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3ds Max is InfraWorks Softwares best Friend

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Learning Objectives

- Discover the best way to import and optimize your InfraWorks data into 3ds Max
- Learn about the different lighting techniques in 3ds Max for infrastructure-based projects
- Learn how to set dress your InfraWorks project with 3D cars and 3D vegetation by using the 3ds Max Asset Library
- Learn how to build the best materials, realistic and non-photorealistic

Description

During this presentation, you'll learn how to win more business by using 3ds Max software, which is part of your Architecture, Engineering & Construction Collection. Starting with an InfraWorks file, you'll learn a step-by-step visualization approach that's easy to understand and use in your own environment. After getting your InfraWorks data, you'll start by adding lighting, so we'll discuss image-based lighting techniques with daylight and photometric lighting, both rendered with the default ART and Arnold render engine. We'll also learn how to set up a nice environment with 3D trees, cars, and people, which are part of 3ds Max. Materials and textures will be the final step. You'll gain a good understanding of which materials are being imported from InfraWorks and the advantage of converting your materials in an automated environment.

Speaker(s)

I started using Autodesk products twenty-seven years ago. After learning AutoCAD 12 and 3D Studio DOS version 3.0 I started my long career as an AutoCAD draftsman. I became part of Autodesk distribution in 1995 and started delivering technical training and support for AutoCAD and 3D Studio resellers in the Benelux region. As it is today, I'm still part of Autodesk distribution and I do support Autodesk and the Autodesk resellers in Benelux, UKI and the Nordics. 3ds Max is the product where I'm currently focusing on.

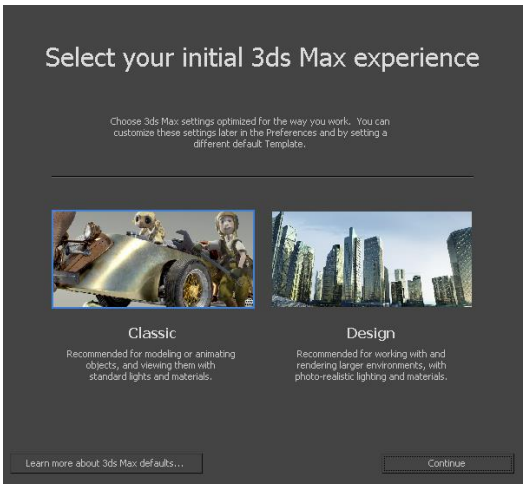
Contents

Discover the best way to import and optimize your InfraWorks data into 3ds Max

Before you import an InfraWorks file into 3ds Max I would recommend changing a couple of things with regards to the 3ds Max setup.

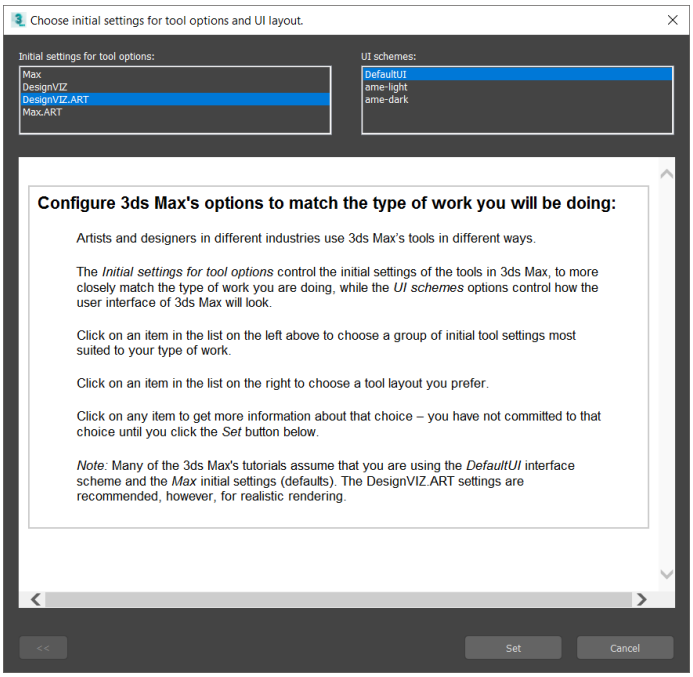
Learn how to start using 3ds Max the easy way

Starting to use 3ds Max can be quite challenging. From the first moment a lot of users have no clue how or where to start. By setting up a few things your 3ds Max live will be much easier and you will start enjoying the product in combination with your InfraWorks design. But first things first. When you do start 3ds Max for the very first time a dialog will be shown where you must choose what kind of user you are.



The initial 3ds Max experience shown the very fist time you start 3ds Max

Based on your choice, a lot of preset settings will be made. If you're working in a Design Visualization environment your preferred choice should be the Design preset. If you made a mistake in the presets or if you want to check if the Design preset applies you can always go to the **3ds Max Customize** menu and open the **Customize UI and Defaults Switcher** dialog.

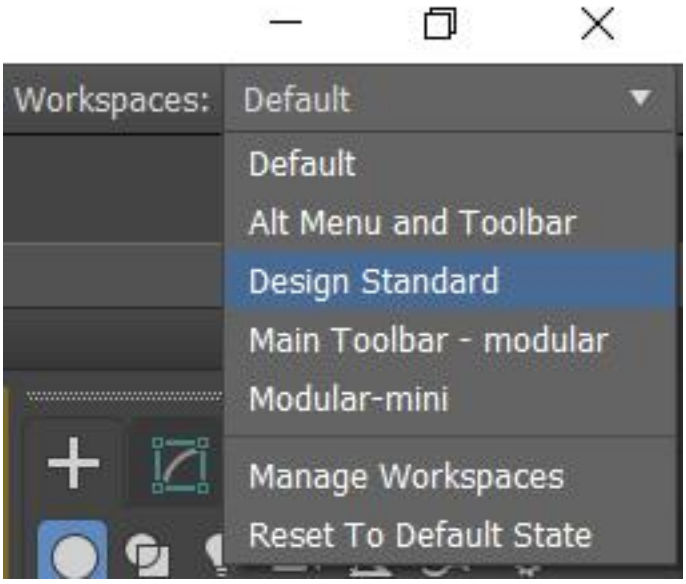


The Initial settings dialog box can be used to change the 3ds Max experience

The Initial Settings in de left upper left part of the dialog box should be set to DesignVIZ.ART. As a result, ART will be the default renderer, you will work in a layer-based approach and lots of other default settings or made to make you 3ds Max live much easier.

Design Standard Workspace

3ds Max commands and options are widespread through the application which is just too complicated when you're used to a ribbon-based approach. 3ds Max does provide a ribbon as part of the application but is not set by default. In the upper right corner of 3ds max you can set the Workspace to the Design Standard workspace. After switching the workspace, you might have to restart 3ds Max so that all the belonging settings are initialized.

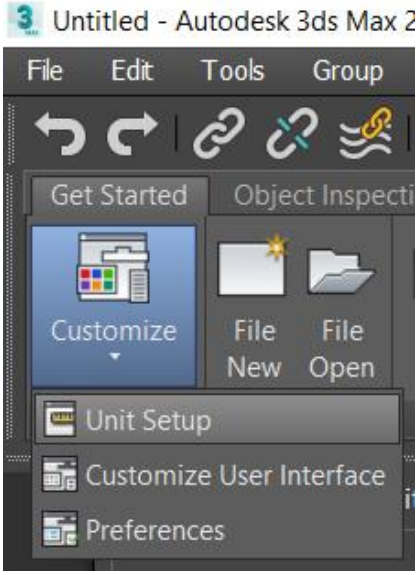


The 3ds Max workspace set to Design Standard

When you've switched to the Design Standard Workspace 3ds Max will set that as the default workspace and will automatically remember your preferred choice. The Design Standard ribbon basically works from left to right and does provide a task-based approach.

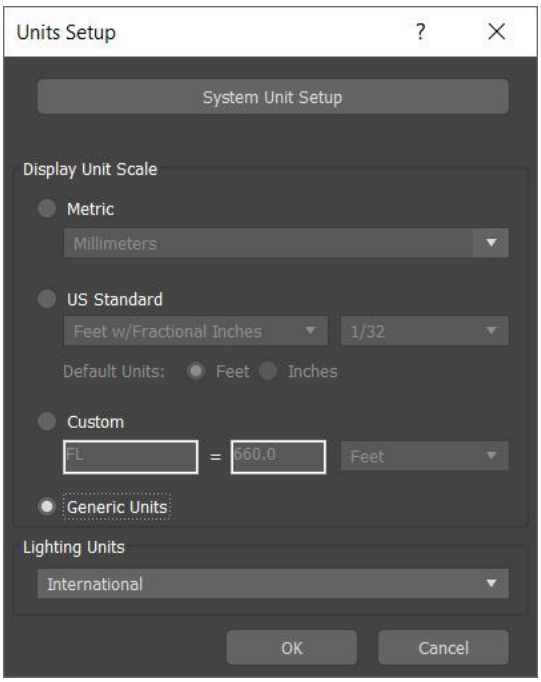
Units Setup

The first "Get Started" Tab of the Design Standard ribbon will show you one of the most important things before you start to import or link your InfraWorks Designs. Below the Customize button in the Options panel of the Design Standard ribbon you will find the Units Setup.



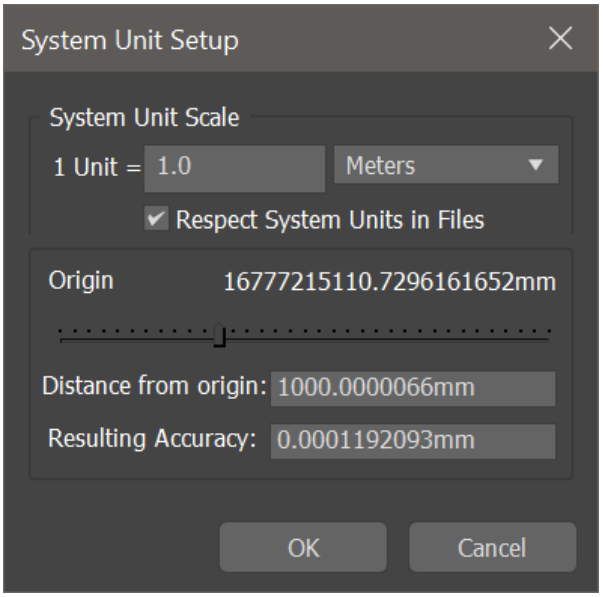
Unit Setup found in the Get Started tab of the Design Standard workspace

When activating the Unit Setup command, the Units Setup dialog box will appear.



The 3ds Max Units Setup dialog box

By default, the Display Unit Scale is set to Generic units. The Display Unit Scale is not the most important one in this dialog box. This is just all about how you would like to display your units if you measure something for instance. The most important one is the System Unit Setup which can be set by just clicking on the System Unit Setup button.

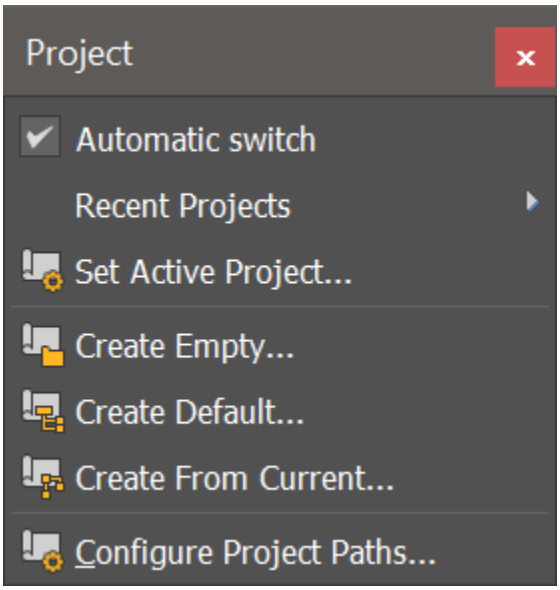


The 3ds Max System Unit which is the most important one

If you're dealing with InfraWorks data, your System Unit Scale must be set to Meters since that's the default hardcoded unit of InfraWorks. If you don't set this right, you will run into scaling issues later. 3ds Max will remember your system unit scale as long as you don't open another 3ds Max file with different units. If so, you automatically do get a warning.

3ds Max Projects

3ds Max files are being saved based on an active project environment. If you don't set it up all your files will be saved on your local hard drive. A 3ds Max project is nothing else then a Windows folder with a lot of additional sub-folders which can be stored wherever you want. If you want to change the default 3ds Max project, you only must create a new folder with your Windows file explorer in the location where you want to store your 3ds Max project. In many occasions the name of this project folder is the name of the customer or project number. After creating the folder with the Windows file explorer, you set it up as a 3ds Max project via the 3ds Max **File menu** followed by **Project** and **Create Default**.



3ds Max Project options in the File menu

After pointing to the earlier created folder, 3ds Max will take care of all the belonging sub-folders for your 3ds Max files, your renders, your backup's and so on. *With at least 3ds Max 2019.2 installed you'll get a very handy toolbar for your project management which will be showed by default in the 3ds Max User Interface.*

The dedicated 3ds Max Project Toolbar introduced in 3ds Max 2019.2

InfraWorks to 3ds Max

Going from InfraWorks to 3ds Max is not a very complicated task. In the Present/Share tab, found in the InfraWorks ribbon, you're able to export to an 3D Model File. The file extension of the preferred 3D Model File is a .FBX file format, which is the file format needed for the 3ds Max importer.

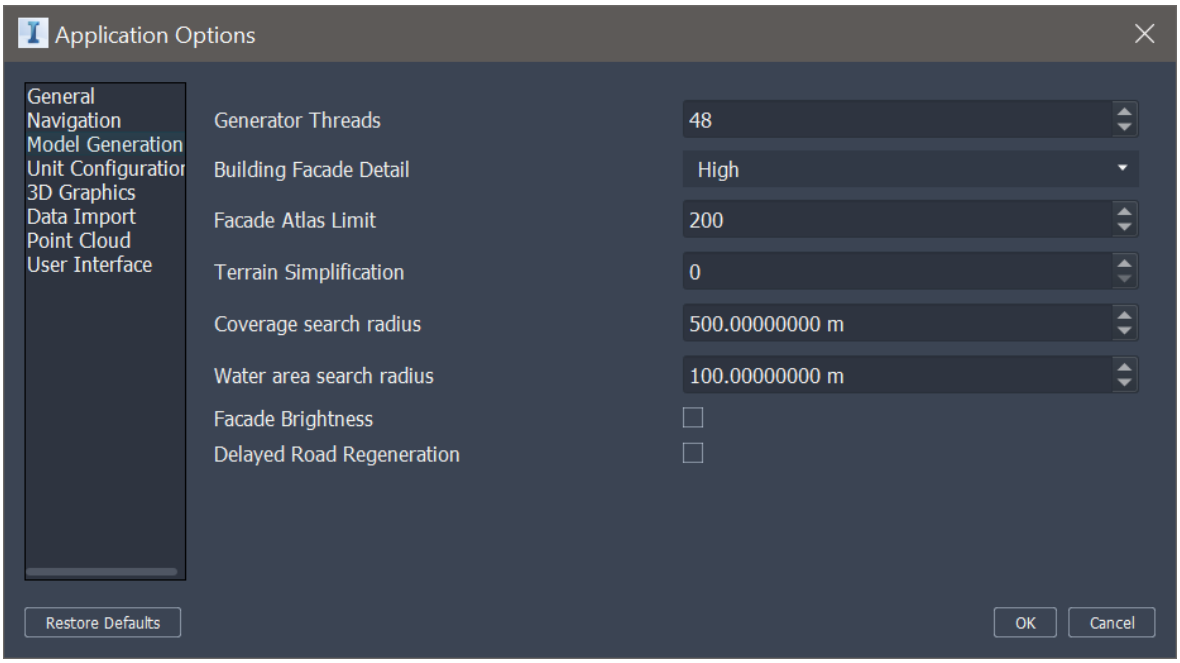
The default settings in the Export to 3D Model File dialog box can be changed but the default settings are not too bad. Keep in mind though that everything visible in the current InfraWorks file will be exported!

InfraWorks Application Options

By default, you don’t get a lot of detail in a Building Facade in InfraWorks.

