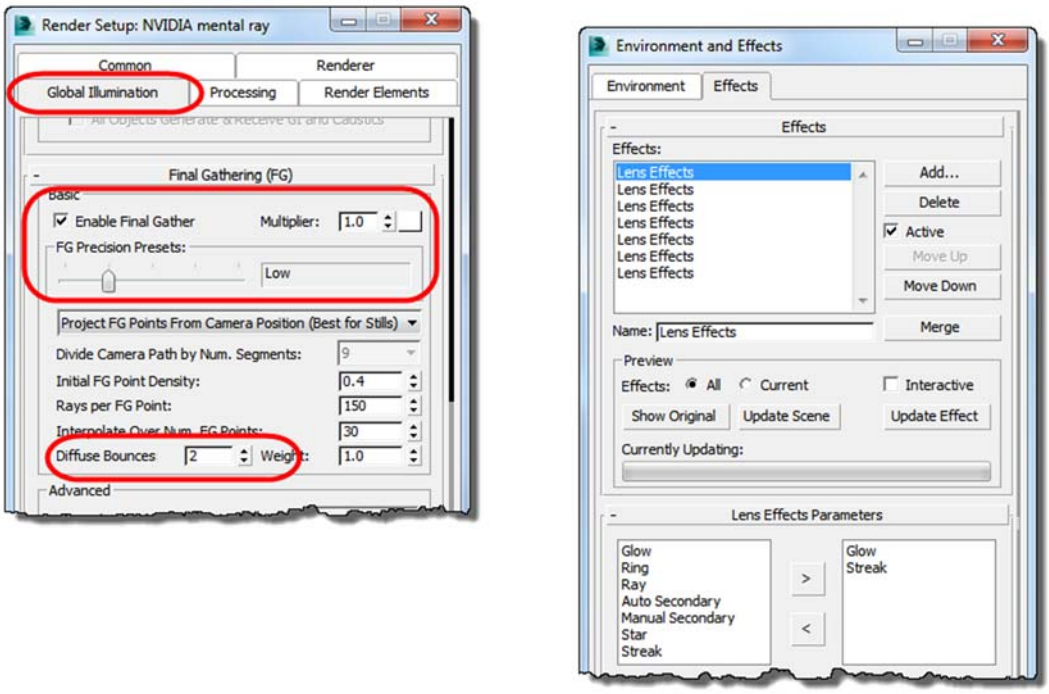


Disabling the Sun and Sky lighting and turning off the mr Physical Sky environment map, replacing it with an explicit background color to simulate night.

Additionally, as shown in the image above you will want to adjust your Environment controls in two significant ways. First turn off the “Use Map” setting for the Background and set the color to something that is more indicative of a night sky – a very dark blue approaching black should

work. Second change the Exposure Value to a much lower setting. The Preset for Outdoor Nighttime is 3.0.

Since your nighttime scene will have to be lit by artificial lighting, you will also want to enable Final Gather, especially if any of the lights are on the interior of your building. In the image on the left below, note that Final Gather has been enabled. The quality is set to low, however with only two FG bounces. This is usually sufficient for an exterior night scene – remember – the higher the quality and the more bounces, the longer the rendering will usually take.



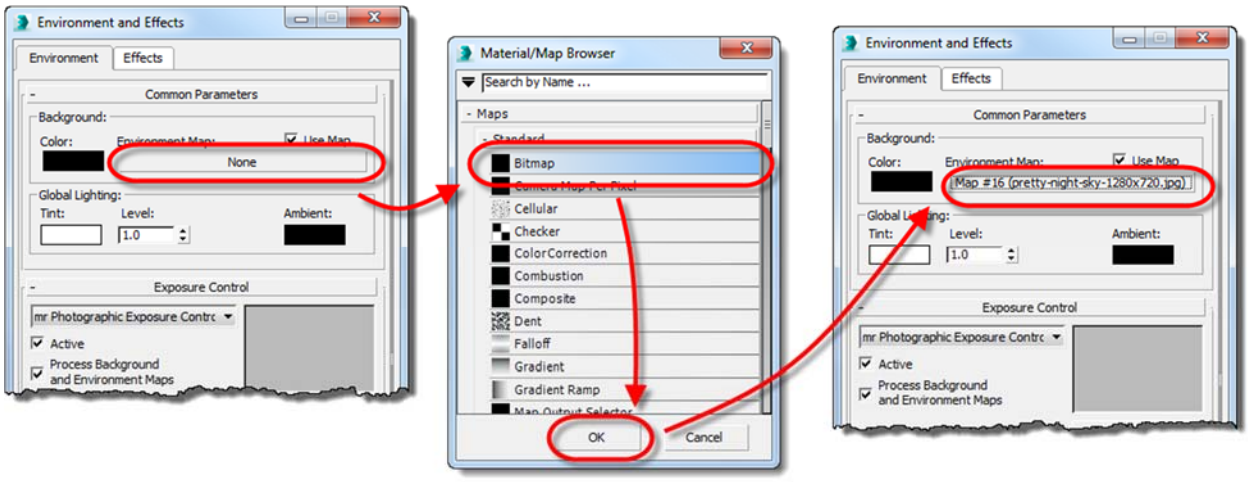
Setting Final Gather for an exterior night scene on the left. On the right the addition of Lens Effects to selected lights in the scene.

Note also on the right that Lens Effects have been added to selected exterior lights using the "Environment and Effects" dialog (the same dialog that includes the Exposure Control settings). These can dramatically enhance night scenes especially, as shown in the completed rendering below.

The completed night scene rendering produced with the settings shown on the previous pages.

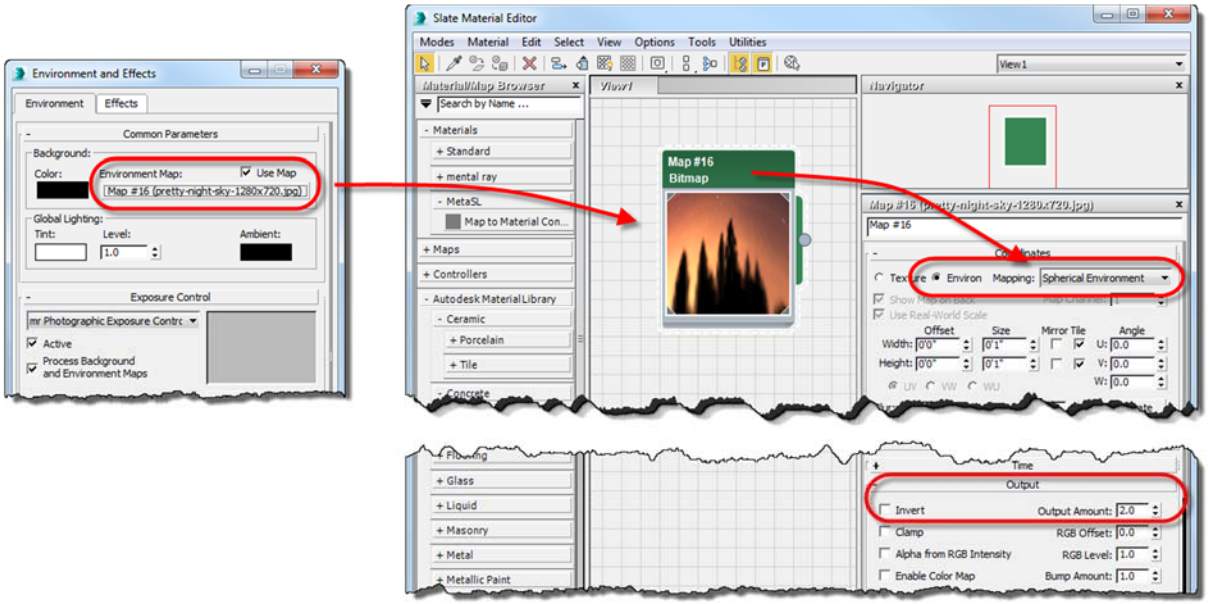
Using a Background Image

An effective option for creating a night-time scene is to use a background image. You can find a wide variety online to provide virtually any effect you want. Once you have obtained a suitable image, assign it as your background by clicking the Environment Map button in the Environment dialog as shown below. Choose “Bitmap” in the Material/Map Browser and click “OK”. Select your image file and it will be assigned in the Environment dialog.



Assigning a background image.

Once you have assigned the background image, you will need to modify it slightly to make it suitable for use as a screen background. Open the Material Editor (in this example, we will use the Slate Material Editor). Drag the image from the Environment map dialog and drop it into the editing section of the Material Editor (if using the legacy Material Editor, drag and drop it to a sample slot). Edit the map as shown below, setting the “Mapping” parameter to “Screen”. You may also find it necessary to increase the output of the image to make it show up in your rendering, as shown below.



Adjusting a background image for use.

> ***Note:*** You should size the background image appropriately. Once you have decided what your final rendering resolution will be, edit the image file in any of a number of image editing applications (I use SnagIt, by Techsmith) so that the image size in pixels matches the resolution of your final rendering image. It is more effective to scale the image and crop it if necessary to match the desired resolution, as stretching it to fit will cause distortion.

