

AS124016

# Rendering Compelling Photographic Scenes Using Revit, 3ds Max 2018, and Arnold

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## Learning Objectives

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

- Learn how to successfully link to a Revit model from within 3ds Max 2018.
- Learn how to convert the scene and apply physical materials to a model.
- Learn how to create and configure the Sun Positioner and camera exposure.
- Learn how to place cameras using the rule of thirds, diagonals, and the golden ratio to render compelling imagery.

## Description

In the real world, one program just can't do it all when it comes to design, animation, and rendering of architectural models. This class will discuss the use of and best practices for animating and rendering Revit models using 3ds Max 2018 software and the new Arnold renderer in 3ds Max 2018. Learn methods for working with Revit models and rendering photo-quality images. Explore the use of the Scene Converter to update linked models so they work with Arnold. Use Physical Materials and the Sun Positioner to simulate outdoor lighting. Learn traditional photographic techniques and rules of composition to create compelling images. Learn how to frame a shot using composition techniques like the rule of thirds, diagonals, and the golden ratio. You will also see how to utilize Physical Camera controls to adjust scene exposure and depth of field. Get ahead of the competition by learning to create visually compelling, photorealistic renderings using photographic composition in a streamlined workflow.

## About the Speaker

*Steven Schain is the post-production supervisor for all CADLearning products from 4D Technologies, as well as the content development manager of CADLearning's Media & Entertainment products for Autodesk, Inc. software, including 3ds Max and Maya. In 1998, Autodesk recognized Steven as one of only 16 Autodesk Training specialists worldwide. He has since contributed to Autodesk's certified courseware for 9 releases of 3ds Max, was a co-developer of Autodesk's ACI Program and 3ds Max's fundamental standards, and is currently an Autodesk Certified Instructor. As a premier Autodesk trainer, he has continued teaching end users, companies, and many others, including The Walt Disney Company, Guess, and the United States Army. As a 7-year veteran of Autodesk University, Steven has taught classes ranging from creating particle fountains in 3ds Max, to classes on 3D printing and entrepreneurship.*

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## Introduction

As an architect or designer, you can use Autodesk's Revit software to create buildable designs for anything from simple framed structures all the way to complex, multi-floor high-rise buildings. At any stage in the design process, you may need to share or present your design, and often, it is a requirement to render it using a method that provides photorealistic results. While Revit is capable of high-quality renderings of your design, you may need to have a higher level of control over the look of the final image, and the rendering tools used to generate the final image.

Arnold is a rendering tool that provides an exceptional level of rendering quality and a true photographic view of your design. 3ds Max is the ideal environment for the creation of photorealistic renderings of your Revit designs. You can import your Revit models into 3ds Max by linking to the Revit file directly. Once imported, you can edit materials that were assigned in Revit, or assign new materials you create. In the case of the Arnold renderer, it's easier to use the Scene Converter to update the materials and scene lighting to work with Arnold.

Often, 3D Revit models will come into 3ds Max with a default Daylight system that is used for rendering the direct sunlight and the scattered skylight. Once you import it and convert it to include a Sun Positioner, you can modify the sunlight. You can also change the time and date, as well as the location that you want to use for the rendering.

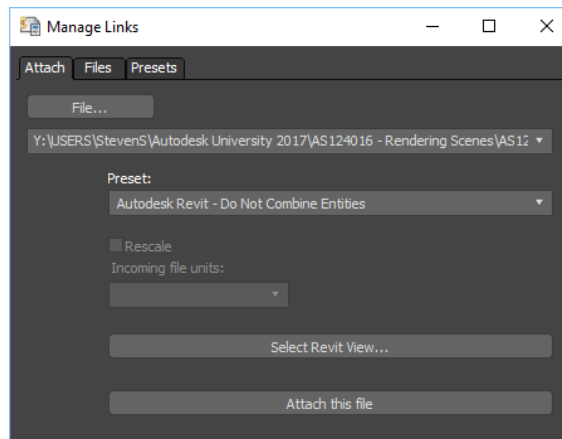
Controlling the camera's point of view is a critical part of generating a compelling rendering. By using simple compositional rules, you can set up a camera view that will present a dynamic rendering of your design. Once you set your view point, you need to decide what the output will be for the final rendered image.

In many cases, images are rendered to a file that will be used either for printing or digital presentation. The size and level of quality of the final rendering will usually be based on specific output requirements. For generating truly photographic quality renderings, you can use the Arnold renderer. If you're running a test to see if the image looks the way you want it to, you can set the quality level to give you a shorter render time. Then, when it comes time to creating a final high-quality rendering, you only need to change a few settings in Arnold to render the image.

This class will discuss and outline the steps you would take to go from an Autodesk Revit design file to a fully rendered, photorealistic image using 3ds Max and the Arnold renderer.

## Linking to a Revit Model

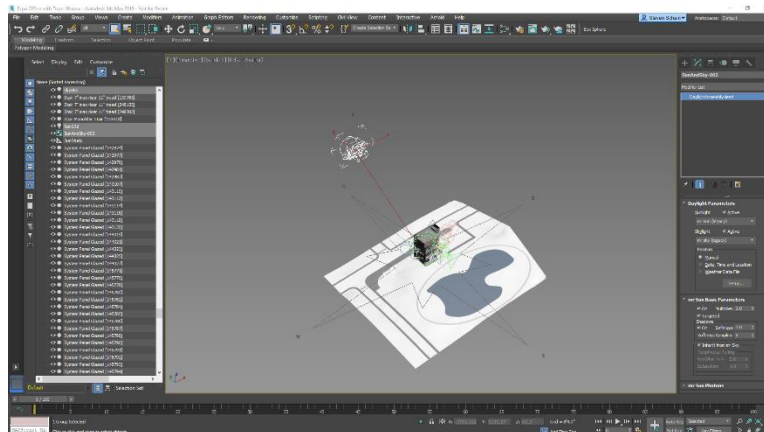
You're going to link versus import a Revit file, because if your design changes, you can reload it through the File Link Manager. The File Link Manager is the dialog that gives you access to the file link tools. You can choose what file you wish to link, choosing from DWG, FBX, and Revit. Once you link to a Revit file, you're able to choose from several preset options that control how the file is linked into 3ds Max.