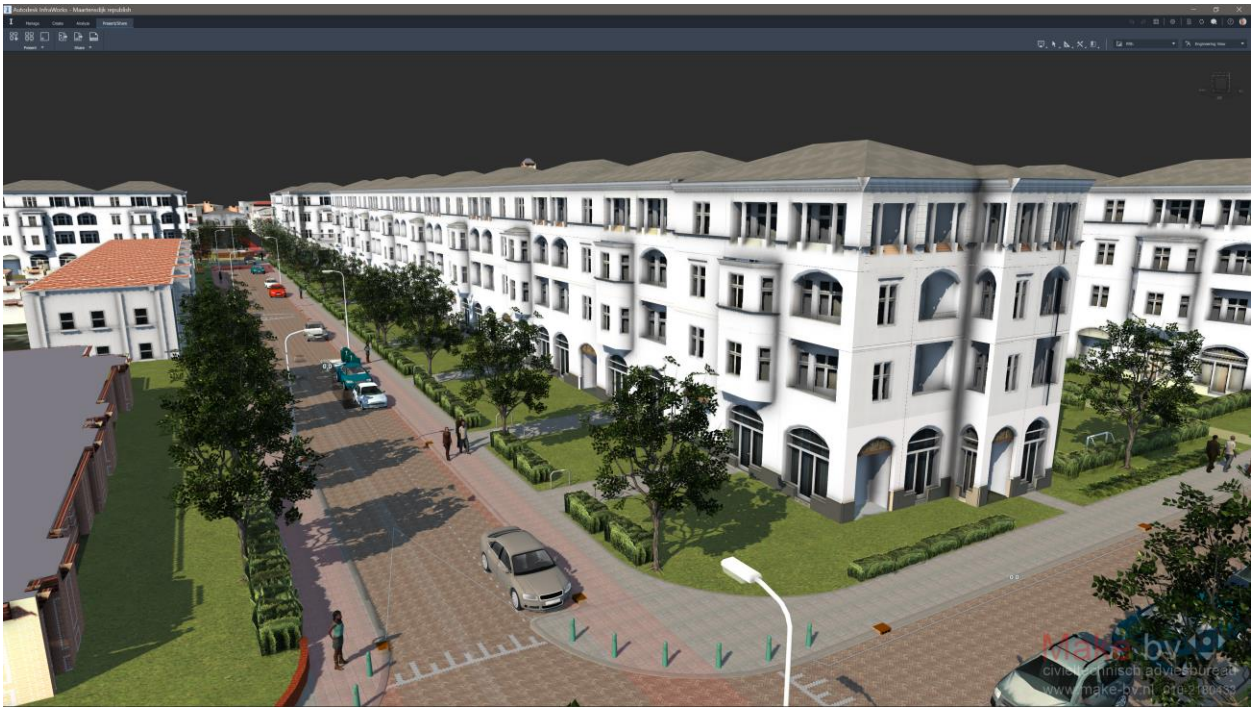
The Building Facade detail set to Low by default

If you want to have much more detail in a Building Facade you can easily change the Building Facade Detail option in the InfraWorks Application Options.



The InfraWorks Application Options dialog box

Changing the Building Facade Detail from low to High will yield in much greater details and visual quality later in 3ds Max.

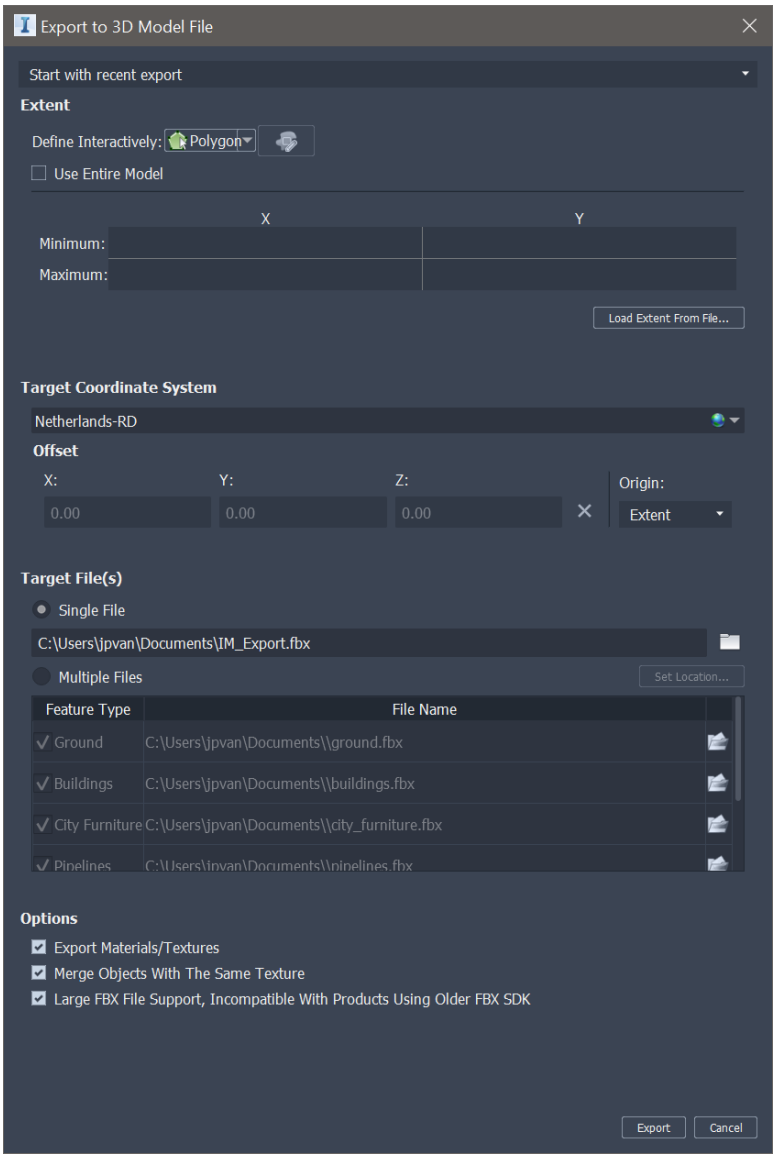


The Building Facade detail set to High in the Application Options

Export to 3D Model File

Extent

In the Extent part of the Export to 3D Model dialog box you export the entire model by simply activating the User Entire Model option. To specify an area to export, you can use the Define Interactively Polygon or rectangular option if you want to.



The Export to 3D Model File dialog box with default settings

Target Coordinate System

The Target Coordinate System doesn't make any sense for 3ds Max. The InfraWorks model will always be imported into the 3ds Max World Space coordinate system.

Target File(s)

The default Target File(s) option is set to a Single File, followed by the path and file name. If you want to export to multiple files, click the Multiple Files option.

Options

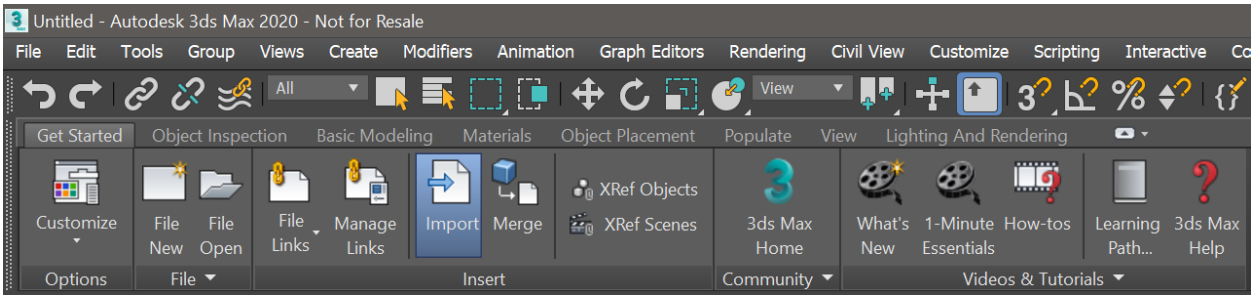
- **Export Materials/Textures:** Checkmark to include materials and textures that are assigned to styles in the model, in the exported FBX file.

- **Merge Objects with Same Texture:** Checkmark to sort all the triangles of all the objects in the model by material and merge them together so that the FBX output will contain exactly one object per distinct material. It is recommended to enable this option if you are planning to use the exported model for visualization. However, if you are planning to bring the exported data into another application and then reimport the data into InfraWorks, it is recommended to leave this option uncheck marked.

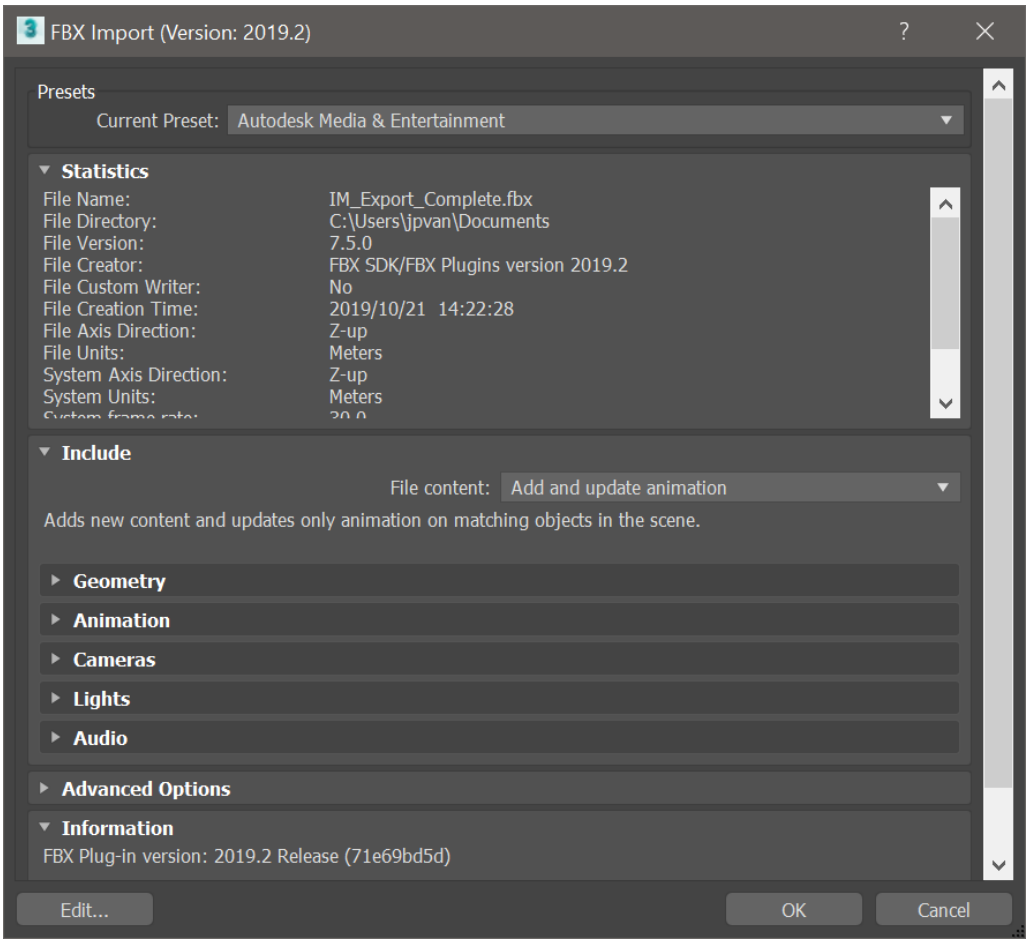
- **Large FBX File Support, Incompatible with Products Using Older FBX SDK:** Checkmark this option if your exported FBX file will exceed 2GB in file size. If you leave this option uncheck marked, exporting an FBX file larger than 2GB in file size is not supported.

3ds Max Import

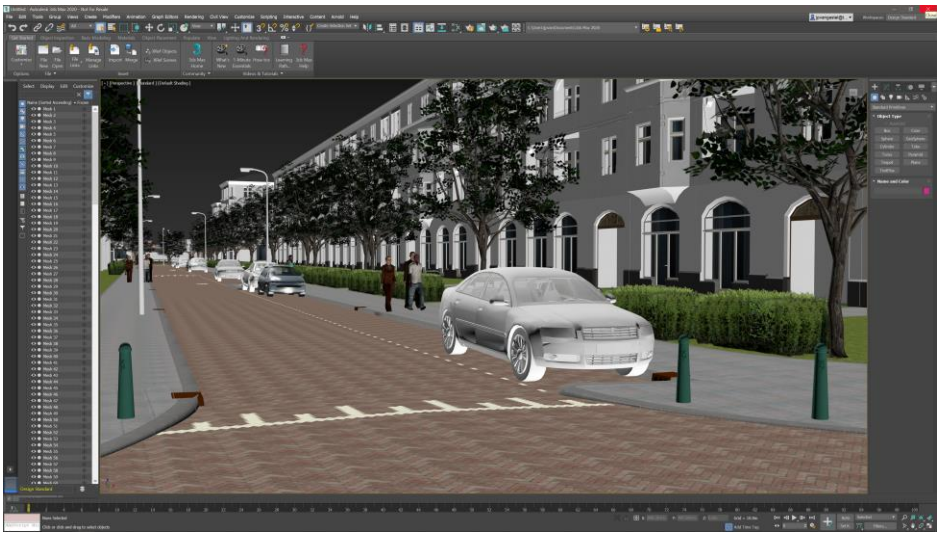
In 3ds Max you import the exported InfraWorks file format by utilizing the 3ds Max import option found in the Get Started tab in the Design Standard ribbon.



When importing the exported InfraWorks FBX file format there's no need to change any of the default settings in the 3ds Max FBX file importer dialog box. If you want, you can check the Statistics to see what will be imported into 3ds Max.



The FBX Import dialog box in 3ds Max



Result of the imported InfraWorks FBX in 3ds Max

Navigation in the 3ds Max viewport

The navigation in the 3ds Max viewport can be done by using the viewport navigation tools in the lower right corner of the 3ds Max User Interface.

The 3ds Max viewport navigation tools

Besides the official 3ds Max navigation commands you can also use your three-button mouse for zooming, panning and orbiting. Keep in my though that the ALT key is the shortcut key in combination with the middle mouse button for orbiting in 3ds Max. It's also a best practice to set the default orbit to Orbit Point of Interest.