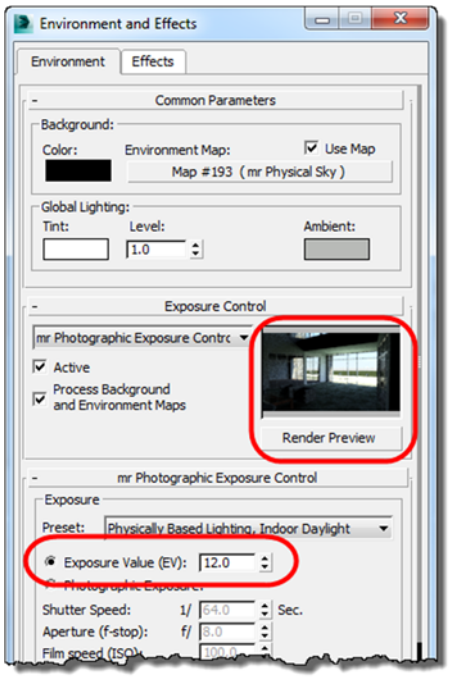
Interior Images

Interior scenes are usually a bit more complex than a typical exterior scene because Global Illumination plays a much more important role in the appearance of the scene, especially if you are generating an image that relies all or in part on exterior daylight.

Interior Scenes with Daylight

As with exterior scenes, you should start by setting your exposure control. The default for Physically Based Lighting, Indoor Daylight is an Exposure Value of 10. This will probably be fine if you are not actually looking outside from the camera, but simply using exterior lighting for

diffuse lighting effects. However if your viewpoint includes a substantial view of the outside you may notice that the exterior of your scene is washed out and appears over-exposed after generating the render preview in the Exposure dialog. To correct this you can increase the Exposure Value to 11 or 12. Now, however the interior of the scene is unusually dark. This can be corrected by using a *Daylight Portal*, placed strategically in front of your primary exterior light sources (windows and curtain walls). Daylight Portals are rectangular planes – create them in an elevation view, then in a plan view move them until they are just outside the window or curtain wall whose daylight you want to amplify. They are also directional – you will see an arrow indicating the light transmission direction in the plan view. Using the Modify Command Panel you can flip the direction and modify the intensity and light quality of the Daylight Portal.



Exposure control for an interior scene lit with exterior daylight. Because of the large glass area, the exposure value has been increased to 12 from the default setting of 10 to keep the exterior parts of the scene from being overexposed, however this causes the interior of the scene to be too dark.

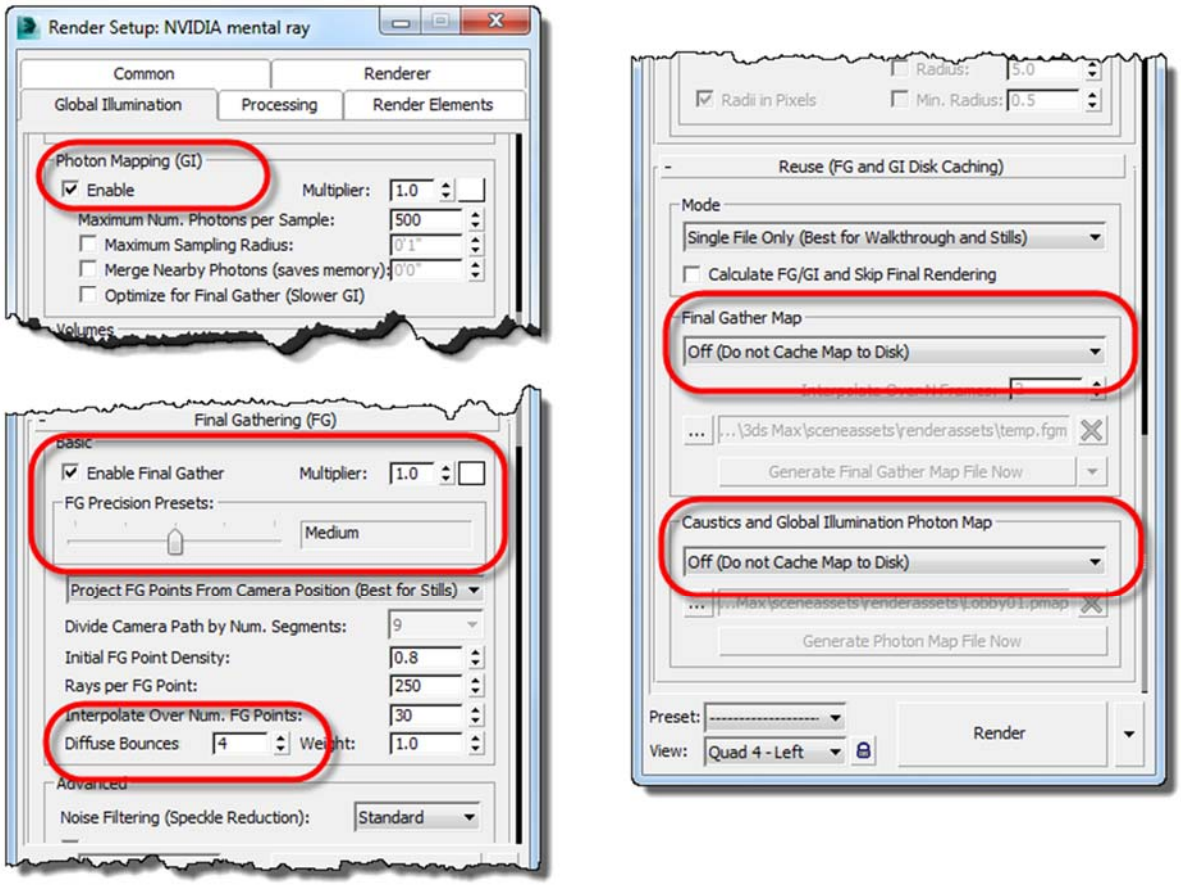
Whether or not you decide to use a Daylight Portal you will absolutely need to work with Final Gather and possibly other aspects of Global Illumination to get the interior of your scene to be better lit. Because you will most likely need to experiment a bit to get your settings tuned before generating your final rendering, you should first set your rendering to a smaller format to shorten the rendering time. Additionally, you should again take advantage of the RAM player to compare renderings as you make changes to your Global Illumination settings. A suggested sequence of events is as follows:

- Establish Exposure Settings
- Create a Daylight Portal if needed
- Set initial Final Gather (2 FG bounces and Low quality at first, increase only if necessary)
- Test render to a small size
- Increase Final Gather quality (number of bounces and quality)
- Test render
- Consider increasing the multiplier for Final Gather, then test render
- Enable Photon Mapping in Global Illumination if necessary (Adding photons can drastically increase rendering times, however it can have a marked improvement in the quality of your scene. It is worth testing in a small test render at the least.)
- After you are satisfied with the illumination quality of your scene render to your final desired output size, and assuming you are satisfied with the final rendering when it is complete save the image from the Render Frame window.

The figure above was rendered using four Final Gather bounces with the Final Gather quality set to “Medium”. A Daylight Portal was also used to offset the overridden exposure value. Additionally, Photons were enabled to further enhance the quality of the interior lighting, as shown on the left side of the image on the following page.

On the right side of that image are settings that you may find useful if you are generating a number of iterative renderings after you have established your lighting, or if you are generating

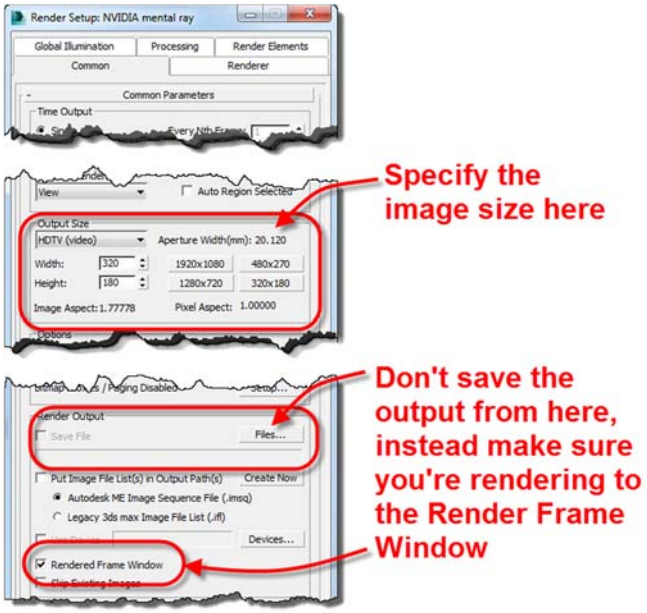
an animated sequence with several frames. In order to speed up the rendering of multiple frames you can save the Final Gather and Photon calculations to disk to be re-used in subsequent frames in the animation sequence. In the example shown, those calculations are not being saved and re-used since the rendering output is a single image, however we will revisit that in the section on animations.