From the 3ds Max application button, click the **Import** option, and then click the **Link Revit File** option. You first need to select a **Revit View**, and once it is selected, the **File Link Manager** becomes available.

Using the **Do Not Combine Entities** preset that that does not combine the model entities gives you the flexibility to organize your scene the way you want to. Then, click the **Attach this file** button to link the Revit model. During the import process, you may see a Daylight System Creation dialog. This asks if you want to create a Daylight system in the current scene.

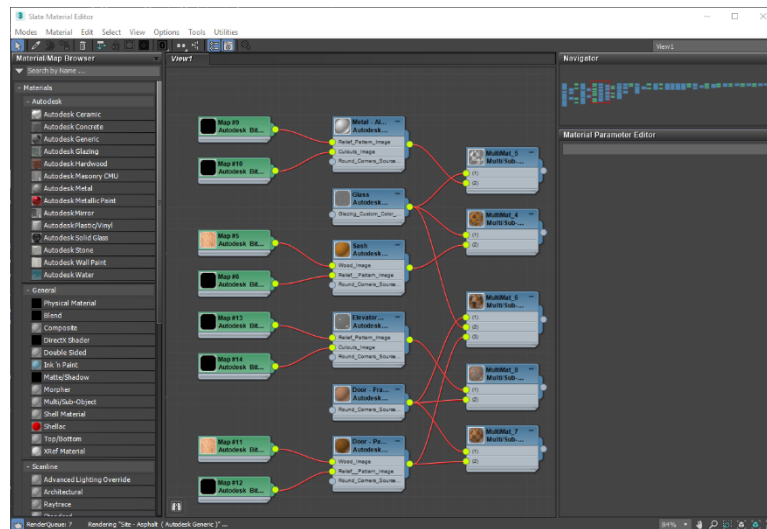
Once the import process is complete, you will see the File Link Manager and the linked model in the viewport.



*THE LINKED REVIT MODEL, AS SHOWN IN THE VIEWPORT*

## Converting the Scene

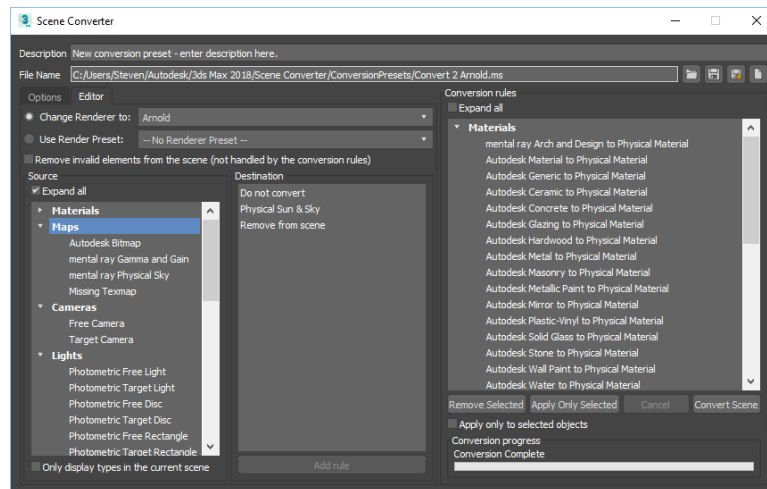
Now that the model is linked, the materials and daylight need to be converted to work with the Arnold renderer. Linked Revit models, like other types of imported models, contain the materials that were applied to the individual objects within the Revit project. One problem with this is that the materials are imported as Autodesk materials and are not compatible with Arnold. To address this, the imported daylight system needs to be converted to a Sun positioner.



*MATERIALS SHOWN IN THE MATERIAL EDITOR FROM THE LINKED MODEL*

## The Scene Converter

An easy way to accomplish this is to use the scene converter. The **Scene Converter** is a tool that provides a straightforward workflow for converting lights, materials, and objects between different renderers. There are many presets available, and you can easily create your own, depending on your needs and the rendering tool you will be using.



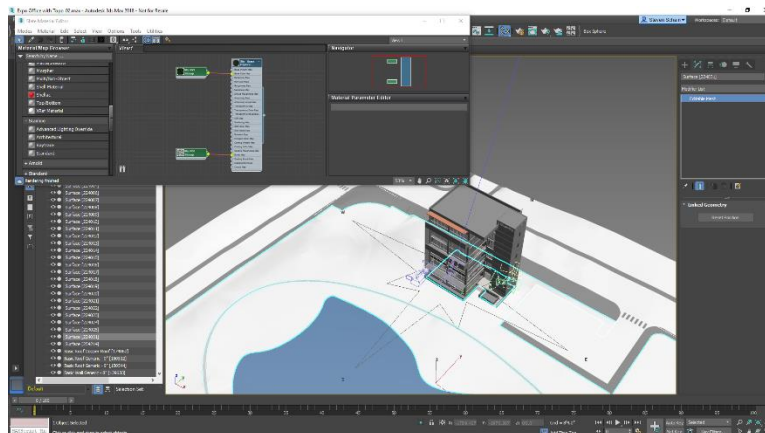
*THE SCENE CONVERTER DIALOG*

While you can create a new conversion script from scratch, it is much faster to use a premade script file that can be loaded into the **Scene Converter**. The Convert 2 Arnold.ms script has been preset to convert all materials into physical materials, convert bitmaps to Arnold compatible textures, cameras to physical cameras, the exposure control to the physical camera exposure control, and lights to Arnold-compatible lights. It also includes converting the Daylight System into a **Sun Positioner** using the **Physical Sun** and **Sky** as the environment map.