Orbit set to Orbit Point of Interest

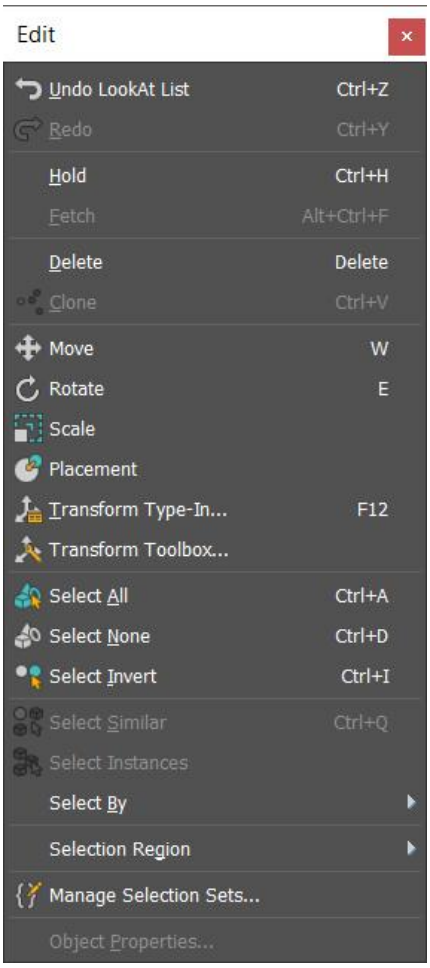
3ds Max also has some very handy shortcuts for navigating in the 3ds Max viewport

3ds Max shortcut keys for Navigating in the 3ds Max viewport

- Z = Zoom Extents Selected
- Control + ALT + MMB (Middle Mouse Button) = 3ds Max Zoom
- ALT + MMB (Middle Mouse Button) = 3ds Max Orbit

Selecting objects in 3ds Max

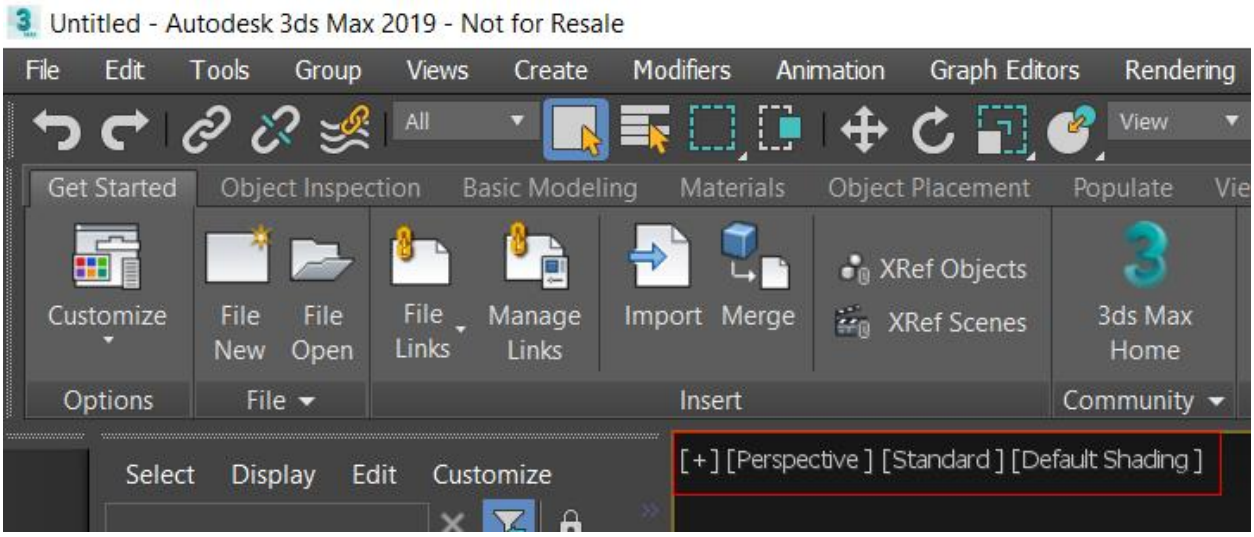
Selecting an object in the 3ds Max viewport can be done by using the Select object tool or you can select any object in the Scene Explorer at the left side of the 3ds Max User Interface. By using the Ctrl and Shift keyboard key you can make any kind of selection as you are probably used to do. In the 3ds Max **Edit menu** you will find many different options for selection your objects in the 3ds Max viewport.



The 3ds Max Edit menu

3ds Max Viewport Labels

3ds Max is using similar viewport labels as AutoCAD. In the upper left corner of the 3ds Max viewport you do have four different menus available.



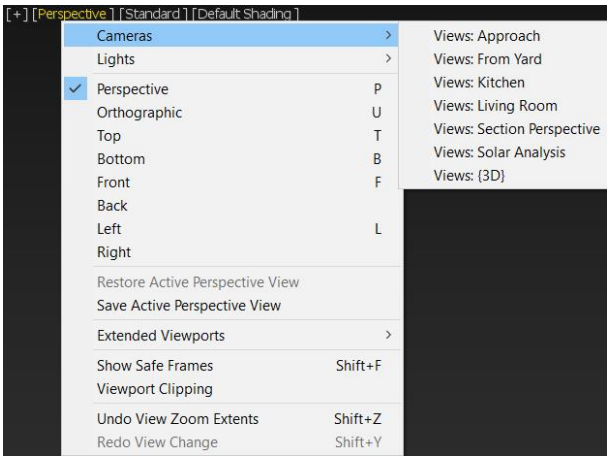
The 3ds Max Viewport labels

+ Viewport label

De + Viewport label holds a couple of interesting tools like switching the Grid on or Off. It also provides you access to the ViewCube of 3ds Max. The most important option in this menu is the **Maximize Viewport** option (**Alt+W**) if you ever want to switch your current maximized viewport to your current viewport layout.

View Viewport label

The second Viewport label which mentions Perspective is used to switch the 3ds Max current view. In this Viewport label you're able to switch to an Orthographic viewport or to a Camera view Cameras sub-menu.

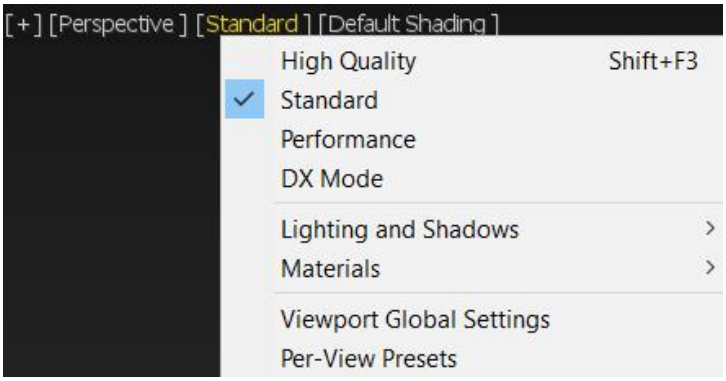


The 3ds Max View Viewport label

In this Viewport label you will also find the **Show Safe Frames (Shift+F)** option which is a very important option when rendering your final frame. The Show Safe Frames option is showing a yellow border in your viewport based on the current render resolution. The View Viewport label is also showing the latest navigation steps and can be undone from this menu or just by using the **Shift+Z** and **Shift+Y** shortcut keys.

Shading Viewport label

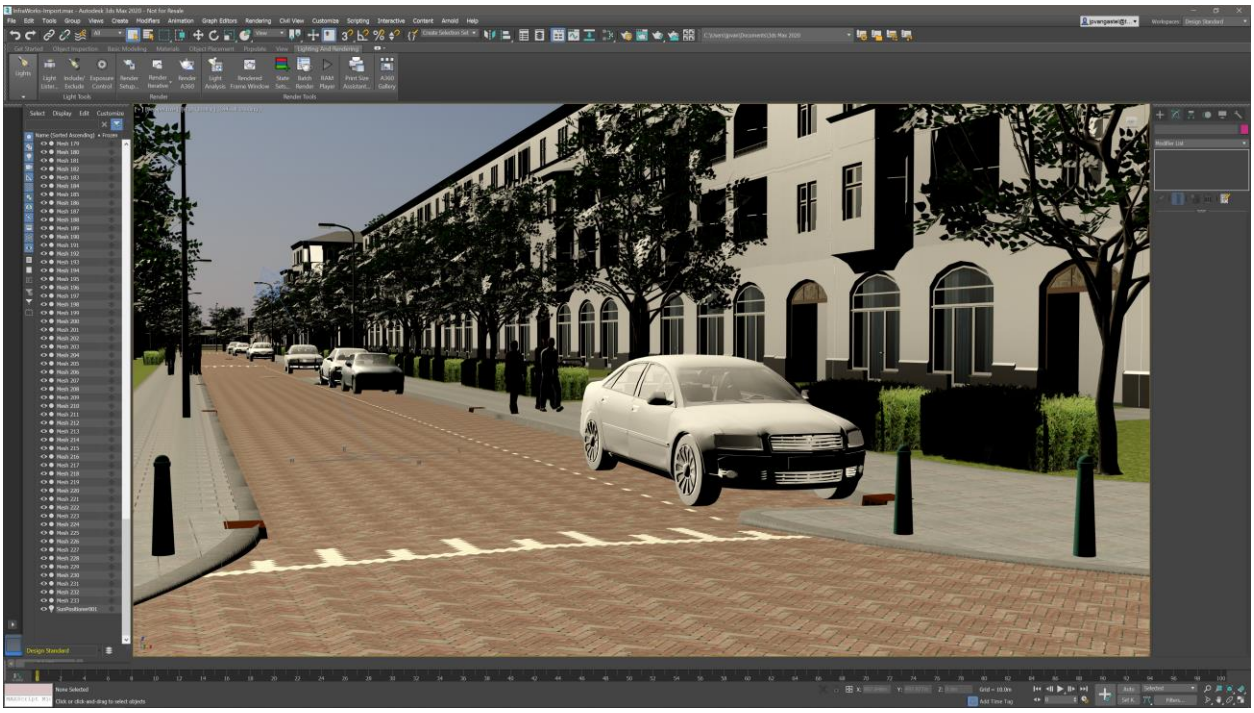
The Shading Viewport label is by default set to the Standard shading level. The standard shading level is not going to provide any kind of shadows in the 3ds Max viewport.



The 3ds Max Shading Viewport label

When you change to a **High Quality** shading level, you'll automatically get visible shadows and ambient occlusion in the 3ds Max viewport. This is always based on the current lights available in the viewport. Keep in mind though when your importing an InfraWorks file format you don't import additional light sources. This will result in the fact that the High Quality shading level is not that High Quality due to the poor quality of the default 3ds Max lights. Adding a light source will help a lot.

The High Quality shading level might take some time to become active based on your graphics card capabilities. All the belonging shaders are automatically compiled and stored in a cache file on the local hard drive. Next time when switching to High Quality mode will be much faster. By default, the textures used in the InfraWorks materials will be visible in the 3ds Max viewport.

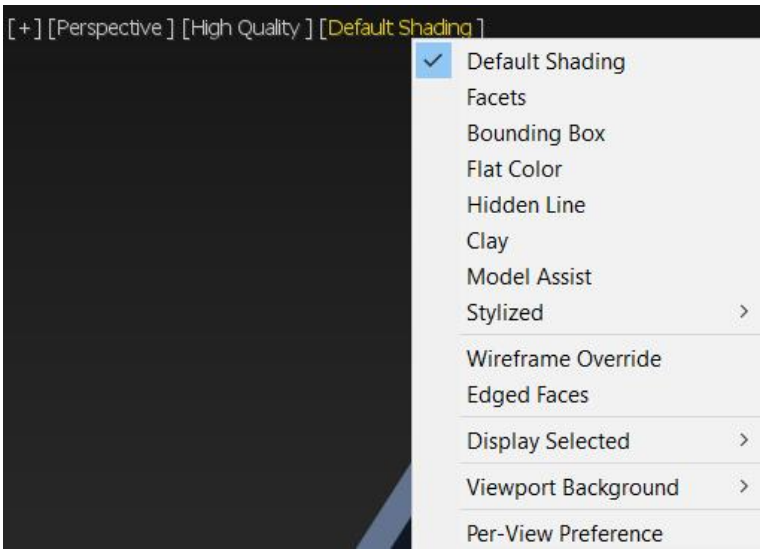


The 3ds Max High Quality shading level active in the viewport

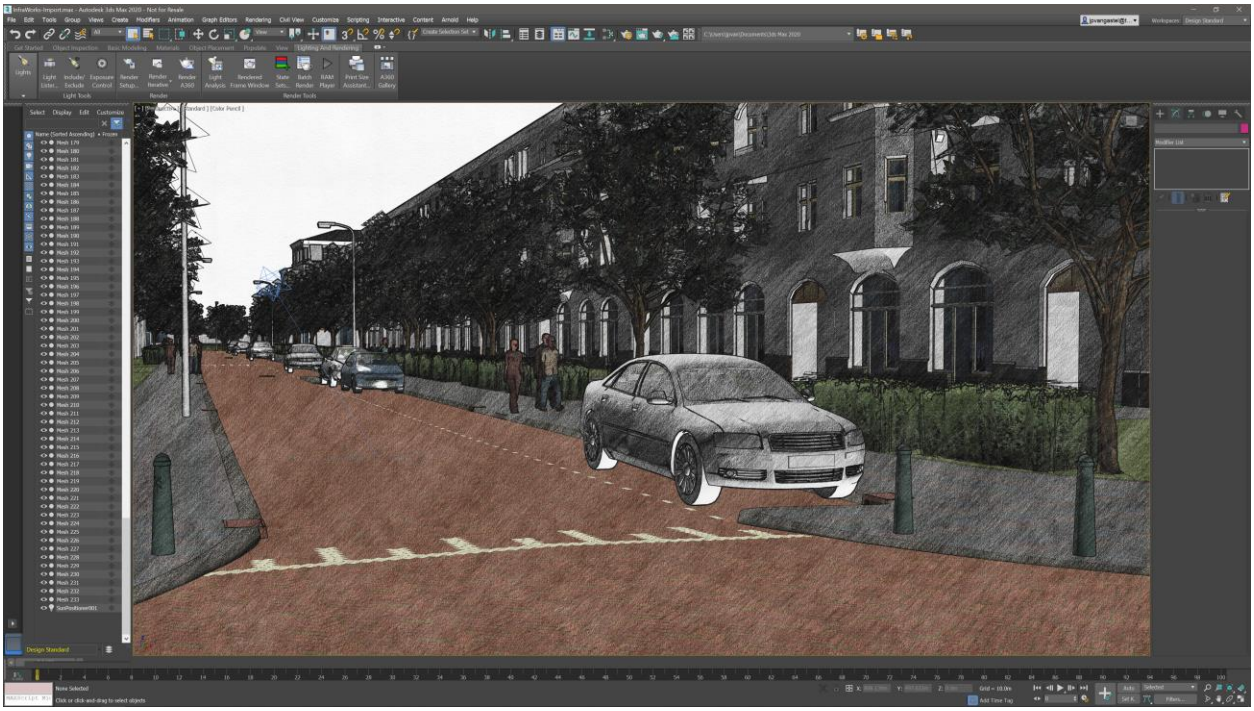
If you are working with very large scenes and your graphics card is not the best, you might use the **Performance** mode which is also part of the Shading Viewport label. When activating the Performance mode shading level your complete model will be showed in a basic grey color and all the lights will be simplified. Keep in mind that this is only happening in the 3ds Max viewport and not in the render.

Default Shading Viewport label

In the fourth and last Viewport label called Default shading you will find all the different shading levels your design can be showed in the 3ds Max viewport.



Many shading styles are self-explanatory but keep in mind that these are just display settings for the 3ds Max viewport and not for the render. The **Stylized** shading styles are quite nice in 3ds Max if you ever wanted to have that non photorealistic render effect.



Color Pencil Stylized shading in the 3ds Max viewport

Another interesting and important option in the Shading Viewport label is the **Viewport Background**. In the Viewport Background options, you can set the 3ds Max viewport background display. Gradient color is the default value but if you set an Environment by

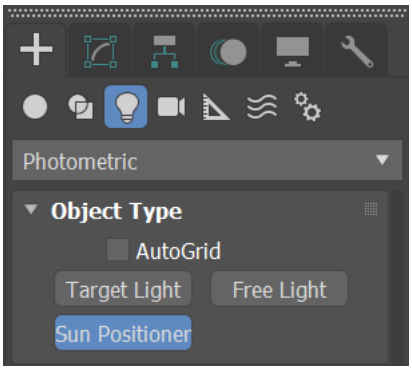
adding a Sun Positioner or an HDR Image file it will automatically show the belonging environment direct in the 3ds Max viewport. This is the new default behavior in 3ds Max 2020.2

Learn about the different lighting techniques in 3ds Max for infrastructure-based projects

3ds Max Sun Positioner

The Sun Positioner uses light that follows the geographically correct angle and movement of the sun over the earth at a given location. You can choose location, date, time and compass orientation. You can also animate the date and time. This system is suitable for shadow studies of proposed and existing structures. In addition, you can animate Latitude, Longitude, North Direction, and Orbital Scale.

The Sun Positioner is found in an intuitive location, the Lights panel.



The Sun Positioner found in the 3ds Max Command Panel

The Sun Positioner exists to position the sun in the scene. Date and location settings are found in the Sun Position rollout. Once the Sun Position object is created, the Environment map and Exposure Control plug-in are created with good default values. All parameters related to shading are **only** found in the Material Editor's Physical Sun & Sky rollout.

Try to think like a photographer and set the time of the day to the golden hour (one hour after sunrise and one hour before sunset) to get that much more interesting looking sky.