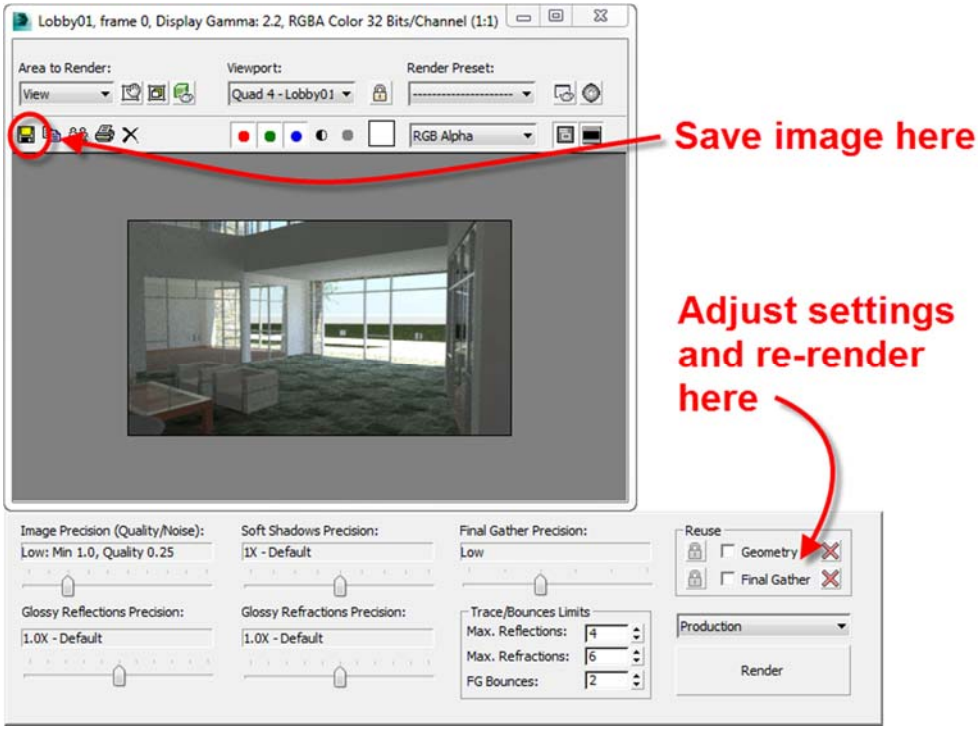
Final Gather and Photon mapping settings for a daylight interior rendering on the left, settings to re-use FG and Photon calculations (currently disabled) on the right.

Rendering Output

Whether you are outputting your final rendering to a still image or an animation, you will specify the output *format* in the Render Setup Dialog on the “Common” tab. However it is recommended that you do not specify the output *file* in that location.



A better approach in the case of a still image is to render to the Render Frame Window, where you can make a final check then save from that location. Additionally if you decide that you need to adjust some of your Final Gather settings you can do so from the statistics dialog that will be shown just below the Render Frame Window.



The Render Frame Window with the statistics dialog.

Creating Animation Sequences – the Easy Way

Animation in 3ds Max can be complex. There are a myriad of methods, processes, workflows and tools for creating and modifying animation sequences. As with the rest of this document, we will focus on a workflow that keeps things simple and focused on what you are attempting to accomplish – visualizing a building.

Animation Setup

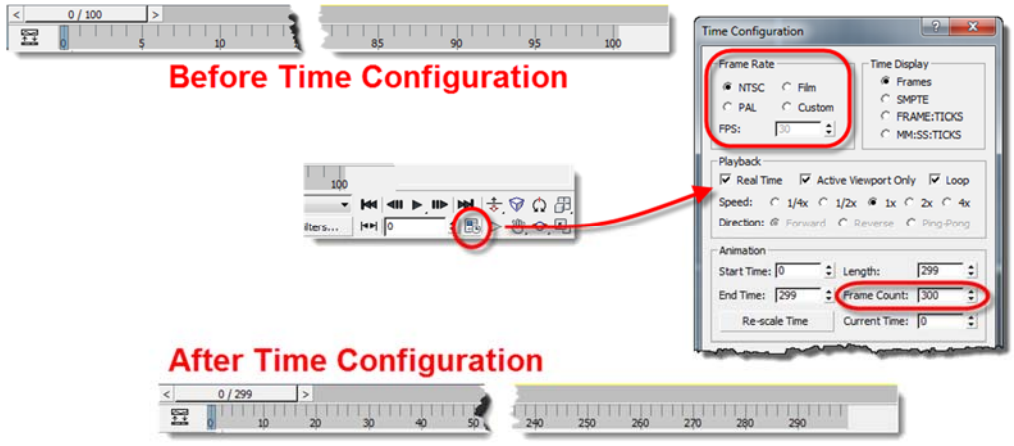
The first step in any animation sequence is planning. Decide what you intend to accomplish with the sequence and set the scene up accordingly. A couple of things to consider:

- Will a single sequence be enough, or should it be broken up? A very common technique is to create several short sequences and compile them together into a single animation later, using cuts and fades to transition from one sequence to another, in much the same way that television and movie scenes are compiled.
- If you are animating movement through a building, what is the distance of travel and how fast do you want the movement to be? This will determine the number of frames needed for the animation. For example, assuming a normal person walks about 11 feet per second, and assuming that you are animating a sequence that will play back at 30 frames per second, then if you are traveling 100 feet, that translates to approximately 9 seconds of animation – or 272 frames.

Regardless of whether you are animating movement through a space or animating objects, you need to determine the total frame count before proceeding with your animation.

Time Configuration

Once you have determined how many frames you need for your sequence, use the Time Configuration dialog to establish that in your scene. In the upper left corner, set the frame rate that you desire, then enter the total number of frames. When you exit the dialog box, the Keyframe slider at the bottom of your 3ds Max screen should reflect the new frame count.



Setting the Time Configuration parameters.

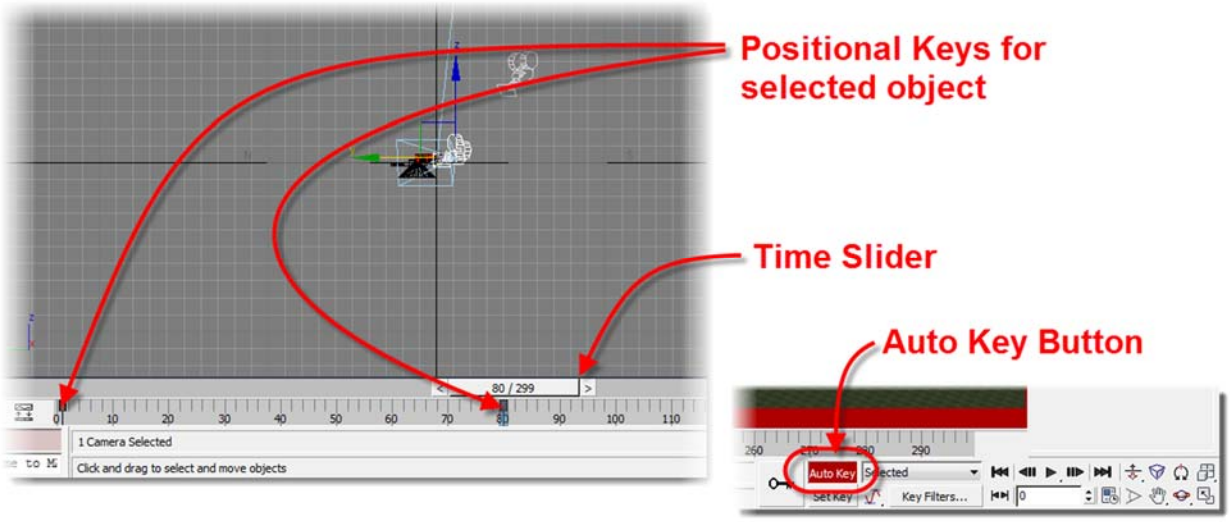
Keyframe Animation

There are two primary methods for animating objects in 3ds Max: Keyframe animation and Path animation. Path animation is usually what is suggested for use for walkthroughs, however I have found it to be unnecessarily complex and cumbersome to configure and modify. There is also a Walkthrough Assistant utility that can be used, however this is again, unnecessarily complex and cumbersome.

In general, rather than creating a single long walk through animation, consider creating a series of short camera movements that give the impression of a walk through, without actually "walking through" the building. In particular, turning corners can be extremely difficult to simulate. The combination of eye and body movement that actually happens in real life is almost impossible to recreate without a great deal of effort. Additionally if you have to travel from outside the building to the inside, you have extreme changes in lighting, global illumination and exposure to deal with that cannot be animated.

For those reasons, we will focus on the process of creating shorter camera movement sequences with Keyframe animation, compiling them into a more comprehensive final animation as the final step.

To initially set up a Keyframe animation, use the Auto Key button, located in the animation control area – in the lower right portion of the 3ds Max screen. When the Auto Key button is pressed, it will turn red, as will the Keyframe Bar and the border around the active viewport. Anything you do to an object such as Move, Rotate or Scale, for example, will create a Key at the location of the Time Slider on the Keyframe Bar. Any Keys for an object will always be visible on the Keyframe Bar when the object is selected, whether Auto Key is turned on or not.