Once converted, there is still some work that needs to be done. Even though all the materials are now Arnold-compatible, the conversion process does not maintain 100% of material properties. There may be a case when materials will need to be edited.

## Working with Materials

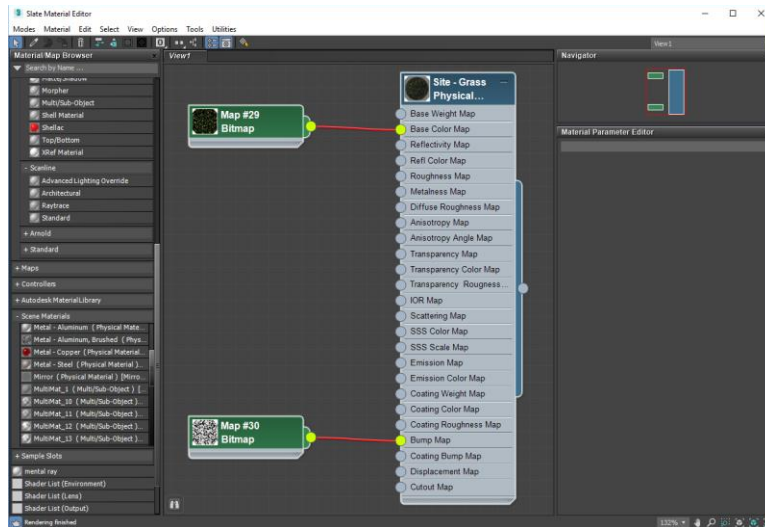
For this, you will work in the Slate Material Editor, since it gives you a good look at the overall structure of the material at a glance. To open the Slate material editor, from the **Material Editor** flyout, select **Slate Material Editor**. One of the nice features of the **Slate Material Editor** is the ability to have the **Material/Map Browser** available all the time. Once open, you can scroll to the Scene Materials rollout. When you open the Scene Materials rollout you can view and select any material currently applied to objects in the scene listed in alphabetical order.



## Editing Existing Materials

To adjust the parameters of a material in your scene, you need to bring the material into the material editor. To accomplish this, you have several options. One method is to use the **Material/Map Browser**, and click and drag a material into the work area. Another is to select an object and get the material from that object, or acquire the materials from the whole scene. However, that last method may not be the best idea if you have a lot of materials in the scene. Working on one or two materials at a time is much easier.

To get a material, first, select the surface that uses the material. For this example, select the site grass. Then, in the **Slate Material Editor**, **Material** menu, there is a command that will bring the material from the selected object into the work area of the Materials Editor. Be aware that making any change to this material will affect any object in the scene with the material applied to it.

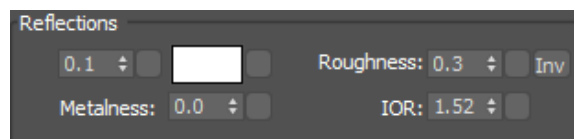


THE PHYSICAL MATERIAL THAT IS APPLIED TO THE GRASS IN THE SCENE

## Editing a Physical Material

When editing a material that is in the material editor work area and is assigned to an object, or objects, in the scene, making any change to it will affect all the objects in the scene that have that material applied to them. To access the material parameters, double-click the material.

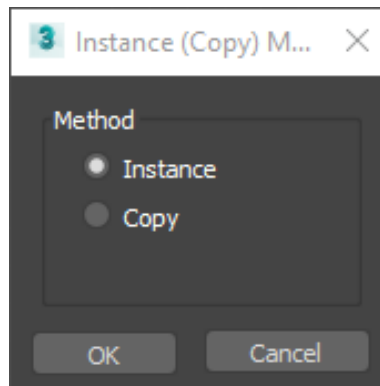
One of the side effects of the material conversion process is that some materials are converted to physical materials with their Reflections value set at 1.0. This will cause them to be a mirror surface, fully reflective. Since this material is grass, it should have little to no reflectivity, and should be a little rough. In order to fix this, set the **Reflections** value to **0.1** and the **Roughness** value to **0.3**.



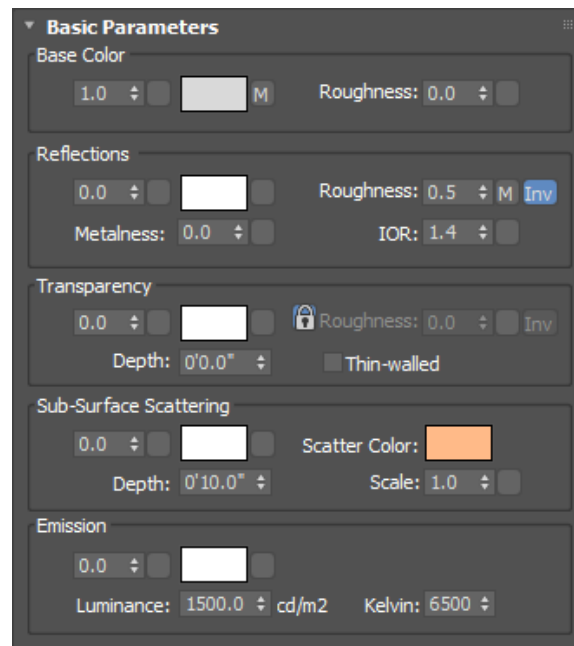
It is highly recommended that you review all the materials that are brought in with the link and converted using the Scene Converter. Not only will this let you verify that the materials are configured correctly, but also, you can make any changes you would like to the materials.