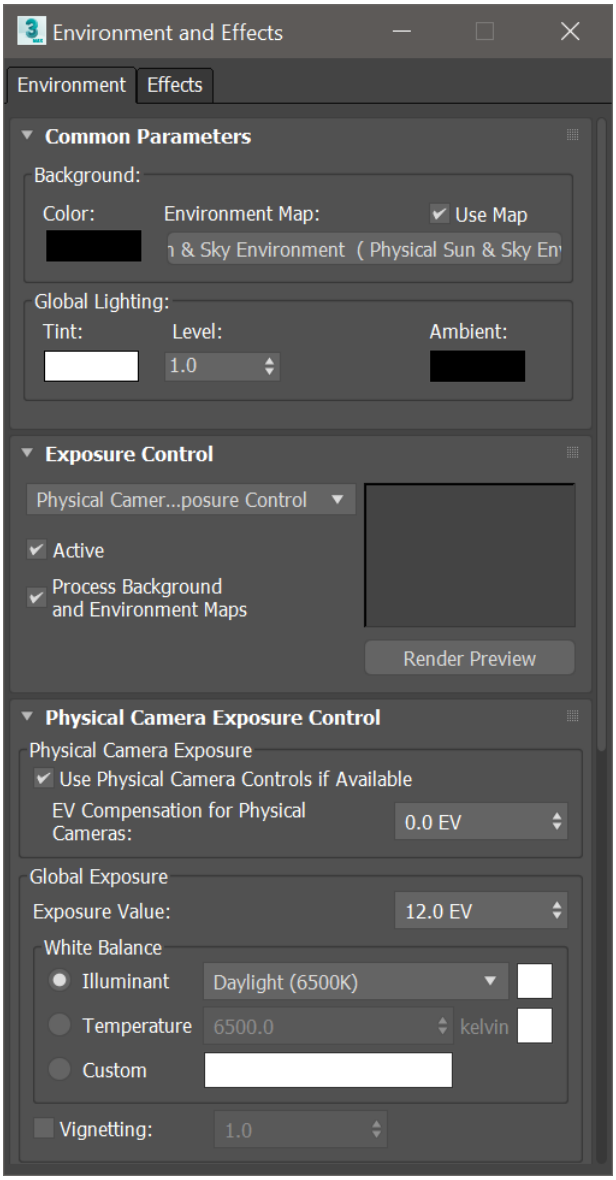
https://www.digitaltrends.com/photography/when-is-golden-hour-and-what-is-it/

Image Based Lighting

Another interesting technique to light your 3ds Max scene is a technique called Image Based Lighting. Actual light data can be captured in an image if the image is in the High Dynamic Range format (.HDR). The ART render engine can light your 3ds Max scene based on the

captured light data in an .HDR image. There are many free of charge HDR images available on the internet (www.hdrihaven.com) . Keep in my mind though that the contrast, lights and colors of the HDR image are responsible for the initial render.

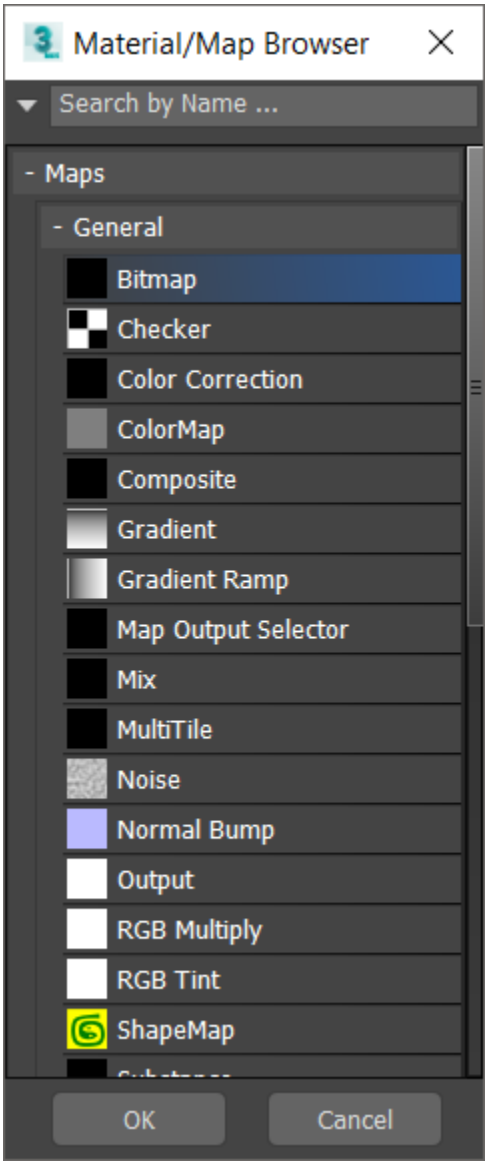
An HDR file is placed in the **Environment Map** which can be found via the **Exposure Control** option in the **Lighting And Rendering** tab of the Design Standard workspace.



The Environment and Effect dialog box

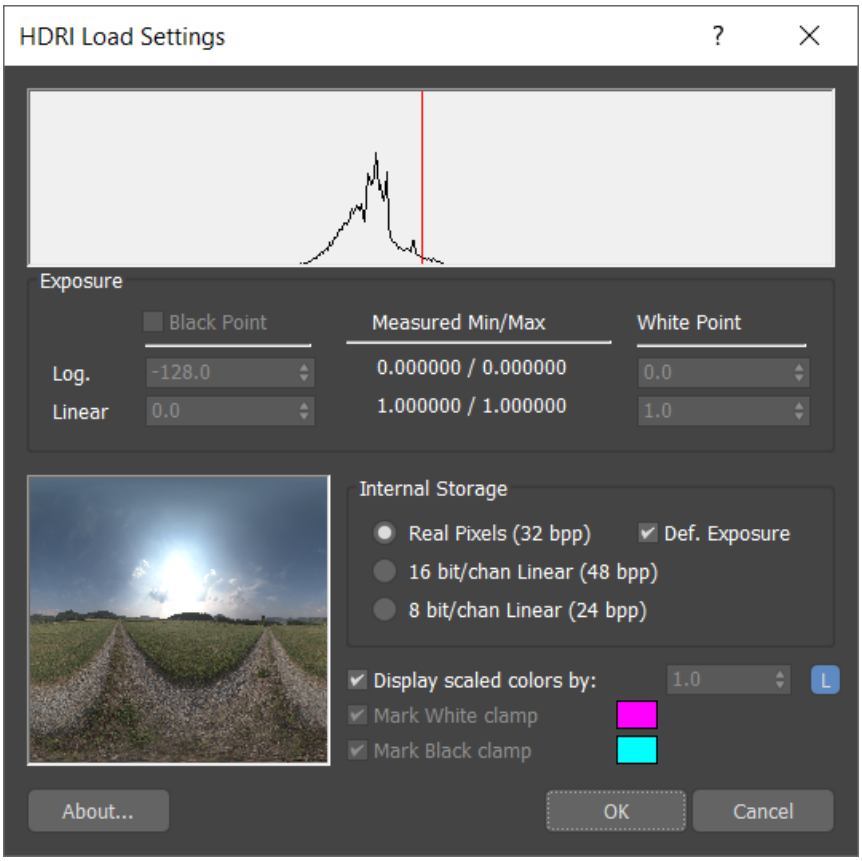
In the upper part of the Environment and Effects dialog box you're able to setup an **Environment Map**. In a complete empty 3ds Max scene the wide Environment Map button is

mentioning the word None. If you have created a Sun Positioner there will be a Physical Sun & Sky Environment placed in the Environment Map option. By clicking on the wide button you're able to load in a different map for the environment by choosing the **Bitmap** type.



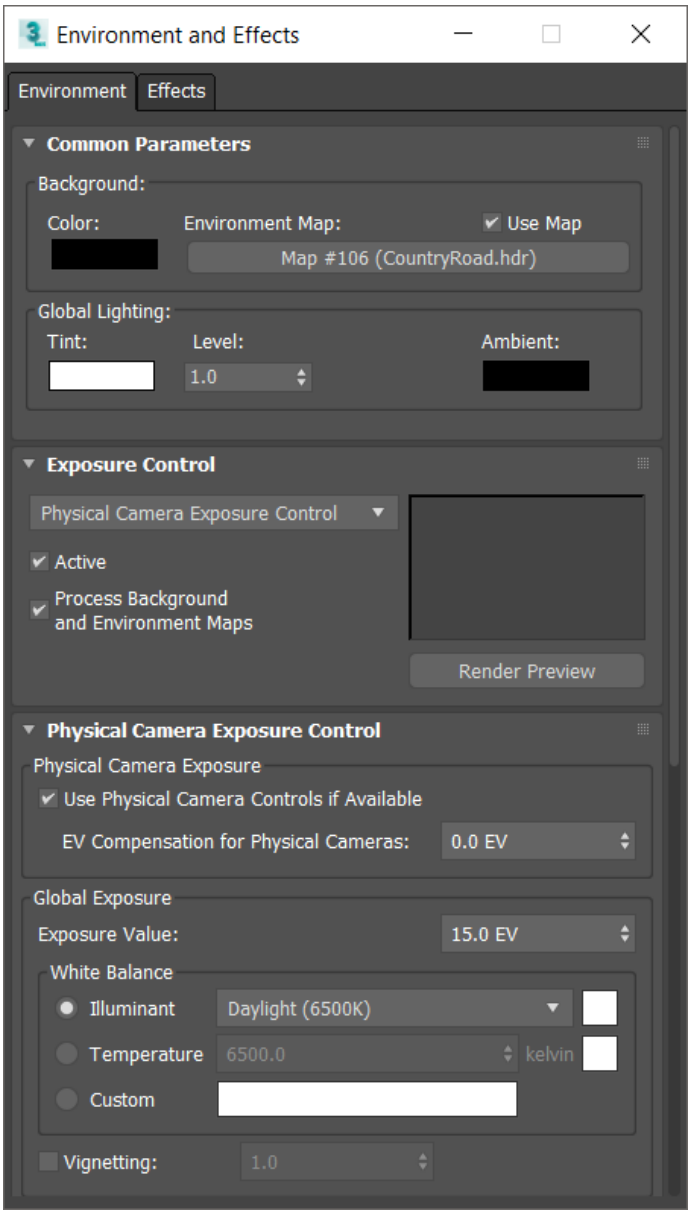
Bitmap is the map type for loading an HDRI in the Environment Map option

After you choose for the Bitmap type, you're able to browse to the location of the HDR image file you want to use in the 3ds Max scene. The **HDRI Load Settings** dialog box will be showed but there is no need to change any parameter in this dialog box.



The HDRI Load Settings are fine by default

After selecting the **OK** button, the Physical Sun & Sky Environment map will be replaced with the HDR image file of your choice.



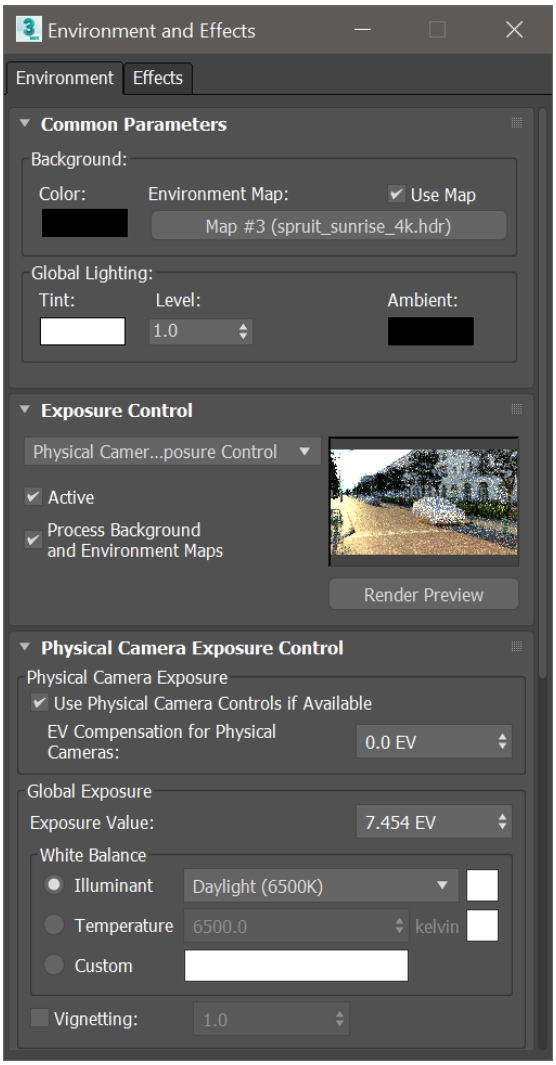
An HDR image file format placed in the Environment Map option

As a result of loading in a different Environment Map your 3ds Max scene and rendering might be showed very dark.

Exposure Control

Based on the HDR image file you're using your rendering might look too dark or too bright. Based on the captured light in the HDR image file you always must adjust your Exposure Control before you start rendering. 3ds Max is using **Physical Camera Exposure Control** and should always be the preferred Exposure Control type. In the Exposure Control rollout, it's quite

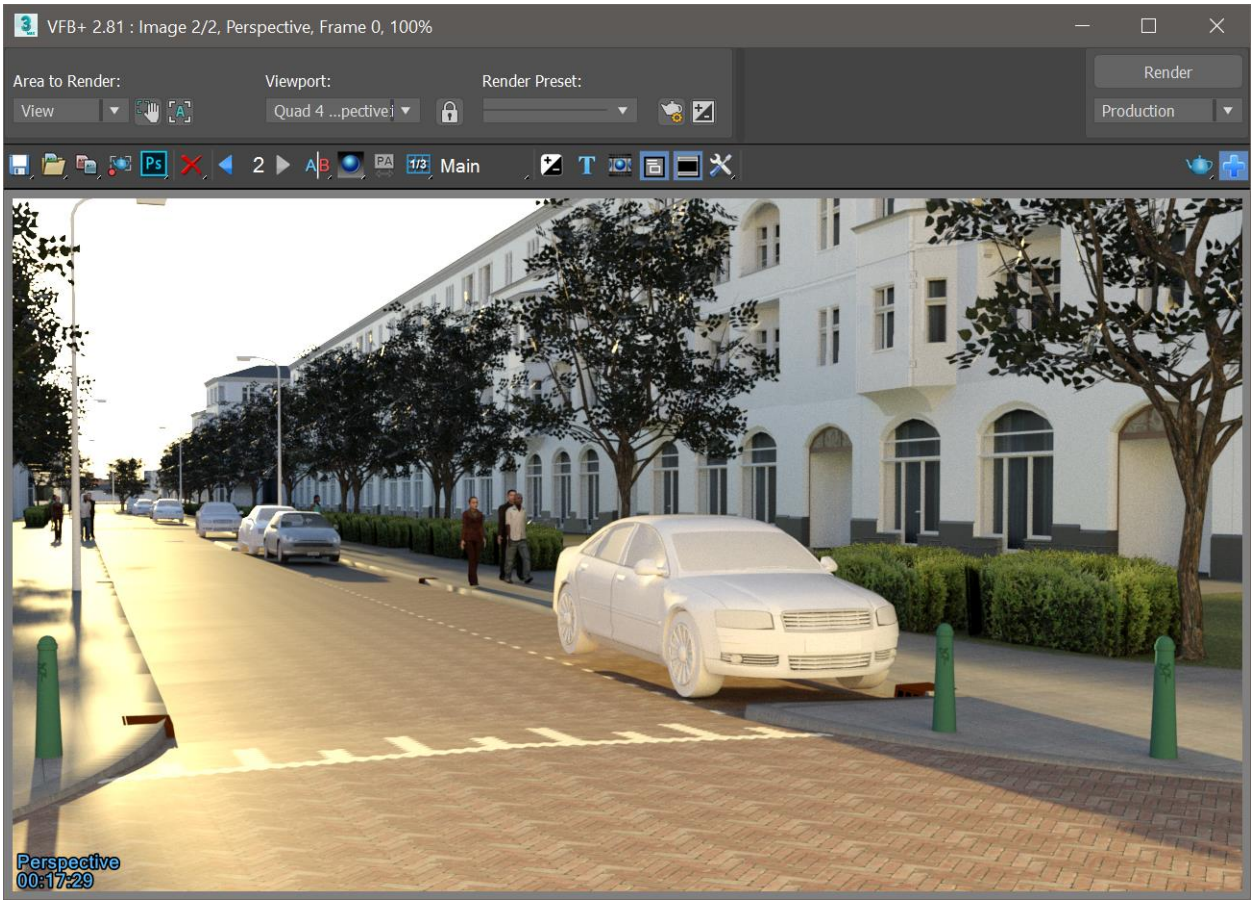
easy to identify if the actual Exposure Value is set to a correct value by using the **Render Preview**. If the Render Preview is too dark you must lower the **Exposure Value (EV)**. When it's too bright you must go up with your Exposure Value. When adjusting the Exposure Value, the Render Preview will be adjusted in real-time. Keep in mind though when you're using **Physical cameras** you adjust the Exposure Value in the actual camera itself in the 3ds Max Modify panel.