Using the Auto Key button and the Keyframe Bar to animate a camera.

A suggested sequence of events for animating an object, such as a camera, using the Auto Key button would be:

- Click the Auto Key button to enable it.
- Move the Time Slider to the Keyframe where you want to specify the end position of the camera for this movement.
- Select the camera and move it to the location where you want it to be at the frame indicated by the Time Slider.
- Turn off Auto Key.
- Play back the animation to confirm that you achieved the desired results.
- Adjust the Keys if necessary by moving or copying them.
- Repeat the process for any more camera positions or for any other objects that you want to animate.

Remember to turn off Auto Key when you aren't actively animating an object, because almost *everything* you do with that button pressed will be captured as a Key in your animation sequence.

> ***Note:*** When you animate an object, the starting position is automatically captured and a Key is placed for that object at the beginning of the Keyframe Bar. It is a good idea not to have an object begin moving immediately upon starting an animation. Give the viewer a second to process the beginning of the scene before things start moving. You can copy the starting Key of an object by selecting the object, holding the <SHIFT> key down and dragging the Key to another frame – copying rather than moving the Key.

Using the Auto Key button and the Time Slider you can accomplish quite a bit, and in many cases you will need nothing else to create your animation sequence for an object. There are other more advanced tools if you need to "tweak" the animation Keys of your object further, such as Track Views and the right-click properties of each Key on the Keyframe Bar, however those are beyond the scope of this class, the purpose of which again, is to try to *simplify* the process.

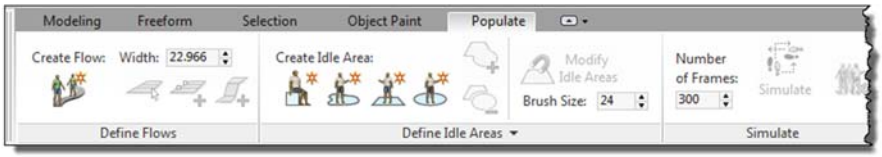
Finishing Touches

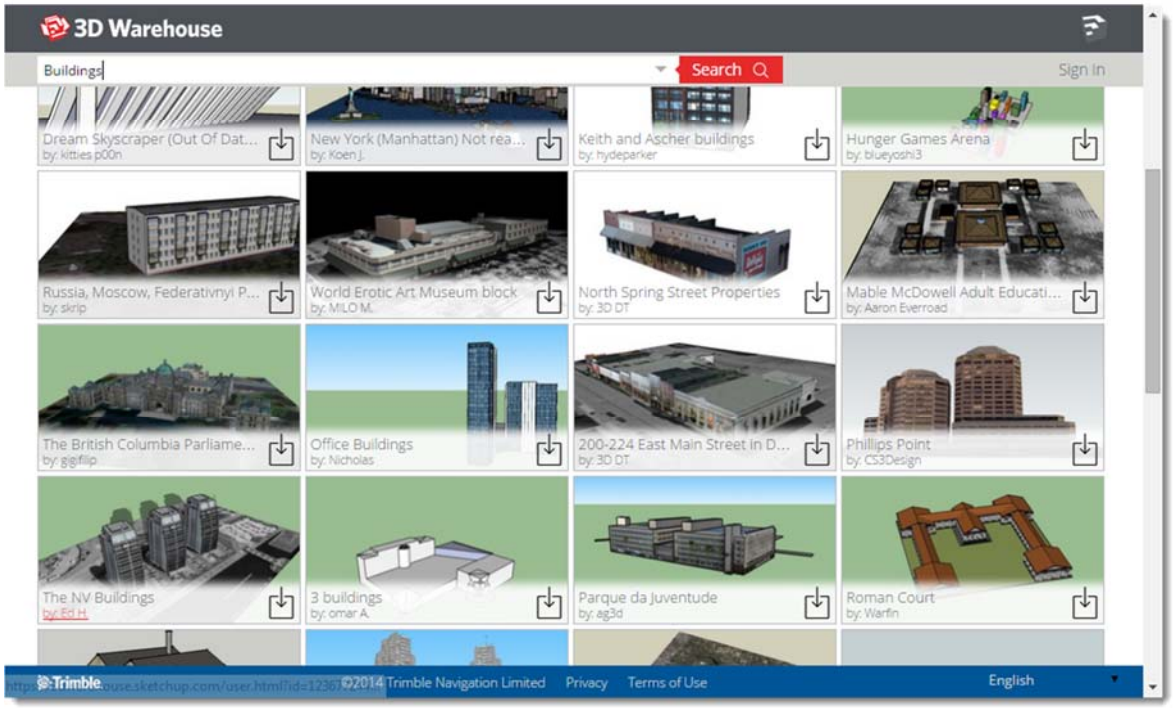
After you have finished setting up all of your animation Keys, you should consider embellishing your scene a bit. Most likely after linking from Revit, you have a complete building model, but an empty building model without any surrounding context will appear a bit stark. There are a variety of sources for entourage (plants, vehicles, people, etc.) with which you can dress up your scene:

- **ArchVision** RPC content allows you to add realistic, low-footprint models of plants, furniture, people and vehicles. It is not free, however you can try it on a trial basis:

www.archvision.com. Revit itself comes with a sample set of Archivision content as entourage – however that content is not brought over into 3ds Max with the FBX link.

- **Civil View** is a plugin that comes with 3ds Max Design that allows for the configuration and animation of vehicles and other entourage in your scene.
- **Populate** is a plugin found on the Animate pull-down menu in 3ds Max that allows you to create animated people, either by specifying a traffic path or "Flow" or a series of "idle areas" with randomly populated male and female figures.
- **Trimble 3D Warehouse** is an extensive library of Sketchup models that can be imported into 3ds Max - https://3dwarehouse.sketchup.com/ . You will find a variety of models of trees and shrubs, vehicles and buildings for free download.





There are a variety of sources of additional contextual model embellishments, some available for free download.

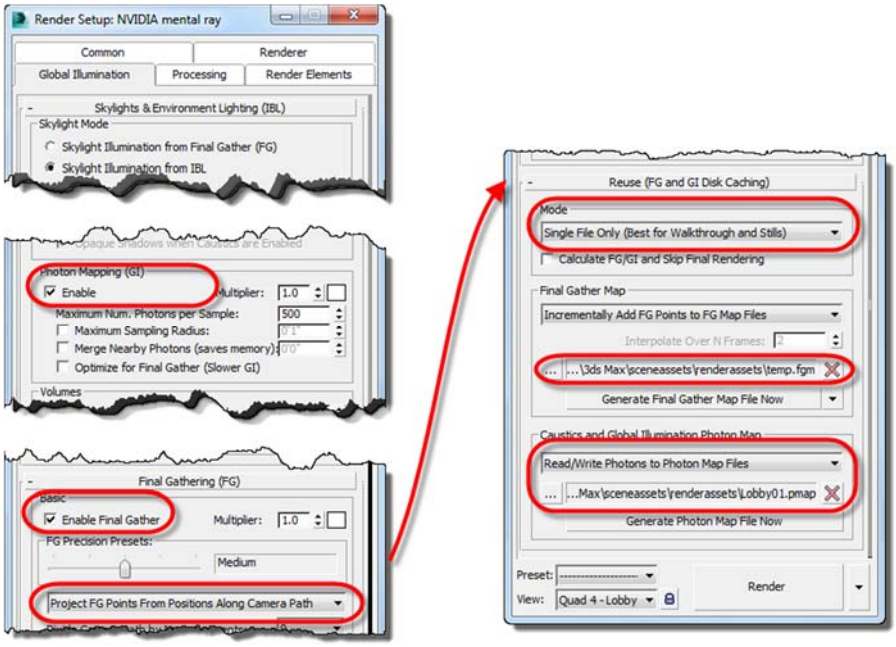
Saving the Animation Sequence

There are two common mistakes that people make when saving an animation.

- The first is to save an entire rendering to a single AVI file, specifying it in the “Render Output” section of the Render Setup dialog. Instead of rendering directly to an AVI file consider rendering to individual JPG or PNG files instead, then compile them into the final output rendering using the RAM Player. This gives you the ability to render your sequence a few frames at a time or to use the Render Farm capability of 3ds Max Design (Backburner) to split the rendering task up among multiple computers on the network, assigning a range of frames to each.
- The second common mistake is to fail to re-use global illumination settings once they’ve been calculated, meaning that they are being recalculated for every single frame of the animation. This can sometimes double the rendering time of the entire animation.

Re-using Global Illumination

As stated previously, Global Illumination can have a dramatic effect on interior scenes and in the case of interior scenes with exterior lighting it is almost a requirement. However Global Illumination will also make rendering times much longer. To avoid this over an animation sequence you should consider re-using your Global Illumination – the calculations are done for the first image frame then re-used for the remaining frames in the sequence. The settings to reuse global illumination are shown in the following image of the “Global Illumination” tab of the Render Setup dialog.