In this case, since there are a number of materials applied across all the objects in the scene, it is often easier to get a material from the Scene Materials in the Material/Map Browser. One advantage to working with the Slate Material Editor is that you can have more than one material in the workspace at the same time. Simply middle mouse clicking and panning the work area can give you room for another material.

With the **Scene Materials** rollout open, you can drag the **Concrete** material into the workspace. Using the **Instance** method for dragging in the material will ensure that changes are reflected in the scene for any object that material is applied to.



Double-click the concrete material in the work area to open its parameters. Here, you can edit any aspect of the physical material that is being used for the concrete. You will again want to reduce the **Reflections**, this time to **0.0**. That will make the concrete a flat, nonreflective surface.



From this point, you can go through and review and edit the remaining materials in the scene.

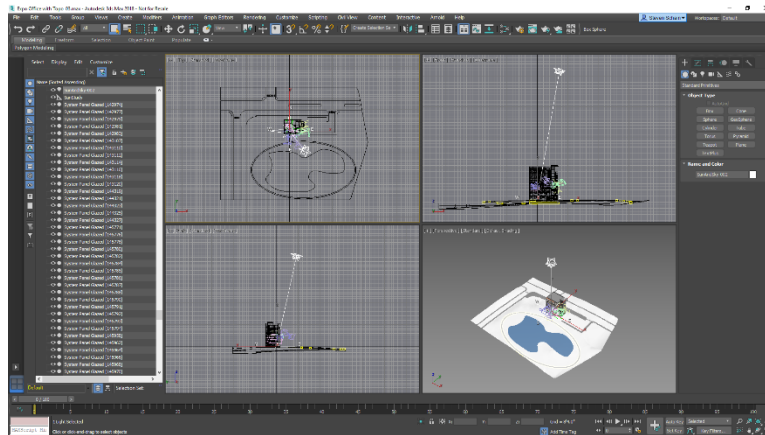
## Working with the Sun Positioner

One advantage of linking to a Revit file is that you can use the Daylight system that is imported through the link. The daylight system is a lighting system that is designed to simulate the effects of outdoor sunlight and skylight. The sunlight provides the direct illumination and direct shadows, where the skylight provides the light that is scattered by the atmosphere. When used in combination, the finished rendering can be visually accurate and highly photoreal.

However, when the daylight system is converted using the Scene Converter, it is replaced by the Sun Positioner. The Sun Positioner also provides a simple interface for placing the sun in

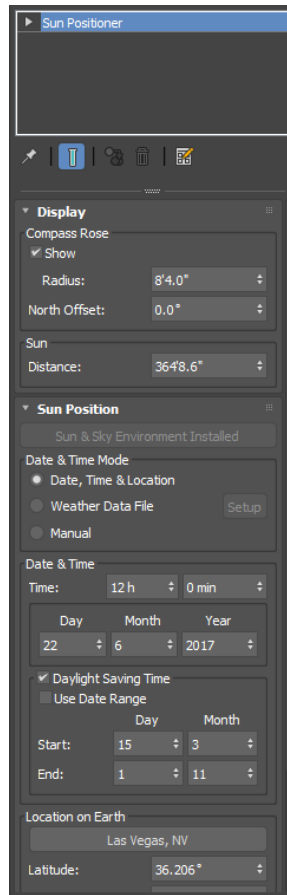


the sky in relationship to the scene. All you have to do is set the time of day, the date, and the location in order to accurately place the sun. Then, to orient the scene geometry, you can simply determine what the north direction should be and reorient the Sun Positioner to match that orientation.



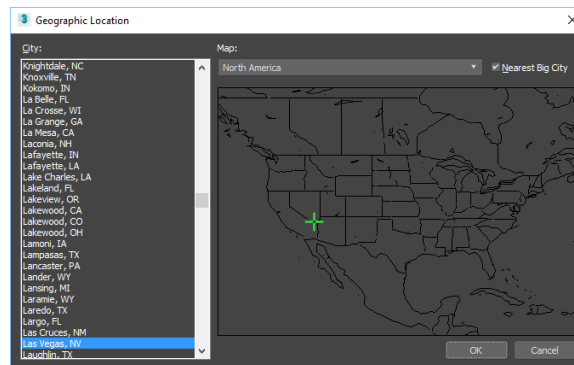
## Modifying the Time, Date, and Location

To edit the sunlight, select the **Sun Positioner** object in the scene, and then click the **Modify** panel. This is the key to the Sun Positioner, as it contains the time and location parameters. To change the time and date, enable the **Date, Time & Location** option, and then modify the parameters. Set the **Time:** in **hours** and **minutes**, and then set the date by adjusting the **Day**, **Month**, and **Year**. You can also specify whether Daylight Saving Time is active, and if you want to use a range of dates.



#### THE SUN POSITIONER ROLLOUT

You can also change the geographic location of the building. Click the **Get Location** button, which opens a dialog containing a map and city list.



#### PICK A LOCATION ANYWHERE IN THE WORLD

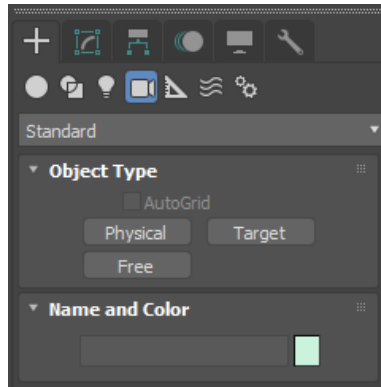
The last thing to do is determine the orientation of the building. To orient the building correctly, enter the required angle in the **North Direction** field, and then press ENTER.