Adjusting the Global Exposure Value will update the Render Preview

Together with the Exposure Value you can define the **White Balance**. By default, the Daylight (6500K) is being used. There are many templates available or you can setup your own Temperature value based on kelvin temperature. Higher values yield into much warmer colors (red) and lower values will be the opposite (blue). There's also a **Vignetting** option available. There is no good and wrong with the combination of all these settings. Again, try to think as a photographer when playing with all these different controls. When you're ready and happy with the Render Preview you can start the final render. The Sun Positioner light source is still part of

your 3ds Max scene but doesn't contribute any light. All the light comes from the HDR image loaded in the Environment Map.



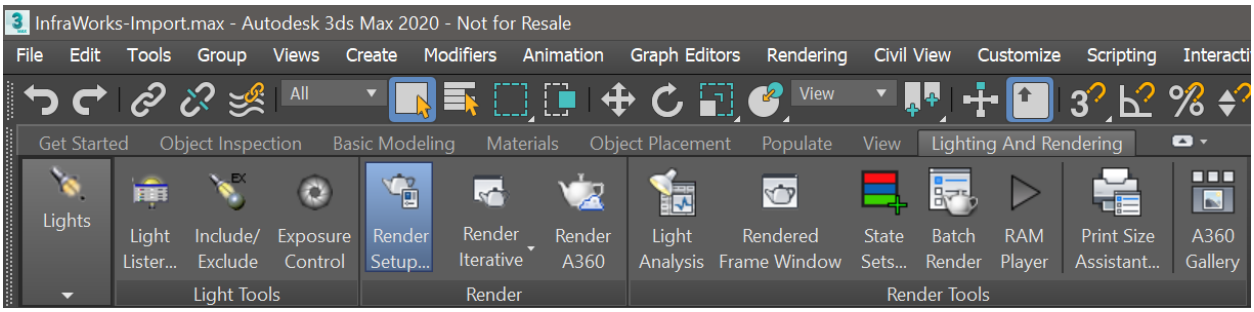
HDR image-based lighting rendered with the 3ds Max ART render engine

The default render engine in 3ds Max is the ART render engine. ART or the Autodesk Ray Tracer is besides 3ds Max the standard render engine in AutoCAD, Revit, Inventor and Fusion 360. Although it's the same renderer 3ds Max renders a CAD file much faster and in much better quality by default. ART is trusting on all your CPU cores, so the GPU is not used during the rendering process.

Render Setup

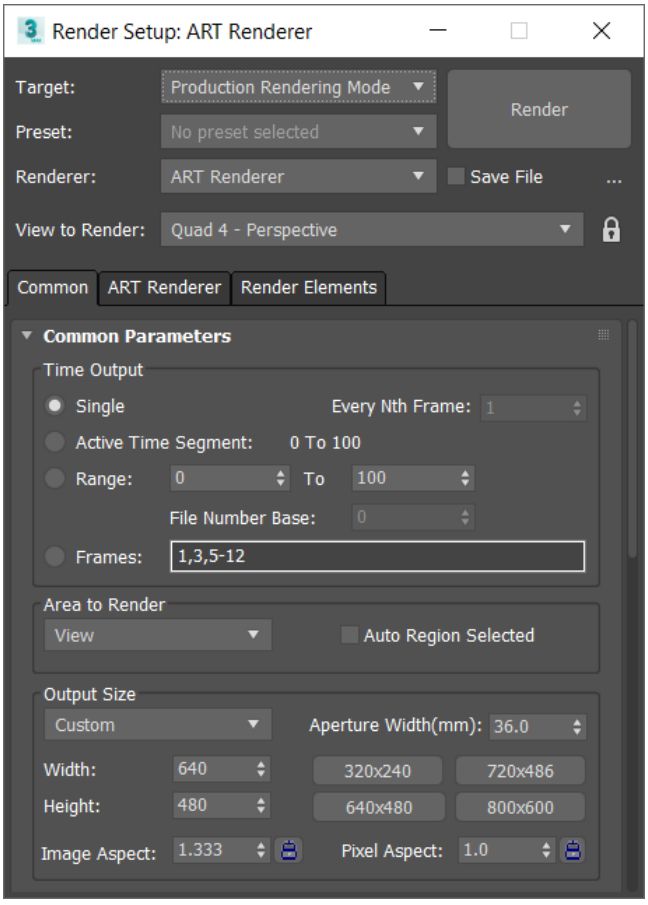
In the **Lighting And Rendering** tab of the Design standard workspace you'll find most of the important render options. The most important one is the **Render Setup**.

The Render Setup can also open by using the **F10** shortcut key on the keyboard.



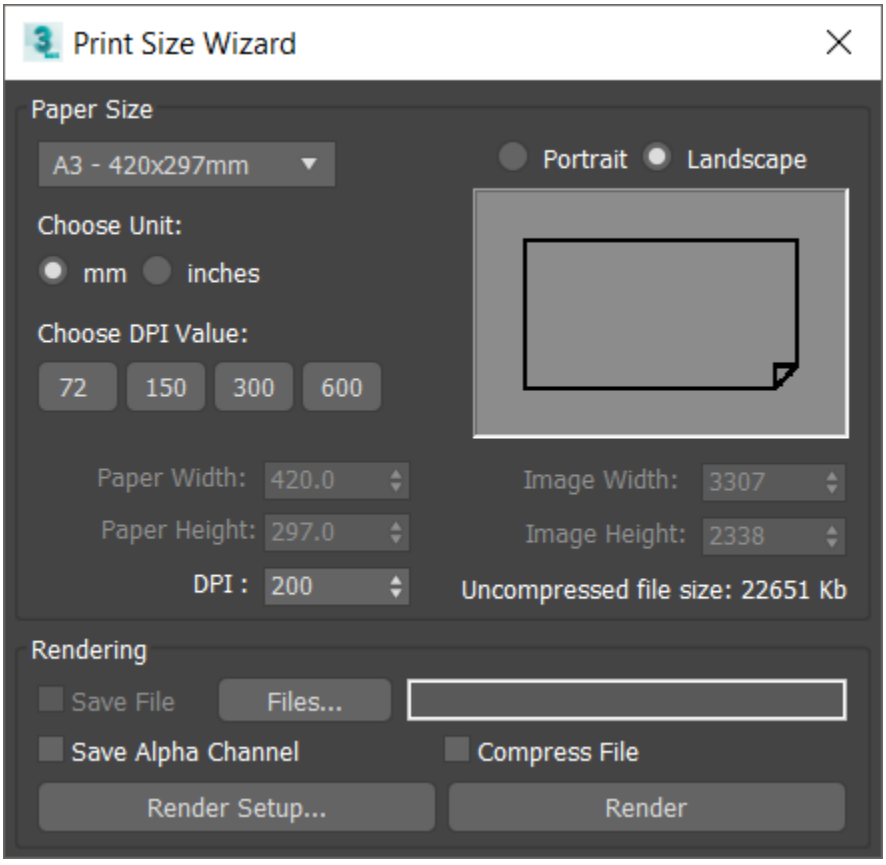
The Render Setup found in the Lighting and Render tab

There are a lot of legacy options in the Render Setup dialog box. The most important settings are the current Renderer, by default set to the ART Renderer and the **Time Output**. Single for a still frame and Active Time Segment for animation. The Area to Render is set to **View** by default and the last most important thing is the **Output Size** which is set by 640 pixels by 480 pixels by default. Since the Output Size is set to Custom you can type in exactly how many pixels you want to render for Width and Height. 1280 pixels by 720 pixels is a good starting point for a render which is going to send by e-mail are showed on a standard display. But keep in mind though if you want to have a larger image you need to render more pixels = more time to render.



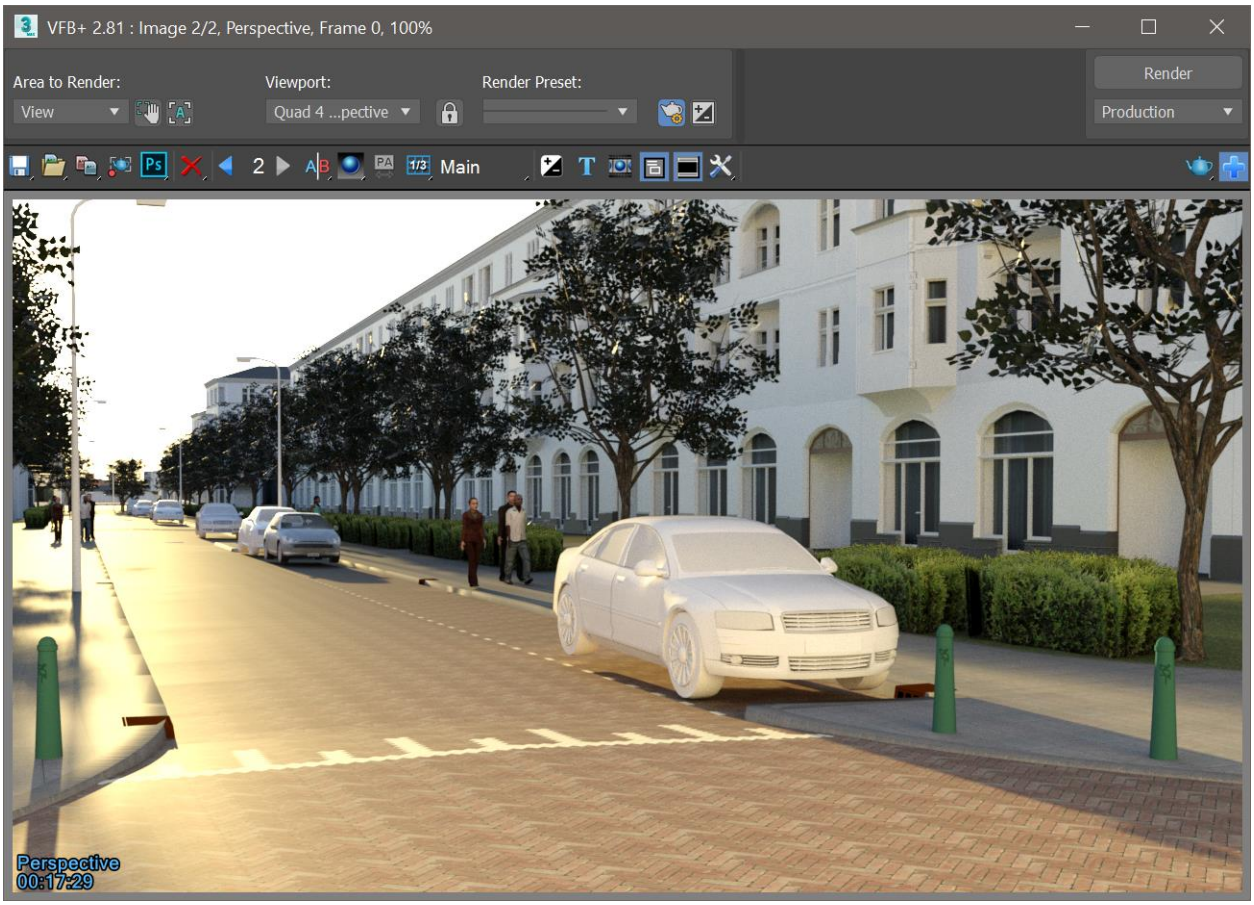
Print Size Assistant

If you want to render for print you might want to use the **Print Size Assistant** which also can be found in the Lighting And Rendering tab of the Design standard workspace. The Print Size Assistant is self-explanatory.



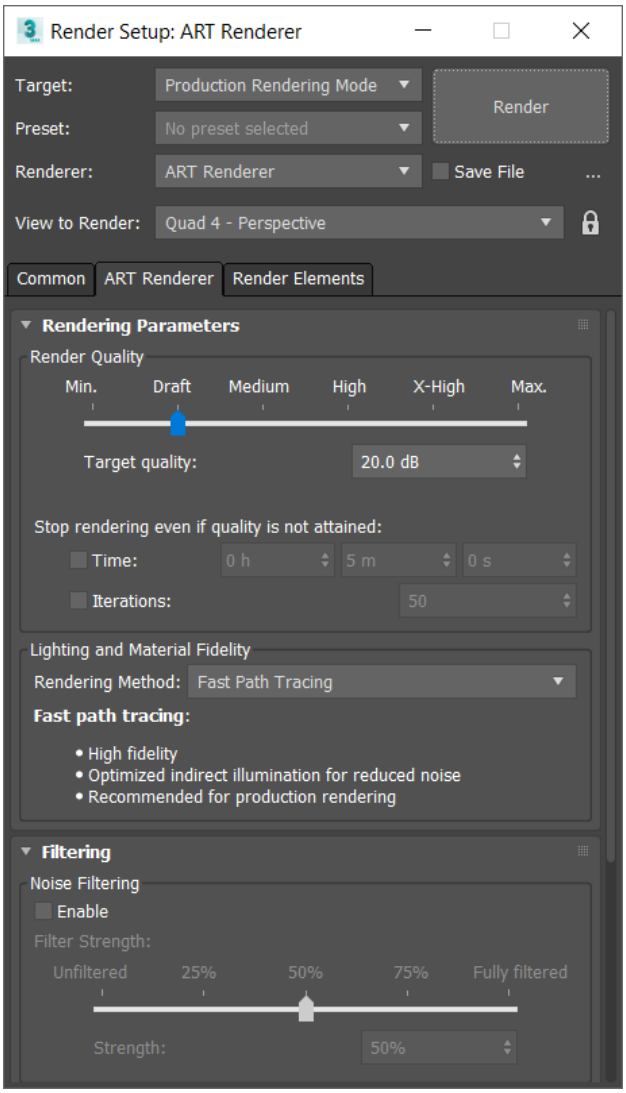
Render Frame Window

When you start your first render the ART renderer start to initialize all your objects. When this is done the **Render Frame Window** will be showed and the render will be showed in a couple of seconds.



The 3ds Max Render Frame Window with the VFB+ plug-in loaded

The ART render engine needs to render longer to get rid of all the noise. This can be all set in the ART renderer tab of the Render Setup dialog box.

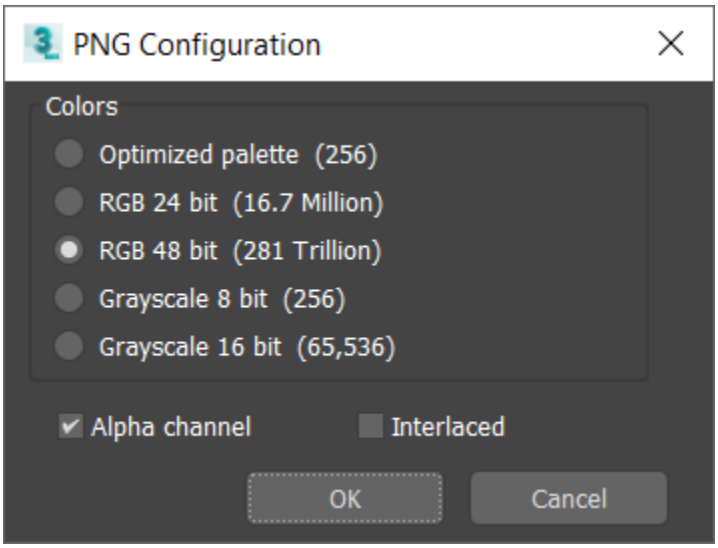


The ART Renderer settings are easy to use

The **Render Quality** slider never ever should be set to the Maximum. For an exterior render, depending on render resolution, between Medium and High should me more than enough. The **Target quality** is expressed in decibel since we are de-noising. If you're not sure how long the render is going to take, or you are facing a tight deadline you can also set the Time value by activating the Time checkbox. Besides that, when 3ds Max is rendering you can save the rendered image whenever you want from the Render Frame Window and 3ds Max will keep rendering when it was not finished yet.