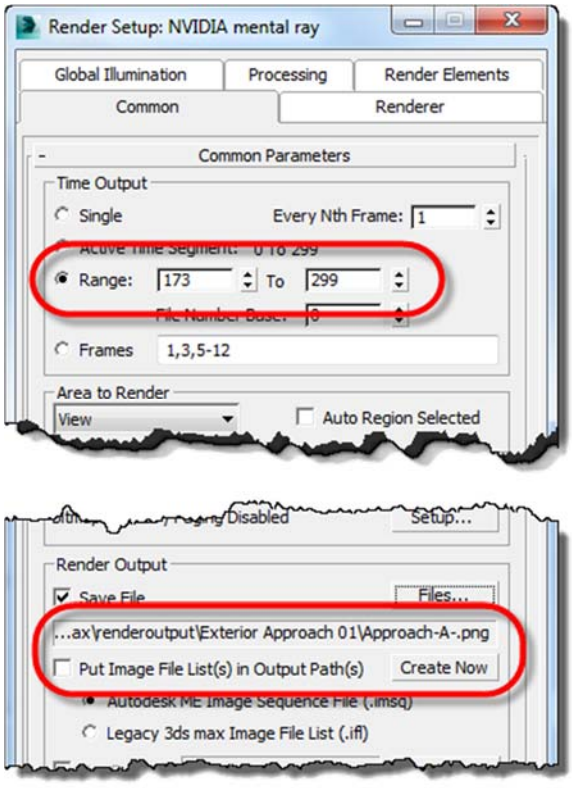


Settings for re-using Global Illumination in the Render Setup dialog box.

Starting on the left side (nearer the top of the dialog panel), notice that “Photon Mapping (GI)” and “Enable Final Gather” are both turned on, as they would be for any image for which Global Illumination is being calculated. Just below the setting for enabling Final Gather, note that in this example the FG points are being calculated from positions along the camera path. This is best for any kind of sequence where the camera is moving through the scene. Moving further down the panel (the right side of the image on the previous page), under “Reuse (FG and GI Disk Caching)” note that “Mode” is set to “Single File Only” and “Final Gather Map” file has a file specified (this can be of any name you choose, but you do need to specify a file to write the Final Gather Map data to). Likewise, “Caustics and Global Illumination Photon Map” is set to read/write photons to photon map files and the map file has been specified.

Using RAM Player to Compile and Save an Animation

To use the RAM Player to create an animation you need to render to individual images. In the Render Setup Dialog you first specify the time sequence to render in the “Time Output” section, then specify the file names and location for the frame images in the “Render Output” section, as shown in the following image.

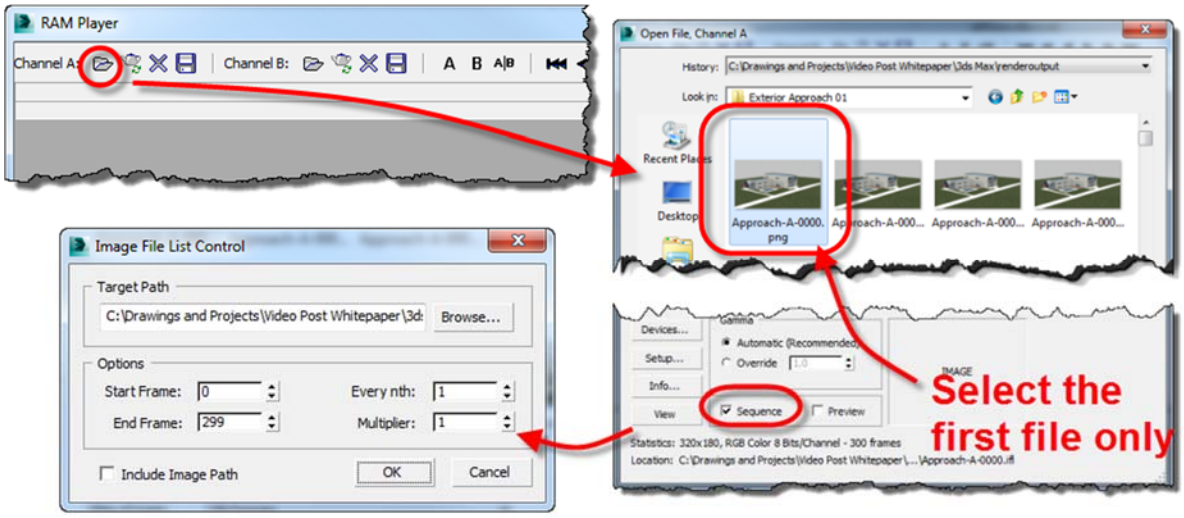


Note in the image on the previous page the time output has been configured for only a range of the images that make up the entire sequence. Also notice that the file name specified for the output is “Approach-A-.png” in this example. What will actually happen is the frame images will

be saved with the frame number as a suffix to the file name, such as “Approach-A-0173.png”, “Approach-A-0174.png”, etc. You need not specify the frame numbers in the file name – by rendering to multiple frames in the time output settings, the file name suffixes are automatic.

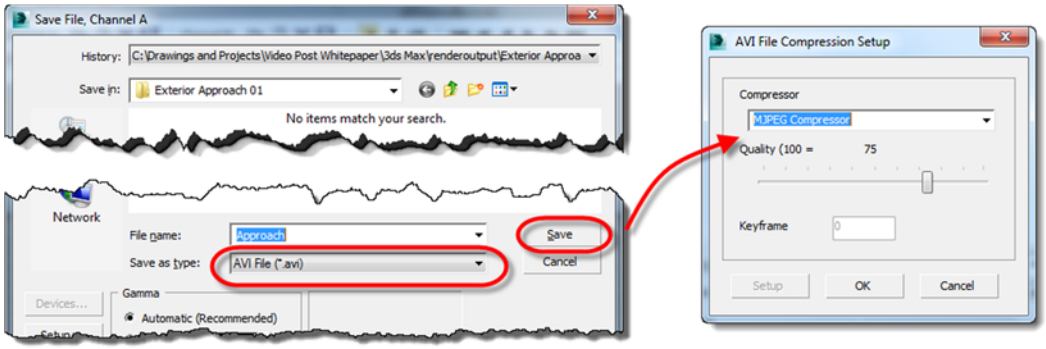
> ***Note:*** You should consider saving each render sequence to its own folder for easy recognition and selection if you later want to use them in conjunction with other sequences using Video Post.

Once your frame images have been rendered, you can use RAM Player to preview the animation and if satisfied, save it to AVI or MOV format. Launch the RAM Player then open the first image in your sequence. In the Open File dialog, choose only the first file in the sequence then make sure that “Sequence” is turned on at the bottom of the dialog as shown in the following image. In the dialog that appears after clicking on “Open”, all of the frames in the sequence should be shown. When you finish opening the entire animation sequence will be loaded in the RAM player and you can play it back using the playback controls.



Opening an animation sequence in the RAM player.

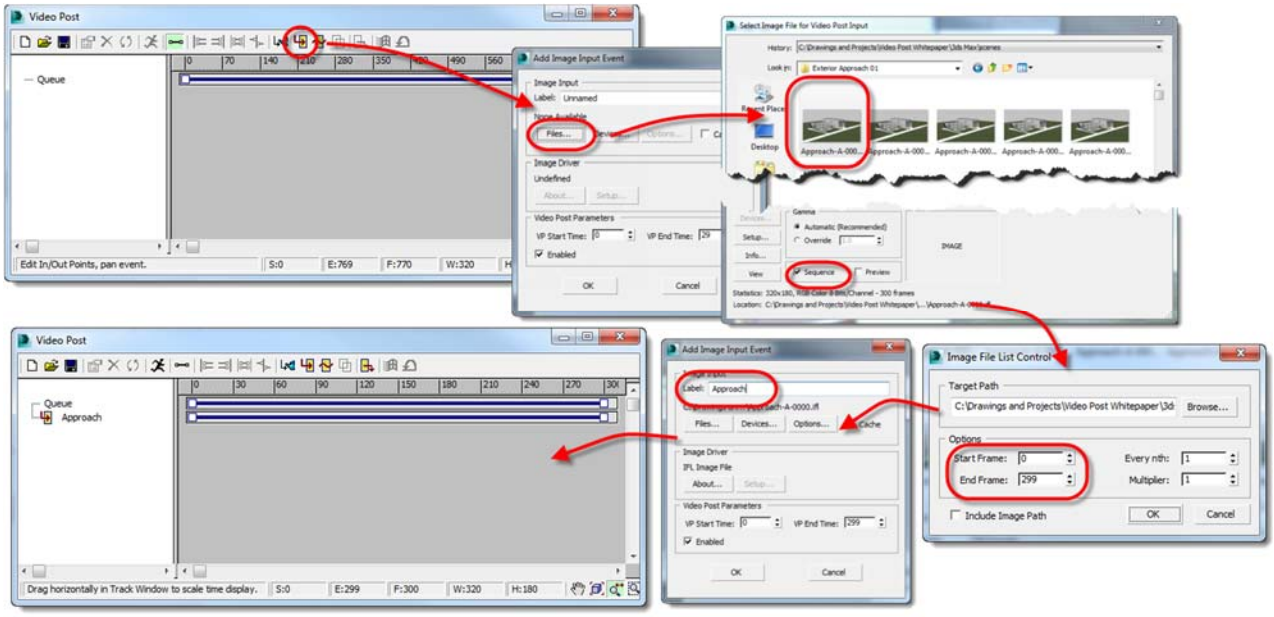
If there are portions of the sequence that you don’t like you can make necessary adjustments to your scene, re-render those frames, overwriting the existing image frames then reload the sequence into the RAM Player. Once you’ve played the animation back and are satisfied with it you can save it to an animation format. If saving to AVI and using one of the HDTV (Video) resolutions consider using the MJPEG Compressor that is provided with the software. Choosing “Uncompressed” will result in an exorbitantly large file with no noticeable improvement in image quality. Choosing the default DV Encoder will result in a somewhat smaller file, however the aspect ratio will not necessarily be the same as that of the image frames, resulting in a distorted image. The MJPEG Compressor results in a fairly small file with the aspect ratio the same as the original image frames.