## Establishing a Point of View

At this point, you are ready to establish a camera view. Choosing a point of view is not as simple as just placing a camera in the scene and rendering the scene. If you want a compelling image, it is important to understand and employ a few basic rules of image composition.

### Creating a Camera

There are three types of camera in 3DS Max: Physical, Target, and Free.

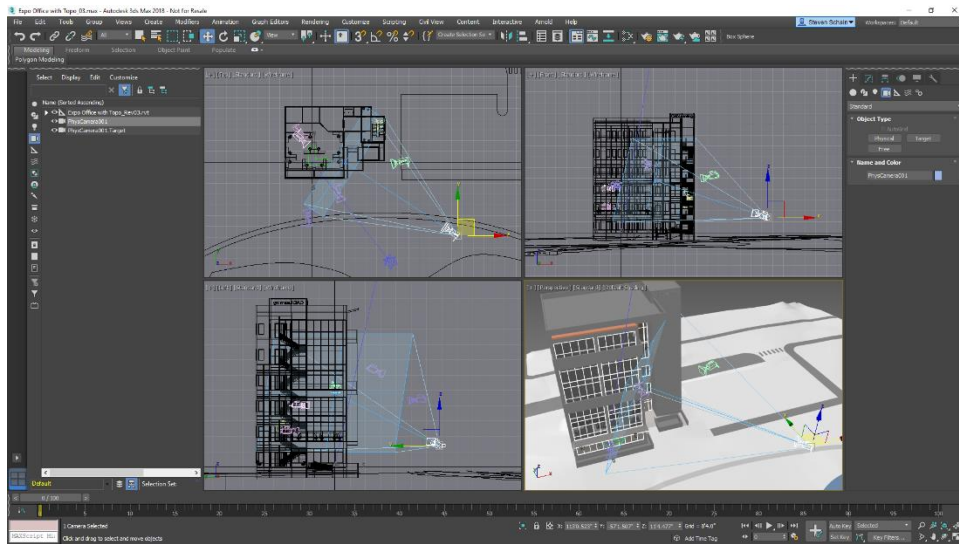


A **Physical** camera is designed to mimic a real-world camera within 3ds Max. It can either be free or targeted, and contains advanced features like film / sensor size for simulating real cameras. Other parameters include the lens zoom and aperture, and whether depth of field is enabled or not. You can also set what type of shutter is used and whether or not motion blur is used for the camera. The Physical camera also controls its own exposure, which means you can have multiple cameras, both indoor and outdoor, with different exposure values.

A **Target** camera is attached to a target, so it views the area around the target object. When you click and drag in a viewport and create a Target camera, you will create a two-part icon. The first icon represents the camera, and the second icon is the camera's target (displayed as a white box). The camera and the camera target can be animated independently.

A **Free** camera is a free-standing object that views the area in the direction that you have aimed the camera.

When you create a **Physical** camera, you see the **Physical** camera icon. This icon represents both the camera and its field of view (FOV). Once the camera is in your scene, the icon for the camera will look the same, regardless of whether it is set as free or targeted, but the free option does not contain a separate target. Free cameras are useful when you need to animate a camera along a path.



*A NEW PHYSICAL CAMERA ADDED TO THE SCENE*

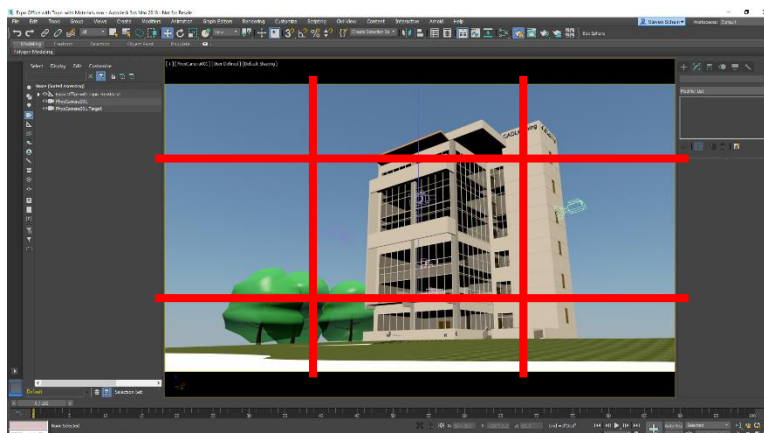
## Composition Basics

If you want a compelling image, it is important to understand and employ a few basic rules of image composition. Many of the rules of composition have been around for centuries. You are going to learn two simple rules that can easily be implemented to give you better-looking images immediately.

### Rule of Thirds

The first rule is the *rule of thirds*. This rule breaks the screen into three sections vertically and three horizontally. When composing a scene using the rule of thirds, you use the two vertical lines and the two horizontal lines to locate key horizontal and vertical image elements.

There are four key interest points that are created at the intersections of each of the one-third lines. When there is a particular object or scene element that is to be the focus, it can be placed at one of these intersection points. By using this rule, you can create an image with a more interesting composition.