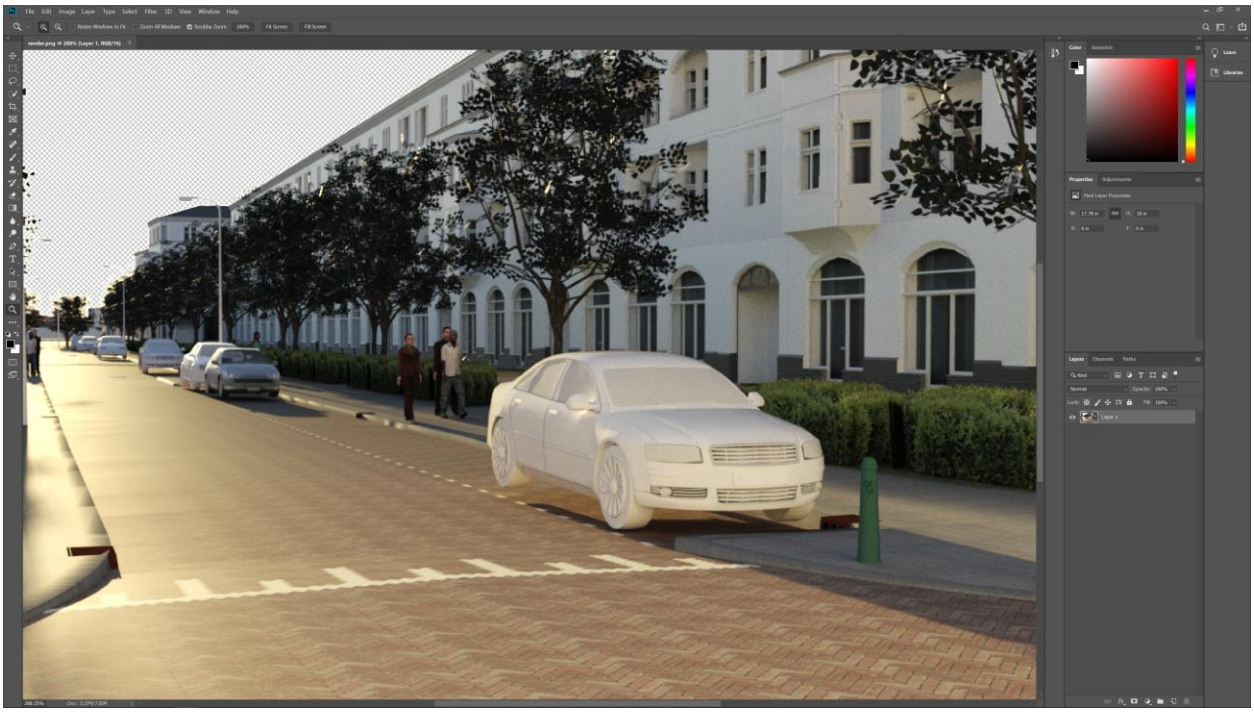
The Render Frame Window itself is showing an uncompressed image in 32 Bits color per channel. When you save your render from the Render Frame Window you must decide how many compression you want or how much quality you want to lose. If you just want to have the maximum file compression you should save to a **.JPG file format**. For production you always should save your image from the Render Frame Window at least to a **.PNG file format**. By

using the Render Frame Window option in the Lighting and Rendering tab of the Design standard workspace you can always open your latest rendering and save your rendered image if you forgot to do so. In the upper left corner of the Render Frame Window you find the Save Image option. In the Save as type part of the Save Image dialog box you should set the file extension to .PNG and give the file a name.



The default PNG Configuration

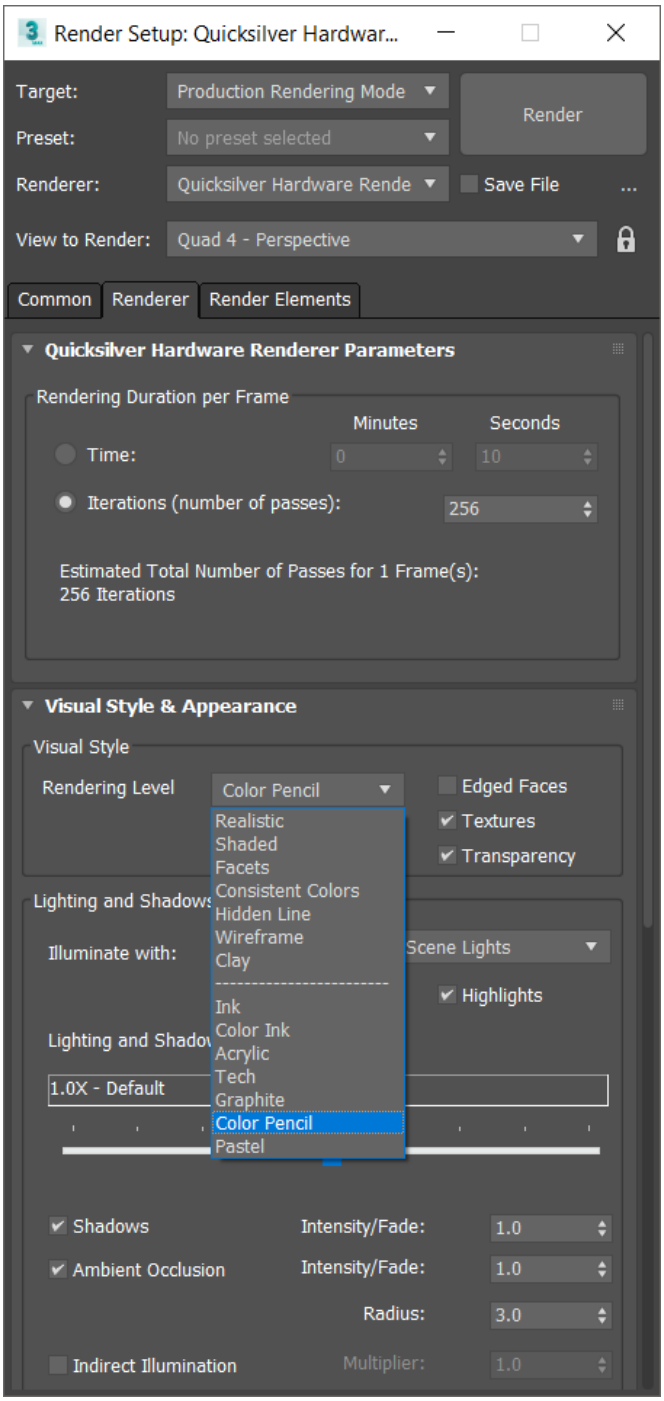
A .PNG file format does provide you 16 Bit color per channel including an Alpha channel for transparency. So, it's super easy to change the background in Adobe Photoshop for instance.



Alpha channel visible in Adobe Photoshop

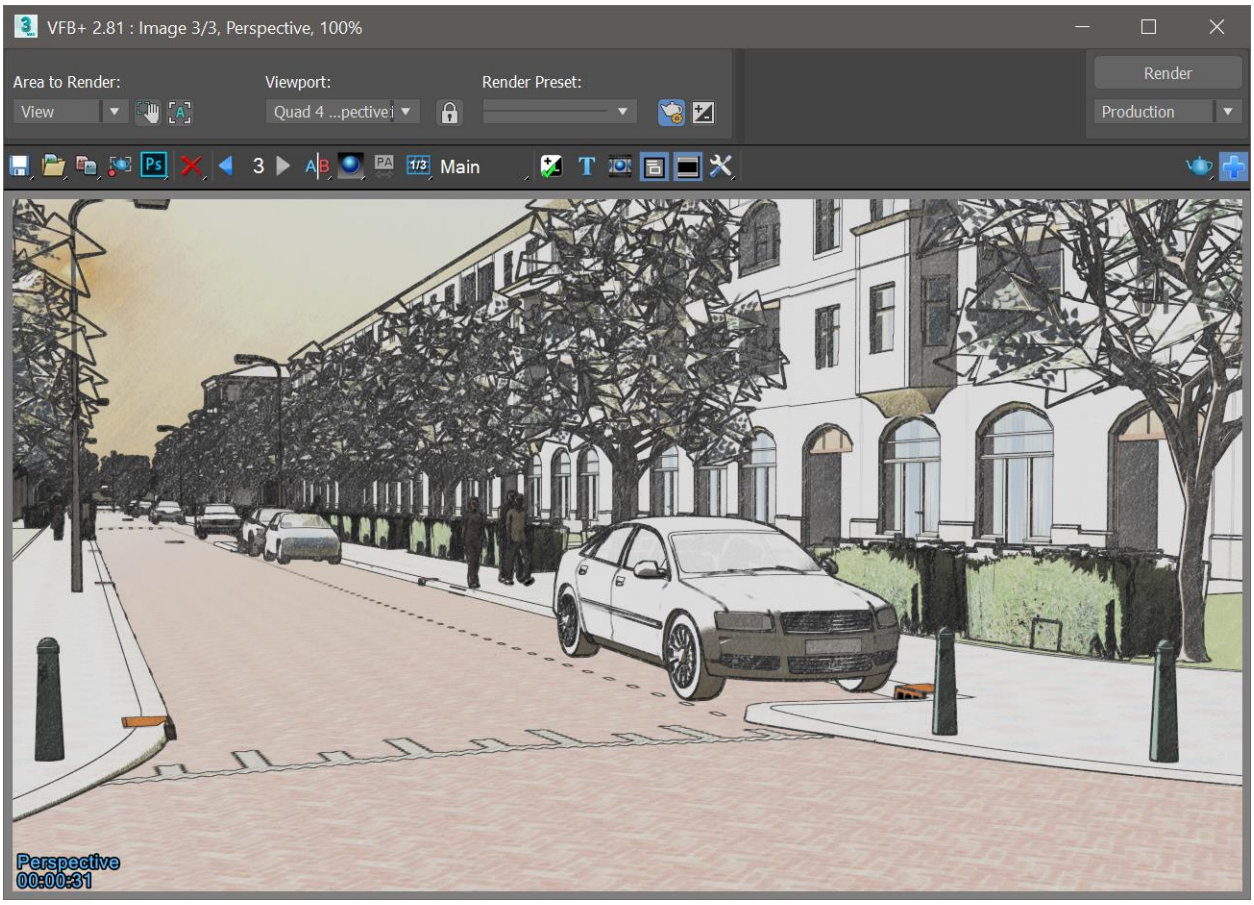
Quicksilver Hardware Renderer

When you don't want a realistic but a non-photorealistic render you should change the render engine to the Quicksilver Hardware Renderer. The Common tab of the Render Setup stays the same as with the ART renderer when you do so.



Different Non-Photorealistic rendering styles can be applied with Quiksilver

The Renderer tab of the Render Setup dialog box will show the specific Quicksilver Hardware Renderer settings. The most important one is the Rendering Level. In the Rendering Level you will find all the different non-photorealistic rendering styles. To have the effect of Ambient Occlusion you must check this option in the Lighting and Shadows rollout.



Visual Style set to Color Pencil and rendered with the Quicksilver Hardware Renderer

By combining those kinds of images in Adobe Photoshop you can achieve come very nice results in a couple of minutes.

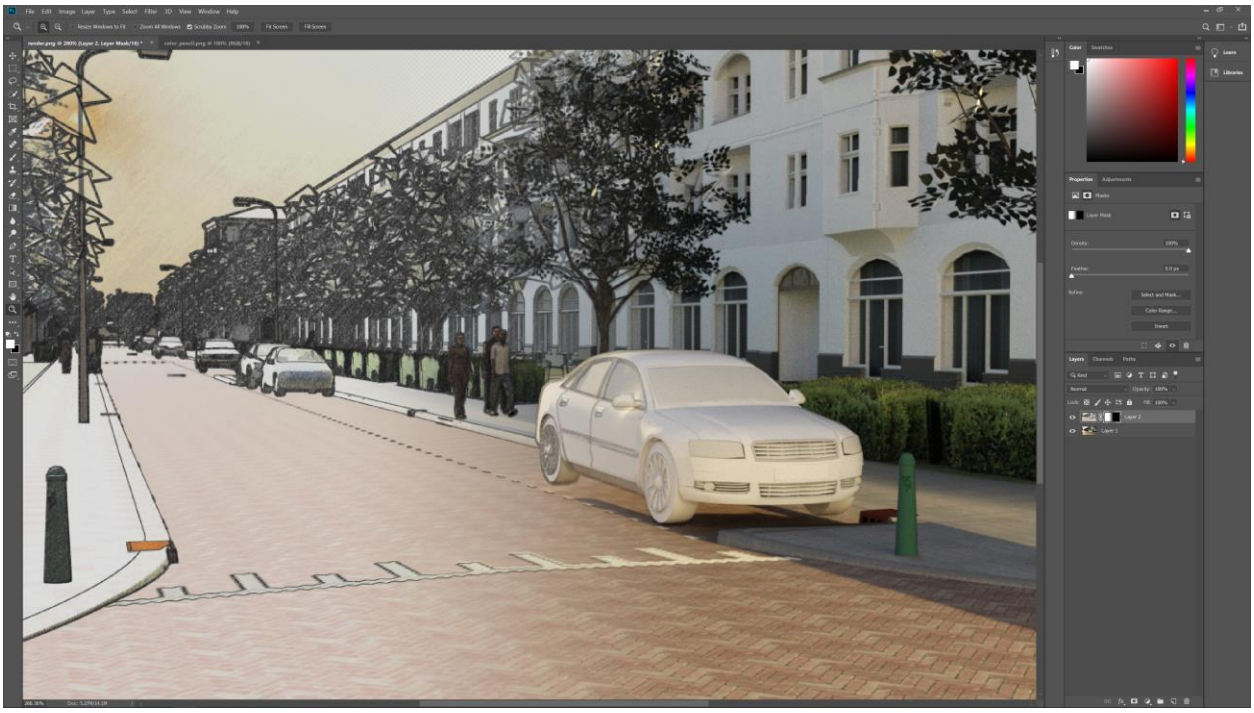
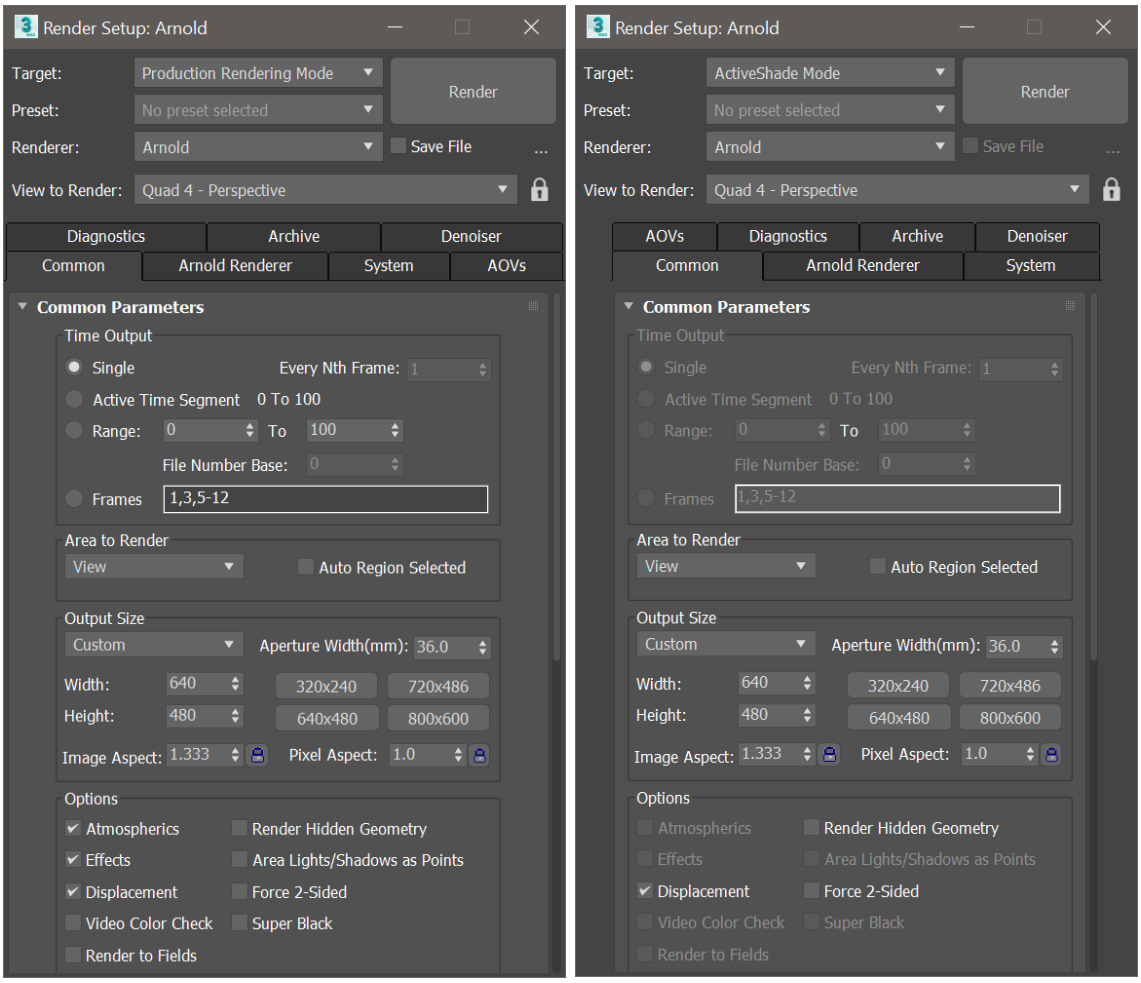