Saving an animation sequence from the RAM Player to an AVI format using the MJPEG Compressor. Video Post to Combine Sequences

You will probably find that the most effective animations do not consist of a single continuous sequence but rather multiple sequences that are put together into one longer animation, with transitions between each sequence. First, consider the complexities of trying to create a walkthrough that starts on the exterior of the building and continues through to the interior. The lighting exposure and Global Illumination settings will differ greatly between the exterior and interior frames – how do you smoothly transition between the two in a single animation sequence? Second, think about all of the video sequences you see on TV or in the movies. If you look closely most of these consist of multiple short segments with effective transitions from one camera/sequence to another. You can accomplish the same thing in 3ds Max Design using a series of shorter sequences that have been compiled to still image sequences using the method explained above, then combining them into a single animation using *Video Post*.

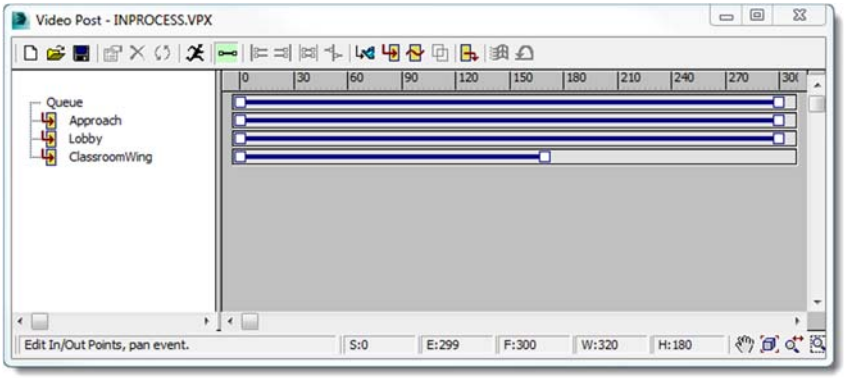
To use Video Post, first render all of your sequences to still image frames. Do not compile them into AVI files yet. You should render each sequence to its own folder, simply to make it easier to select the images to use in the Video Post sequences. Once your sequences are finished launch Video Post by choosing “Video Post” from the Rendering pull-down menu in 3ds Max Design. Initially you will be placed in an empty sequence. To add your animations, click the “Add Image Input Event” button, shown in the image on the next page.



The process for adding an animation sequence to Video Post

Make sure that you choose the first image in the sequence then check on the “Sequence” option at the bottom of the dialog as shown above. In the next dialog check to make sure that the “Start Frame” and “End Frame” values reflect the length of the animation sequence and click “OK”. In the next dialog provide a name for the Input Event for easy identification and click “OK” again to add it to the queue.

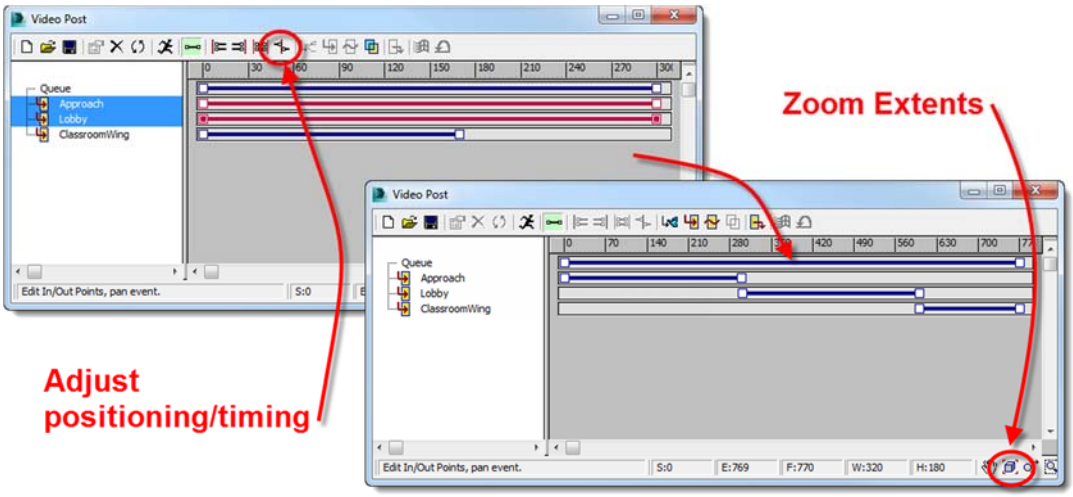
Use the same process to add any additional animation sequences as shown in the following image.



Video post with multiple animation sequences loaded.

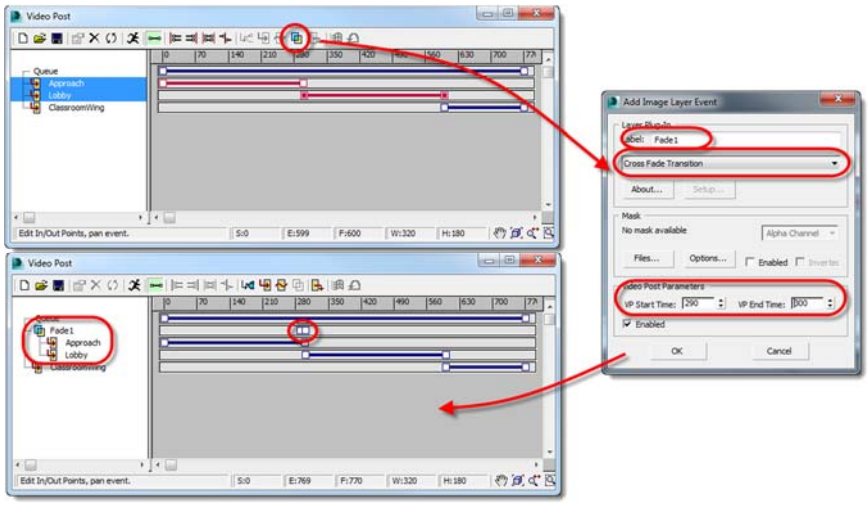
After all of your animation sequences (*input events*) are loaded in the queue, you need to set their timing. The easiest way is to select two events and use the buttons in the toolbar to

arrange one behind the other. You can use the Zoom Extents button in the bottom right corner of the Video Post dialog to expand your view as the number of total frames increases.



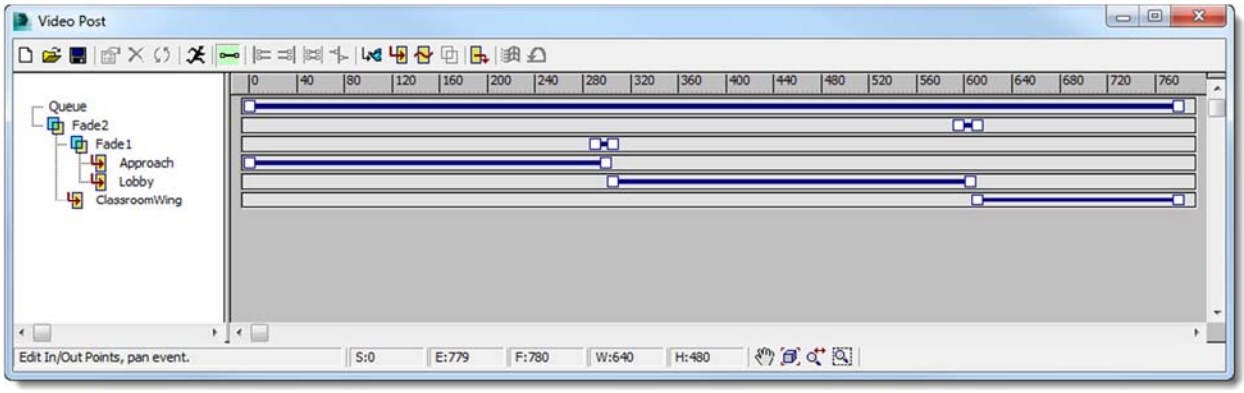
Adjusting the animation events. The image in the upper left shows all sequences loaded but occupying the same frames. By selecting two events, then using the buttons on the toolbar they can be positioned adjacent to each other. The image in the lower right shows all three events after repositioning and after having selected the "Zoom Extents" button to view the entire frame range.