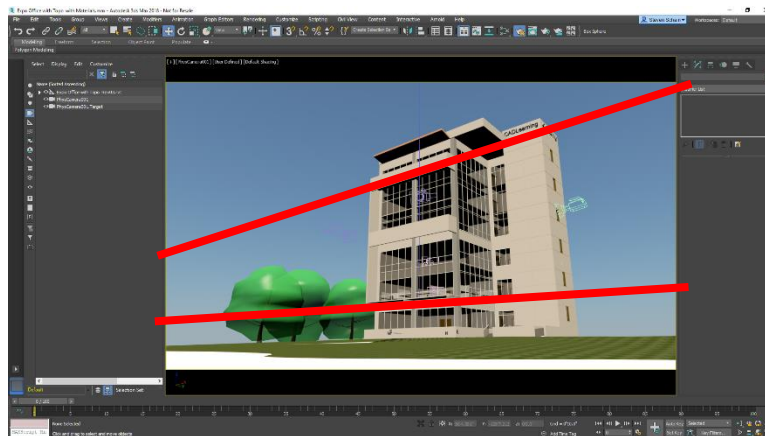


## Diagonals

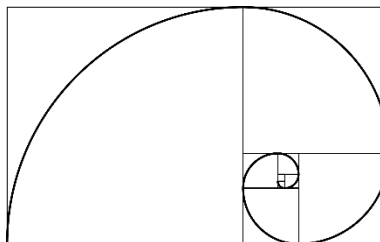
The second rule is the use of diagonals within the image frame. By incorporating *diagonal lines* into any image, you can create a more dynamic image and lead the viewer's eye through the scene. Diagonals are easy to incorporate into a final image, and by using it in combination with the rule of thirds, you can create an image that will appeal to a much wider audience.

The last rule of composition to keep in mind is the use of *camera correction*. Since this is to be an architectural rendering, you want to make sure the vertical lines are all vertical. You can accomplish this by adding a camera correction modifier to the camera.

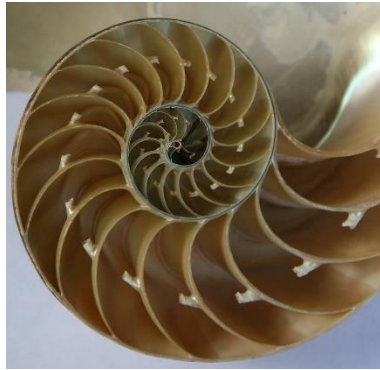
To add a camera correction modifier to a camera in your scene, right-click a camera and choose the **Apply Camera Correction** modifier. In the **Modify** tab, in order to establish the correct amount of correction and obtain a 2-point perspective view, you need to enter a value. Once the proper value is entered, the camera view will have vertical object lines that are perfectly vertical.



## The Golden Ratio

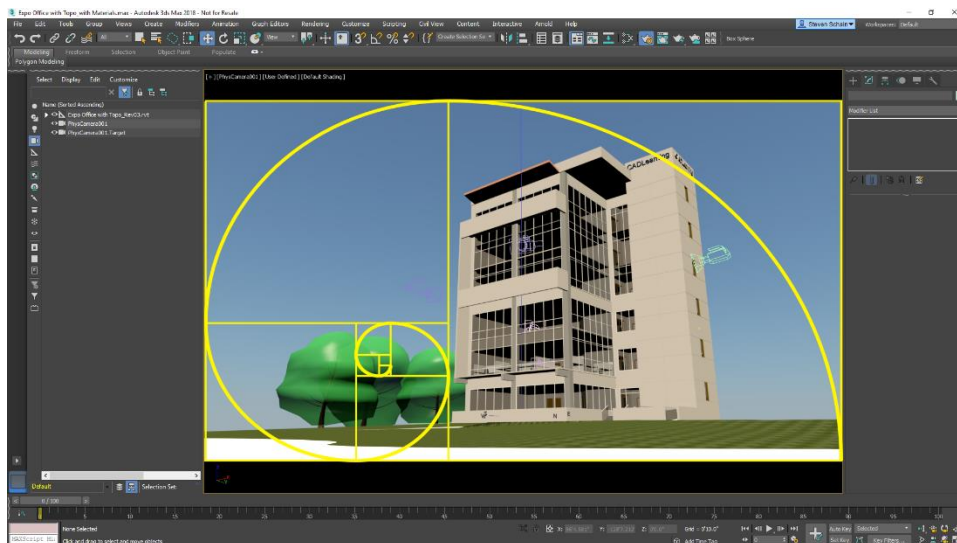


The *golden ratio*, also called the *golden mean*, defines two values, with the ratio of the sum equal to the two quantities. This ratio defines proportions based on length or area, and has been used in architecture and art for centuries. The ratio also appears in nature, like the spiral pattern of a growing fern, or one of the many seashells.



*A NAUTILUS SHELL SHOWING DETAILS OF THE GOLDEN RATIO*

When the golden ratio is used for visual composition, it can create a powerful and dynamic image. Using this in your renderings can provide a balanced image from the viewer's perspective. This balance is more natural to human perception because it is seen in nature almost everywhere, and adds to the visual harmony of the final image.

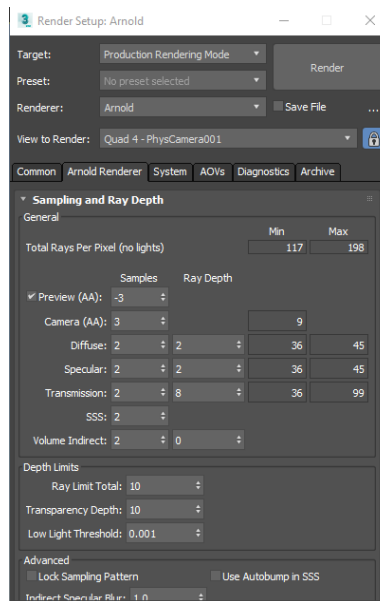


*IMAGE COMPOSITION USING THE GOLDEN RATIO*

## Rendering the Scene

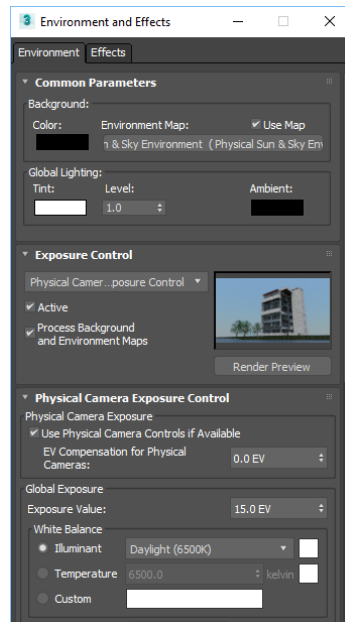
Rendering a virtual photograph has become increasingly simpler as the quality and simplicity of advanced renderers have improved over the years.