Photo realistic and non-photo realistic blended in Adobe Photoshop with a Vector mask

Arnold Render Engine

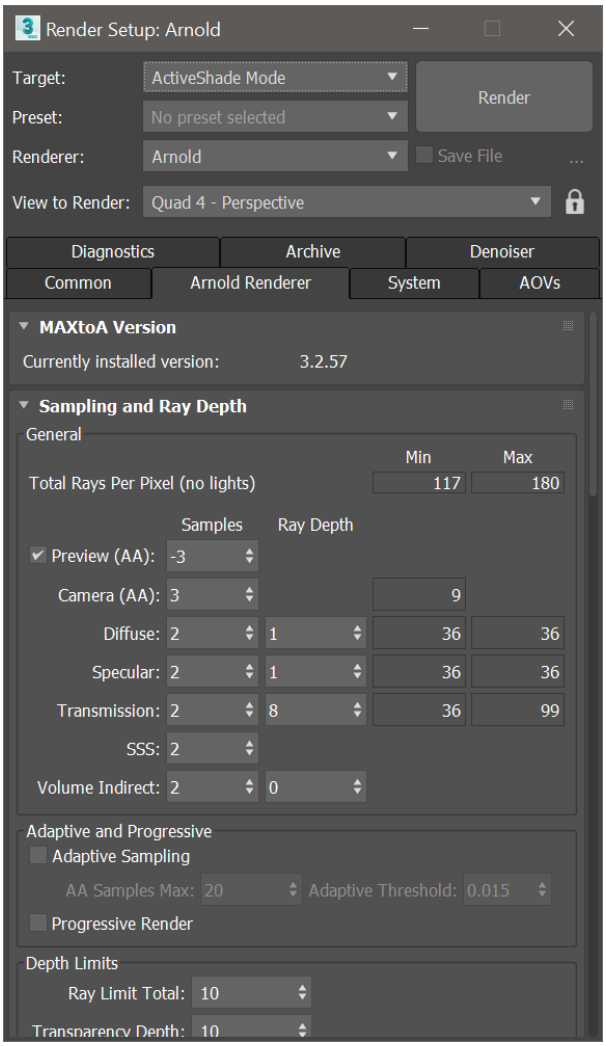
The Arnold render engine is included in 3ds Max since 3ds Max version 2018, although it's not set as the default renderer. To change the 3ds Max renderer to Arnold you'll need to open the Render Setup dialog box **(F10)**. For best practices you should both set the Production Render and the Active Shade to Arnold.



Both Production and ActiveShade mode set to the Arnold render engine

Arnold Renderer settings

In the Arnold Renderer tab in the Render Setup dialog box you'll find the most important Arnold render settings.



MAXtoA Version

The currently installed version of the Arnold renderer is showed in the MAXtoA Version rollout. If there's a new version available you're able to click on the new version link which will point you to the www.arnoldrenderer.com website. Arnold is a plug-in so there's no need to completely uninstall 3ds Max. Installing the updated Arnold plug-in will do.

Sampling and Ray Depth roll-out

In the Sampling and Ray Depth roll-out in the Arnold Renderer tab you control the quality of the rendered image. Quality is expressed in samples and higher samples will yield into better quality (less noise) but longer render times.

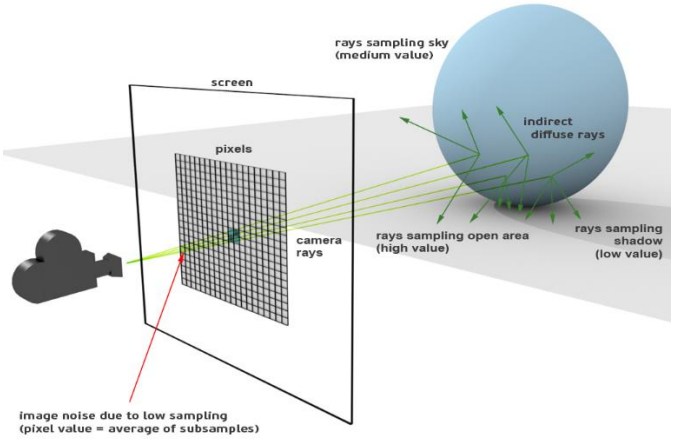
Camera (AA) samples

Supersampling control over the number of rays per pixel that will be traced from the camera. The higher the number of samples, the better the anti-aliasing quality, and the longer the render times. The exact number of rays per pixel is the square of this value. For example, a *Camera (AA)* samples value of 3 means 3x3 = 9-pixel samples. In practice, you may consider using a value of **4 for medium quality**, **8 for high quality**, and (rarely) 16 for super-high quality. This control acts as a global multiplier of all the different rays, multiplying the number of *Diffuse* and *Specular* rays. Motion blur and depth of field quality can only be improved by increasing *Camera (AA)* samples.

Camera (AA) samples **multiply *Diffuse, Specular,* and light samples** after being squared. For example, 6 *Camera (AA)* samples and 6 *Specular* samples = 6^2 x 6^2 = 1296 rays per pixel for the Diffuse, and another 1296 rays per pixel for the indirect specular. Therefore, when you increase the *Camera (AA)* samples to get better geometric anti-aliasing, you should decrease the others to compensate.

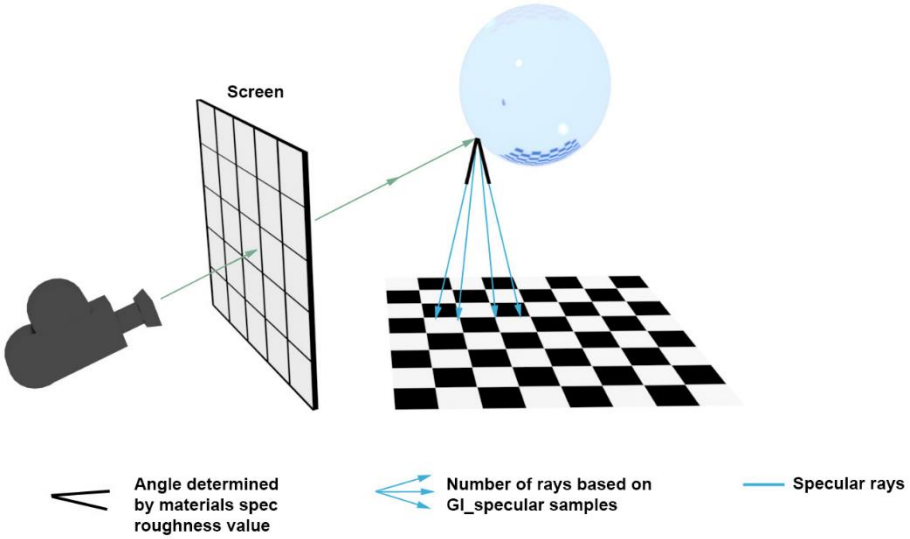
Diffuse samples

Controls the number of rays fired when computing the reflected indirect radiance integrated over the hemisphere. The exact number of hemispherical rays is the square of this value. Increase this number to reduce the **indirect diffuse noise**. Remember that the diffuse sampling is done for each *Camera (AA)* sample, so high values for both *Camera (AA)* samples and *Diffuse* samples will tend to result in slow renders. When *Diffuse* samples are more than zero, camera rays intersecting with diffuse surfaces fire indirect diffuse rays. The rays are fired in random directions within a hemispherical spread. Noise is introduced when there are insufficient rays to resolve the range of values from the environment. Increasing the number of *Diffuse* samples will increase the number of diffuse rays fired from a point.



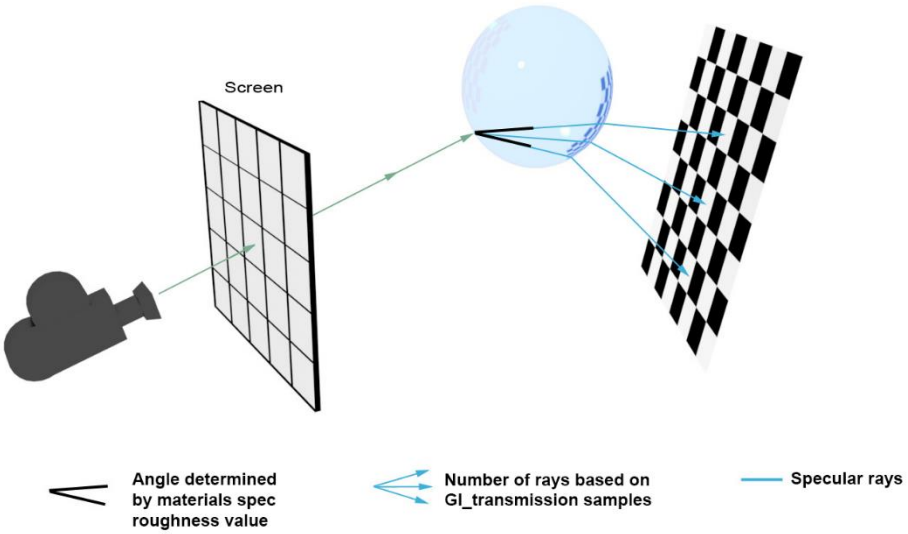
Specular samples

Controls the number of rays fired when computing the reflected indirect radiance integrated over the hemisphere weighted by a specular BRDF. The exact number of rays is the square of this value. Increase this number to reduce the indirect specular noise (soft/blurry reflections). Remember that the specular sampling is done for each *Camera (AA)* sample, so high values for both *Camera (AA)* samples and Specular samples will tend to result in slow renders.



Transmission samples

Controls the number of samples used to simulate the microfacet-based transmission evaluations. Increase this value to resolve any noise in the transmission.
If you switch this parameter to zero, the GI_transmission_depth to zero and the noise disappears, you will know that the noise is due to transmission.

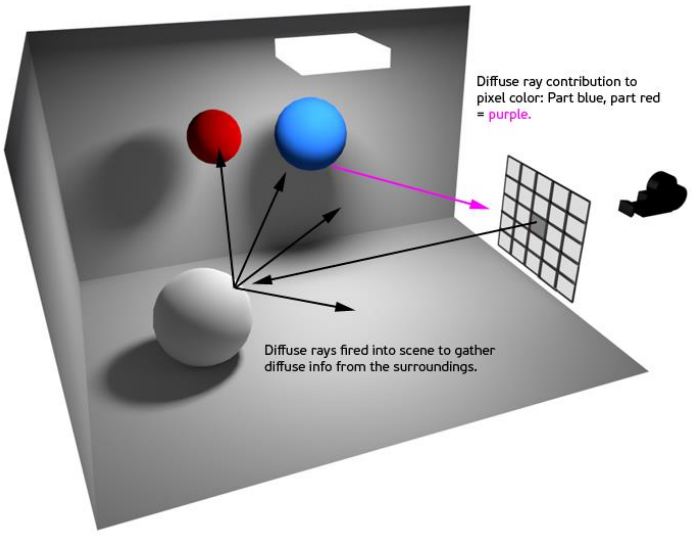


Sub Surface Scattering samples

This value controls the number of lighting samples (direct and indirect) that will be taken to estimate lighting within a radius of the point being shaded to compute sub-surface scattering. Higher values produce a cleaner solution but will take longer to render.

Diffuse Ray Depth

Defines the maximum ray diffuse depth bounces. Zero *Diffuse* is equal to disabling diffuse illumination. Increasing the depth will add more bounced light to the scene, which can be especially noticeable in interiors. You may notice subtle differences when increasing the diffuse bounces incrementally.

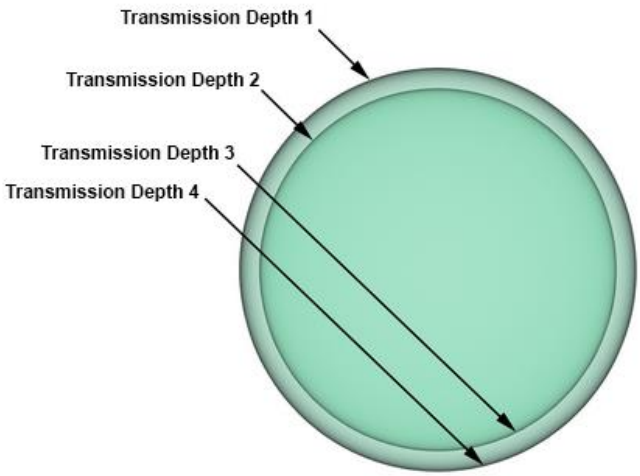


Specular Ray Depth

Defines the maximum number of times a ray can be specularly reflected. Scenes with many specular surfaces may require higher values to look correct. A minimum value of 1 is necessary to get any specular reflections.

Transmission Ray Depth

The maximum number of times a ray can be refracted. Scenes with many refractive surfaces may require higher values to look correct.



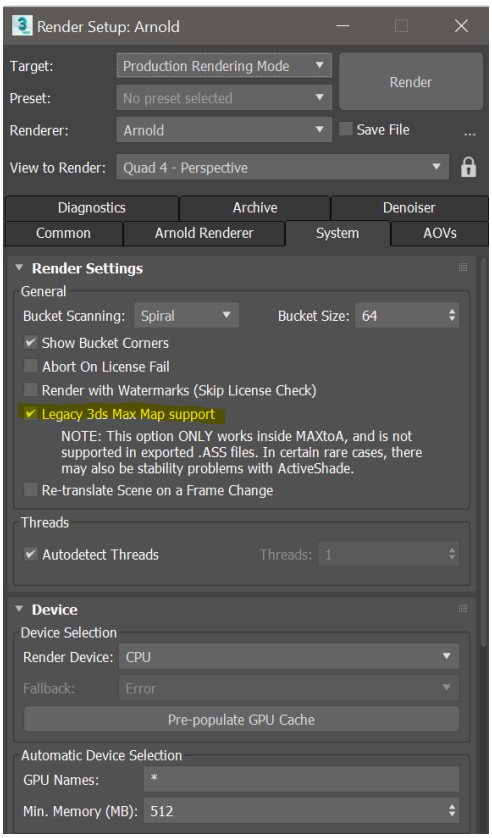
3ds Max ActiveShade in 3ds Max 2020 Floating Viewport

If you want to interact with the 3ds Max scene in ActiveShade mode, you can start a floating viewport which is available since 3ds Max 2020.1 In the floating viewport you can set the 3ds Max viewport to ActiveShade.