Once you have the animations in the correct frame positions you can add transitions where appropriate. The most common is a *Cross Fade Transition*, which is usually used to indicate a change in time or location. In the following image a Cross Fade Transition is being added between the "Approach" and "Lobby" events, because the animation is moving from the outside of the building to the inside.



Adding a Cross Fade Transition.

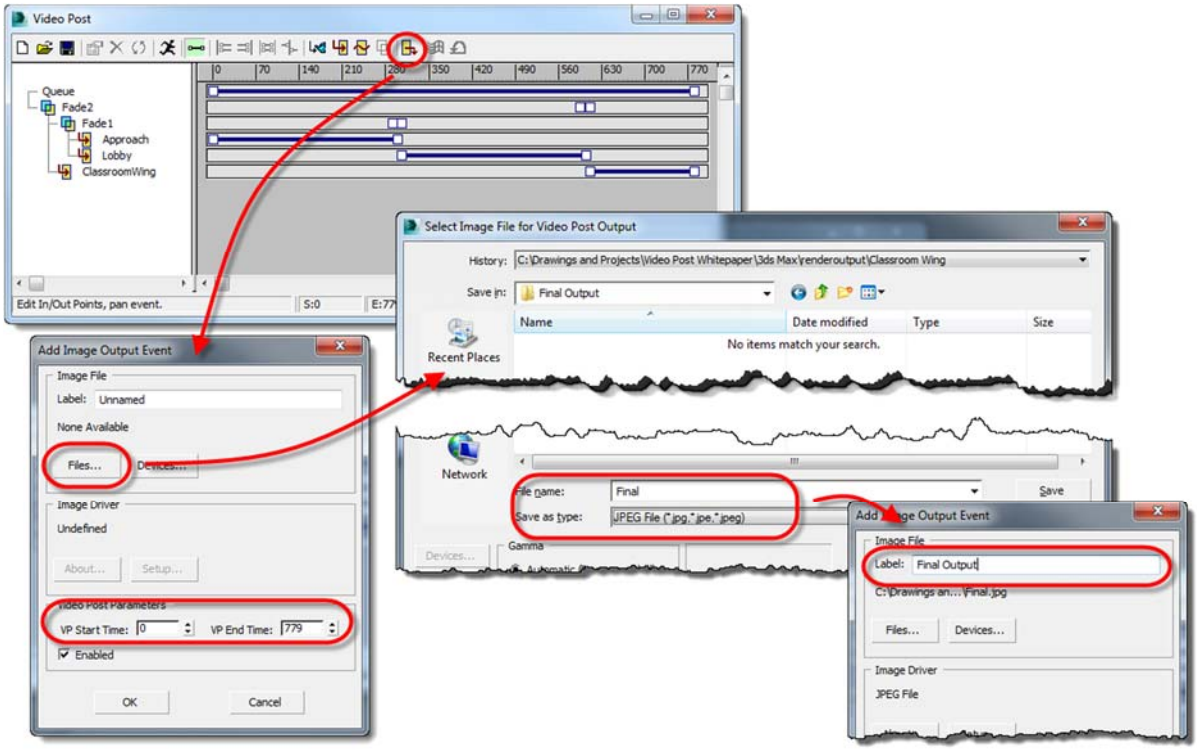
First select the two events in the Queue window on the left then select the “Add Image Layer Event” button from the toolbar. In the Add Image Layer Event dialog provide a name for the transition then choose “Cross Fade Transition” from the drop down list. You can then provide a start frame and end frame for the transition or wait until you are back in the main Video Post dialog and use the grips on the ends of the event line to adjust it manually. In the image below another Cross Fade Transition has been added to transition from the “Lobby” event to the “ClassroomWing” event.



Completed animation sequence with two Cross Fade Transitions.

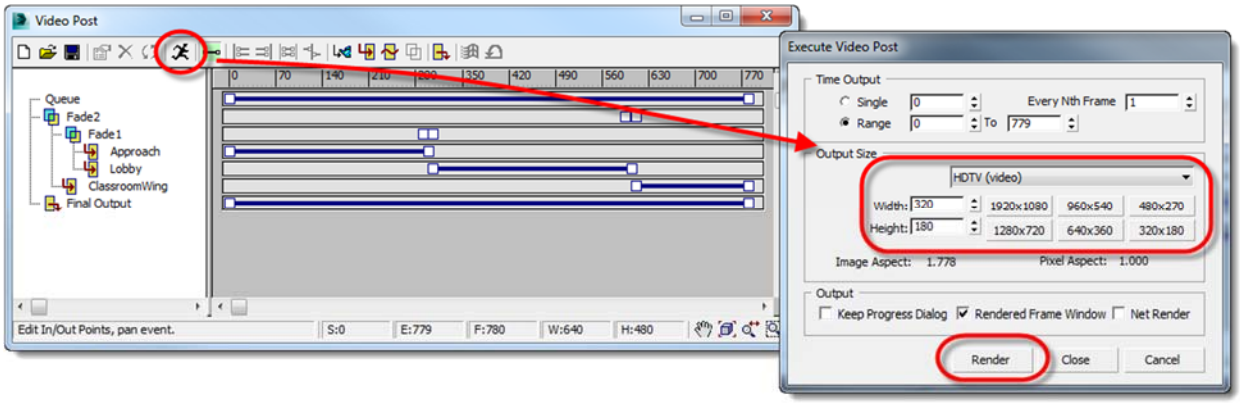
Note that the Cross Fade Transitions are nested, which can be a bit confusing at first. “Fade1” provides a Cross Fade Transition between the “Approach” and “Lobby” events, then “Fade2” provides a Cross Fade Transition between “Lobby” and “ClassroomWing”. To create the “Fade2” transition, “Fade1” and “ClassroomWing” were selected then the “Add Image Layer Event” button was picked. The actual sequencing is seen in the sliders visible in the right panel. Additionally the “Lobby” and “ClassroomWing” events have been moved slightly to provide a short gap between the events, with the transitions extended through the gap. Events are best adjusted by moving the bars. Transitions can best be edited either by moving the bars to the left or right or by dragging the end grips.

Once you have your events and transitions set up the only thing left to do is to add an Image Output Event and generate the full sequence of image frames. Click the “Add Image Output Event” button on the toolbar as shown in the following image. In the Add Image Output Event dialog click the “Files” button and specify a file name for the first image in the sequence as well as a file format. As with other animation sequences it is recommended that you save to still image frames such as JPEG or PNG. The images will be saved with the frame number suffixes. As with the other sequences it is also a good idea to save the frames to a unique folder. Back in the Add Image Output Event dialog provide a name for the event and click “OK” to return to the Video Post dialog.



Adding the Image Output Event.

Once the Image Output Event has been created you are ready to generate the animation. Click the “Execute Sequence” button on the toolbar as shown in the image on the following page. In the Execute Video Post dialog make sure the frame range and output size are correct then click the “Render” button.



Generating the final animation sequence.

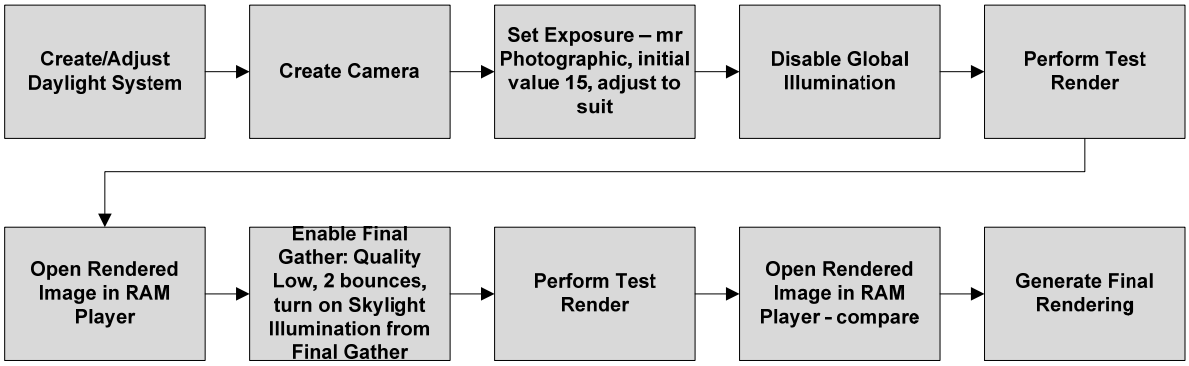
Once the images have finished generating you can use the RAM Player to load them, preview the animation and save to final AVI format as described previously.