The rendering options in 3ds Max are no exception. With the release of 3ds Max 2018, you can now use the Arnold renderer. This renderer is very simple to configure, and needs only a few easy parameter adjustments. The Arnold renderer is a highly photorealistic renderer capable of generating physically accurate lighting with very little worry about rendering settings. It does this by tracing the path of light through a scene.



*THE RENDER SETUP DIALOG SHOWING ARNOLD RENDERER PARAMETERS*

Once you set and configure the renderer, it is important to make sure the exposure is properly set. During the conversion process, the physical camera exposure control is set in the **Exposure Control** section of the **Environment and Effects** dialog. With this exposure control type, in conjunction with the physical camera, each camera can use an independent exposure value. Regardless, if you do not properly set the camera's exposure value, the final image may end up either too dark or too light. Once you set the proper exposure, you are ready to render the scene.

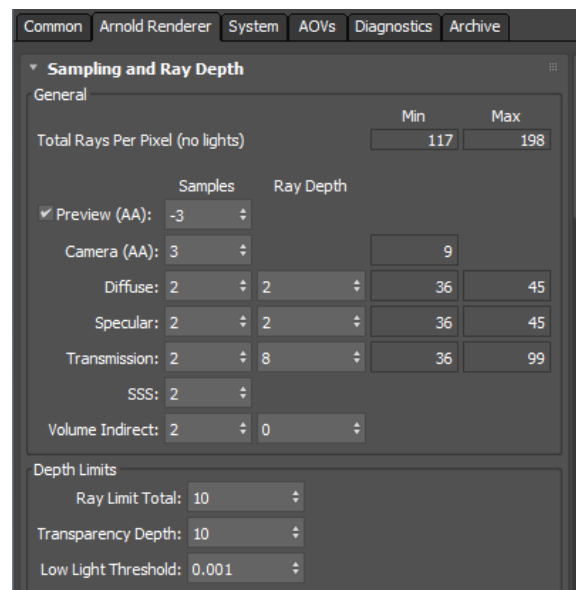


*THE ENVIRONMENT AND EFFECTS DIALOG SHOWING ENVIRONMENT AND EXPOSURE CONTROL*

## Configuring the Renderer

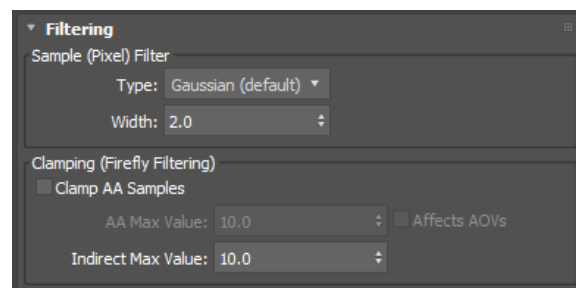
The Arnold renderer is another element that is configured through the Scene Converter. In the main toolbar, open the **Render Setup** dialog. In the Render Setup dialog, select the **Arnold Renderer** tab. Notice that there are only a few options for the Arnold render. Configuring the quality of an Arnold render is handled mainly in the **Sampling and Ray Depth** rollout. The **General** group contains parameters that control the **Sampling Ray** and the **Ray Depth** for different aspects of scene rendering. For example, the **Camera (AA)** only contains Samples, whereas **Transmission** contains both Samples and Ray Depth.

Under **Depth Limits**, you can limit the number of light bounces, which can speed up rendering time. This option can be helpful when you want to render a preview that doesn't have to have full and finished reflections or transparency. If you reduce the **Ray Limit Total** too low, scenes can appear darker than the final rendering with a higher Ray Limit. This is true especially for interior scenes, and exterior scenes that are lit from all around (typically by the sky).



*ARNOLD RENDERER PARAMETERS FOR SAMPLING AND RAY DEPTH*

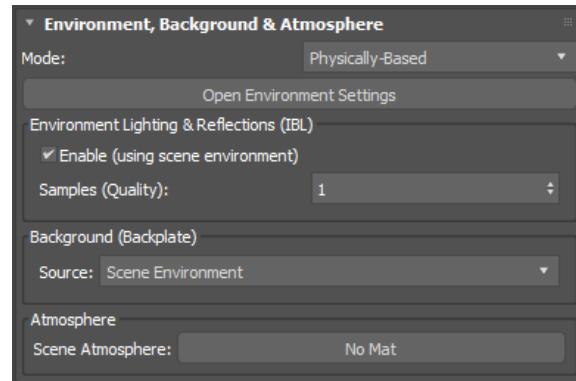
Under **Filtering**, you can select the **Type** and **Width** of the sample area. Increasing the value of Width can soften the image, but may increase render time. You can also control **Clamping**, which can help reduce spots known as “fireflies.”



*ARNOLD FILTER OPTIONS*

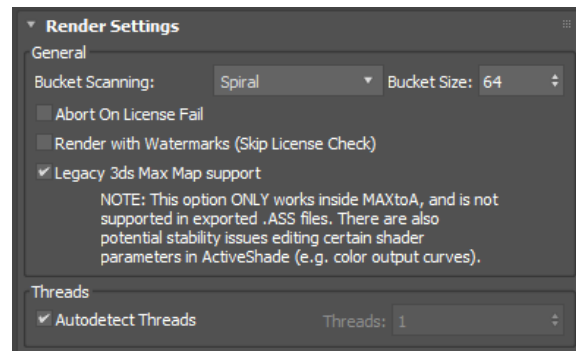


In the **Environment, Background & Atmosphere** rollout, you can set the **Mode** for environment rendering. The **Physically-Based** option uses the current scene environment, or the environment set in the background source. This is calculated using a physically-based rendering approach. The **Advanced** option gives you more control over environment rendering, and is there if you want to use a more artistic approach.



*THE ENVIRONMENT, BACKGROUND & ATMOSPHERE ROLLOUT*

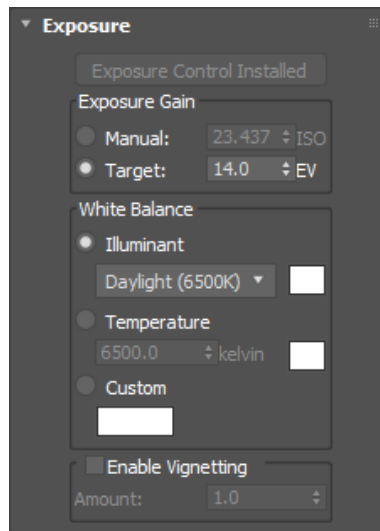
One option that is commonly set is under the **System** tab for the Arnold renderer. In the **General** group, enabling the **Legacy 3ds Max map support** option will allow you to use most of the traditional 3ds Max procedural texture maps, like noise and gradient ramp.



*THE RENDER SETTINGS ROLLOUT IN THE SYSTEM TAB*

## Adjusting Scene Exposure

Before you render a final image, you need to adjust the exposure of the scene. With the physical camera and physical camera exposure control, this is handled through the camera itself.

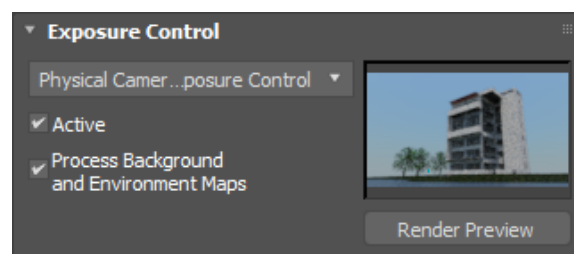


**Exposure Gain** allows you to modify your rendered images with controls similar to those used with real-world cameras. You can set a general Exposure Value, or, if you are accustomed to working with cameras, you can set specific film ISO, as you would with actual photography. It also gives you individual camera white balance, and the ability to add vignetting to the rendered image. The light levels of the scene do not change; only the sensitivity and amount of light entering the camera is changed.

For non-photographers, the EV value is easier to use. The single **Exposure Value** setting corresponds to a combination of three photographic exposure values: shutter speed, aperture, and ISO. Each increment or decrement in the EV value corresponds to halving or doubling, respectively. The general rule of thumb is that higher EV values result in darker images, and lower values result in brighter images. For example, an EV value of 15 would result in a darker rendered image than an EV value of 6 in the same scene.

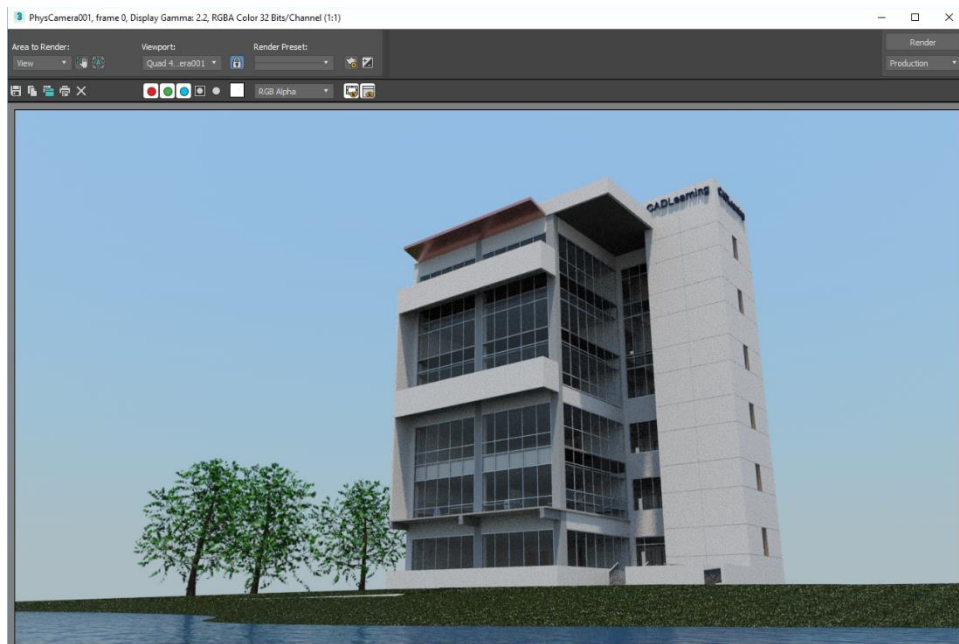
The **Manual (ISO)** setting is the sensitivity of the camera film, expressed as an index. This setting works just like the Target EV setting, except, as the ISO value increases, so does the sensitivity of the camera to the light. This has the effect of brightening the scene.

To preview the render to see what the current exposure looks like, click the **Render Preview** button. Once the preview render is complete, the Exposure Value can be modified as needed to increase or decrease the brightness of the final rendered image.



## Rendering a Final Image

To render the final image, you can either click the **Render Production** button on the **Main** toolbar or the **Render** button in the **Render Setup** dialog. Once the rendering is complete, you can see the result of the material changes, the lighting, and the exposure settings.



*THE FINAL RENDERING WITH ARNOLD*

## For more information:



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