Summary

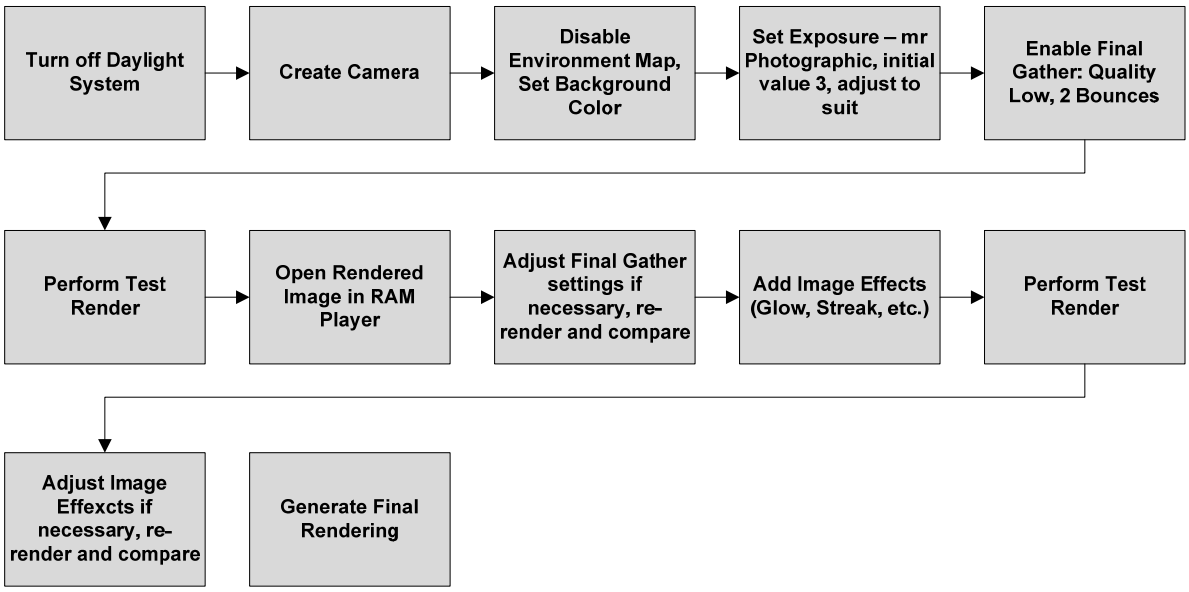
Hopefully this document will help you streamline your process of visualizing a building project, whether you are creating still images or animations. Remember, the most important thing is to stay focused on those tools that you actually need to use to accomplish the job. 3ds Max Design is an extremely powerful and versatile tool that is used for a wide variety of visualization projects. For that reason it includes a lot of tools that you will never need for a building project. Avoid getting sucked across the “event horizon” of a potential black hole – identify the task that you need to accomplish, develop your process and focus only on the tools that make it happen!

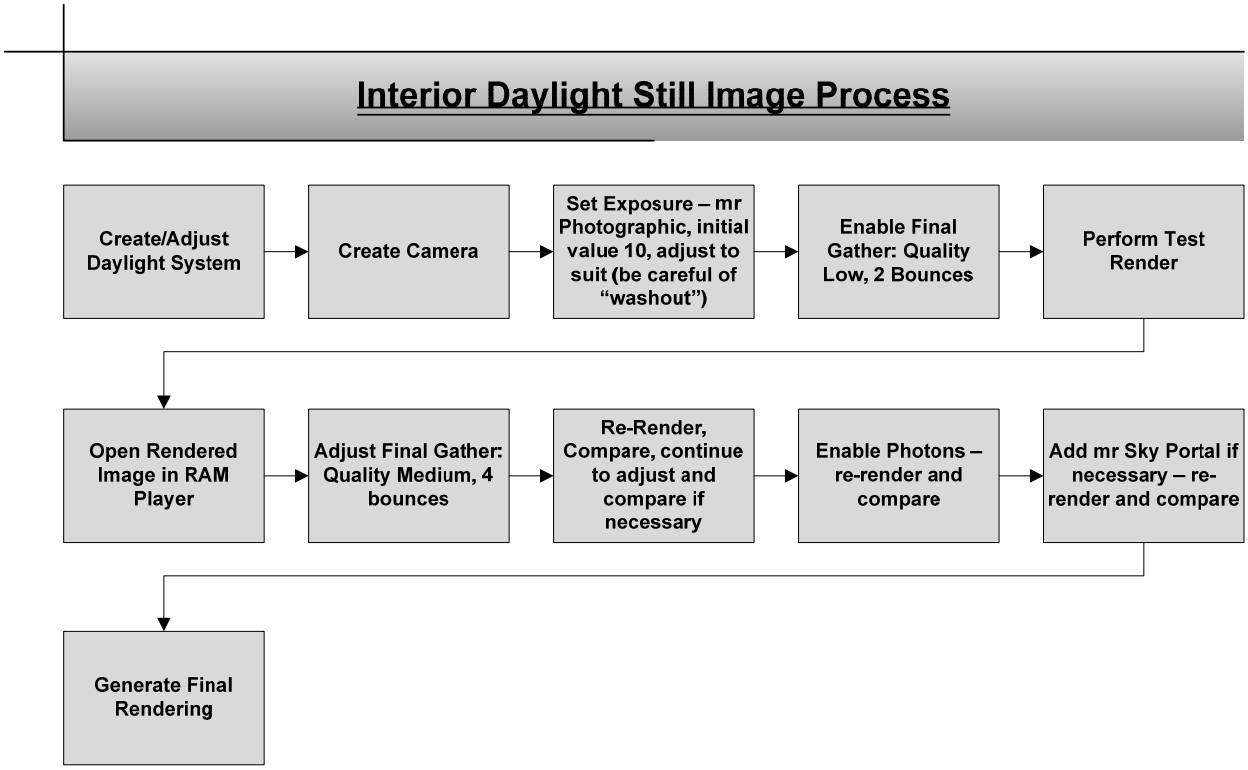
To assist you with your rendering and animation processes, suggested basic flowcharts are on the following pages.

Exterior Daylight Still Image Process

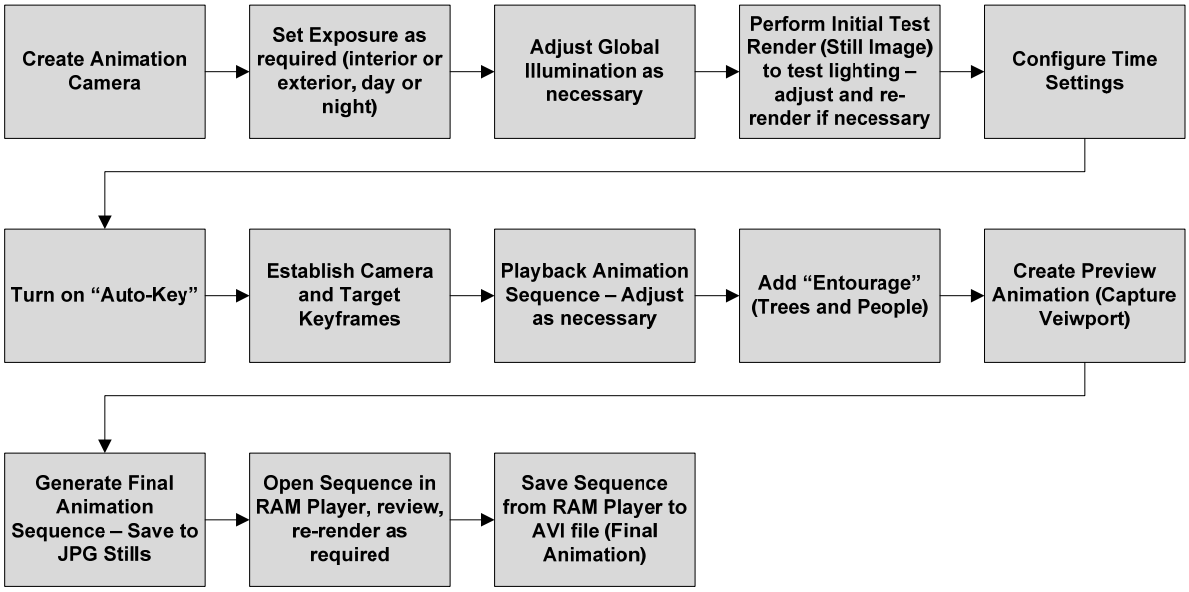


Exterior Night Still Image Process




Interior Daylight Still Image Process
Create/Adjust Daylight System
Create Camera
Set Exposure – mr Photographic, initial value 10, adjust to suit (be careful of "washout")
Enable Final Gather: Quality Low, 2 Bounces
Perform Test Render
Open Rendered Image in RAM Player
Adjust Final Gather: Quality Medium, 4 bounces
Re-Render, Compare, continue to adjust and compare if necessary
Enable Photons – re-render and compare
Add mr Sky Portal if necessary – re-render and compare
Generate Final Rendering

Keyframe Animation Sequence Process



Video Post Process