Floating viewport in 3ds Max 2020.1 with the ART Active Shade running

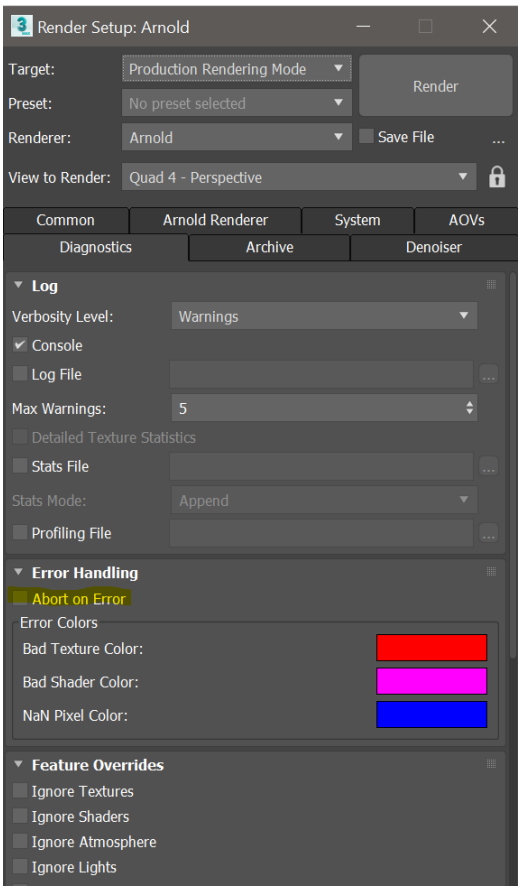
Solving different Arnold errors/warnings

After utilizing the 3ds Max Scene converter you still might get some errors. If this is the case, you can enable Legacy 3ds Max Map Support in de System tab in the Arnold Render Setup.



Legacy 3ds Max Map support enabled in the Arnold Render Setup

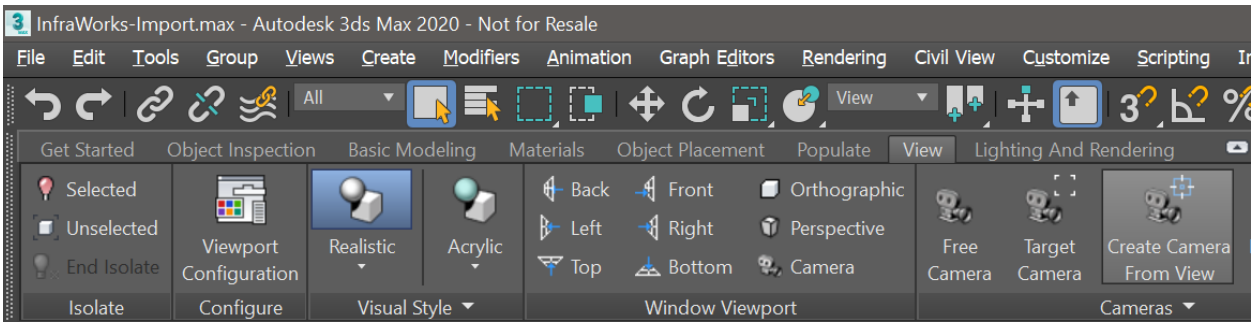
In case you get a warning about empty bitmaps, probably a Bitmap map type is present in one or more Material Slots, but no specific bitmap file has been loaded. If the render stops after the Preview pass and does not continue, then the "Abort on Error" switch has been turned on (usually after an Arnold update) in the Diagnostics tab of the Arnold Render Setup dialog box. This checkbox is turned on by default. If you switch it off your 3ds Max scene will always render despite missing Bitmaps.



Abort on Error switched off in the Diagnostics tab of the Arnold Render Setup

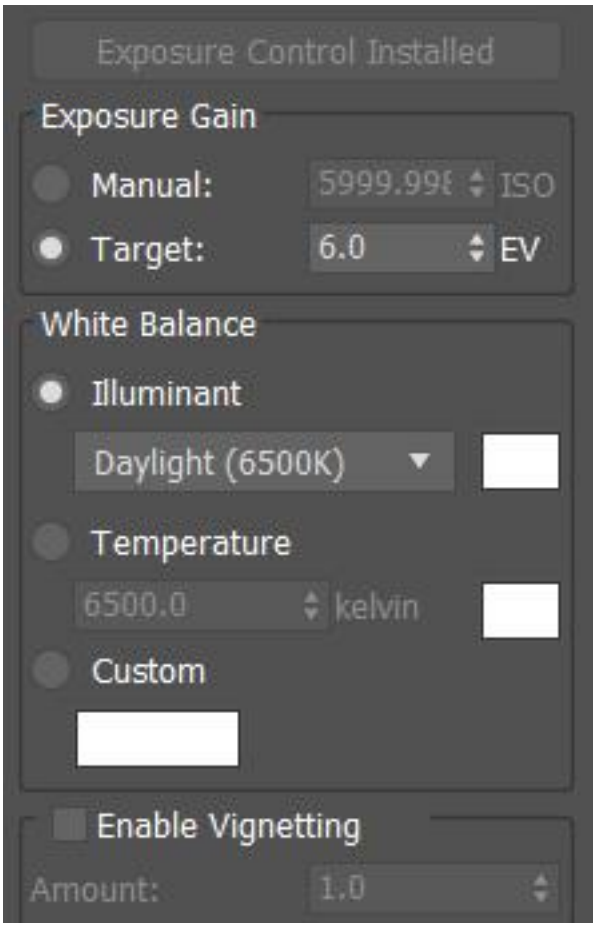
Physical Camera

It's always a good idea to add cameras to your 3ds Max scene. The Physical camera is the most interesting camera available in 3ds Max. The create a Physical Camera in a Perspective View you can use the **Create Camera From View** option in the View tab of the 3ds Max Design Standard ribbon.



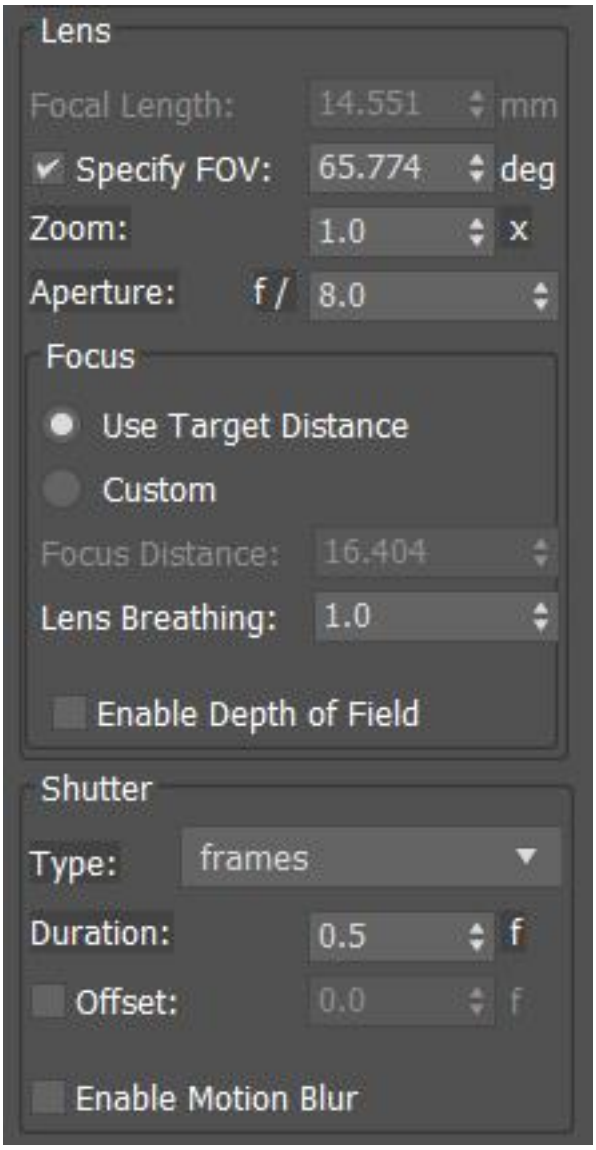
Create Camera From View will automatically create a Physical Camera based on the current view

The Physical Camera does hold a huge number of additional parameters compared with a standard camera. When switching the 3ds Max view to a Physical Camera view and selecting the Physical Camera you can easily access all the belonging parameters in the 3ds Max modify panel on the right side of the 3ds Max User Interface. In the Exposure roll-out of the Physical camera you can define the amount of exposure based on a **Target EV value**.



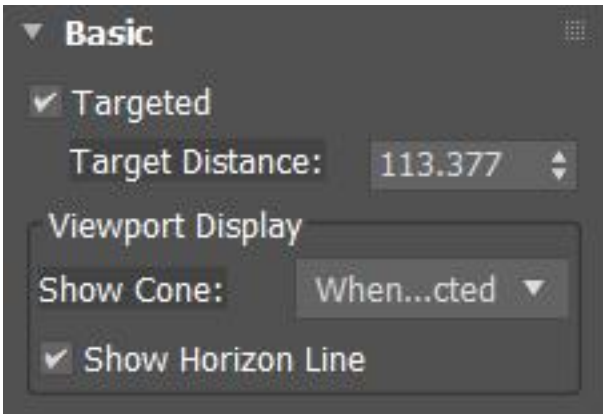
Exposure settings available in the Physical Camera parameters

If you're more into photographic based parameters, you can switch from Target to Manual and define the **ISO value** combined with a **Lens Aperture** and **Shutter**.



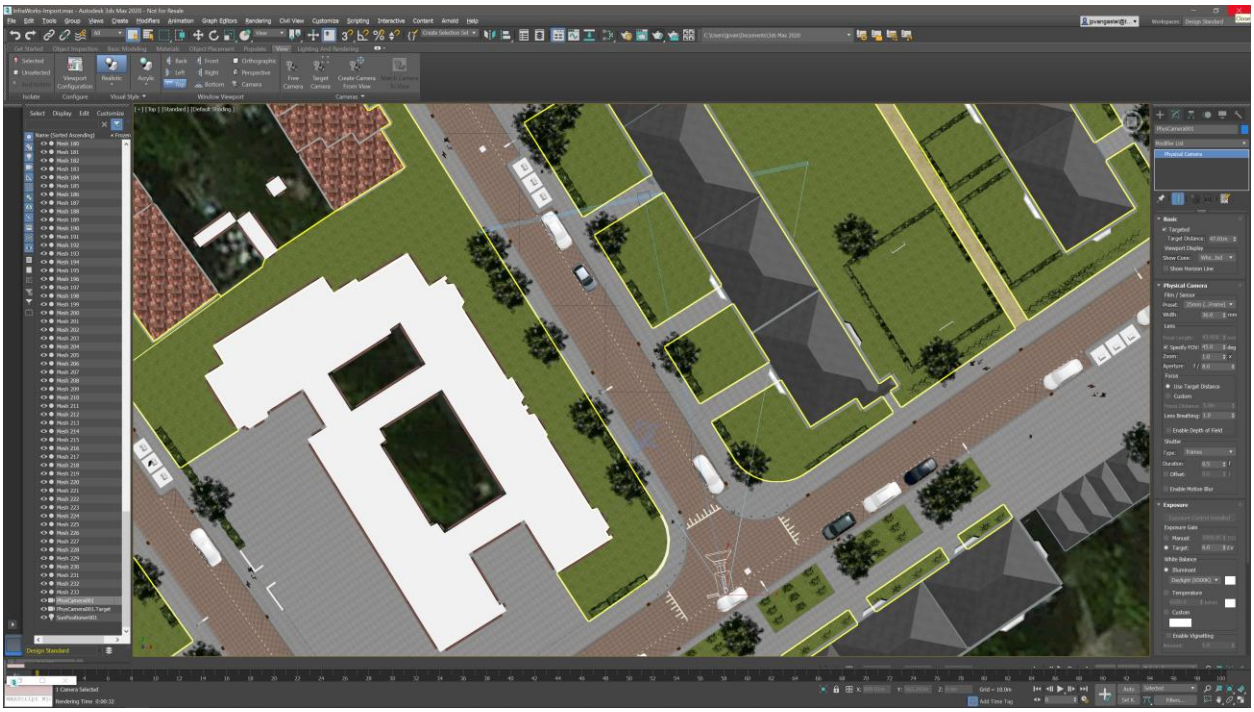
Aperture and Shutter settings in the Physical Camera parameters

By enabling the **Depth of Field** option, you automatically do get a Depth of Field effect based on the film width, lens focal length and aperture f-number in the 3ds Max viewport and in the rendering. The Lens itself can be defined based on a specified Field of View in degrees or Focal Length in millimeter. The target of the camera can be used as a focus plane. By using the **Target Distance** option of the camera, you can change the focus plane of the camera. You might have to active the **Targeted checkbox** of the Physical camera.

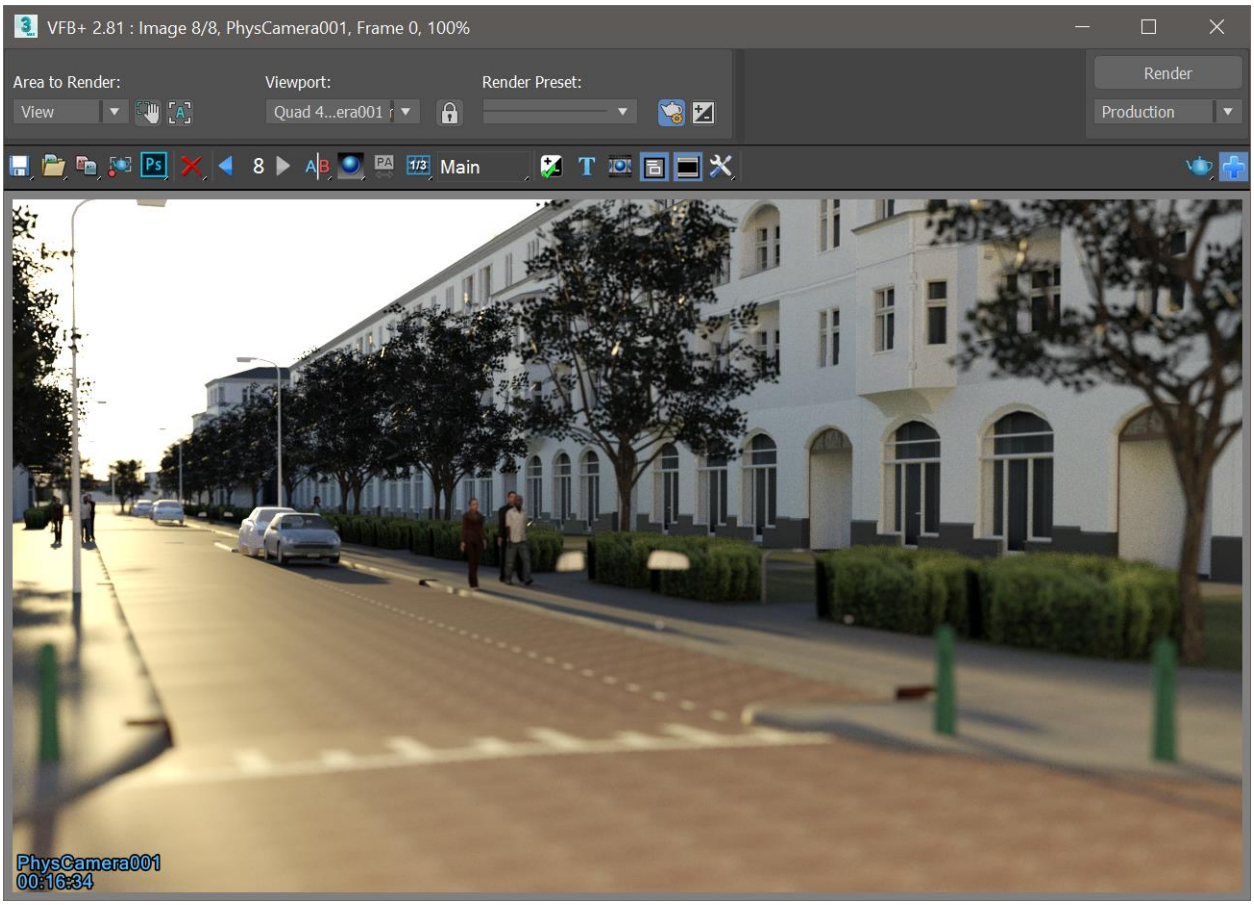


The Target Distance parameter to set the focus point in the render

To set the Target Distance it's easier to switch your 3ds Max view to a **Top view**. By doing that you can easily identify where the current Target Distance is being set and where it's in focus.



The Physical Camera seen from a Top view helps when setting up the focus point



The Enable Depth of Field option rendered with the 3ds Max ART render engine

Every time when you want to create another Physical Camera be aware that you'll need to be in a Perspective view (not a Camera view) and that there isn't a camera selected. Otherwise the Create Camera From View won't work.

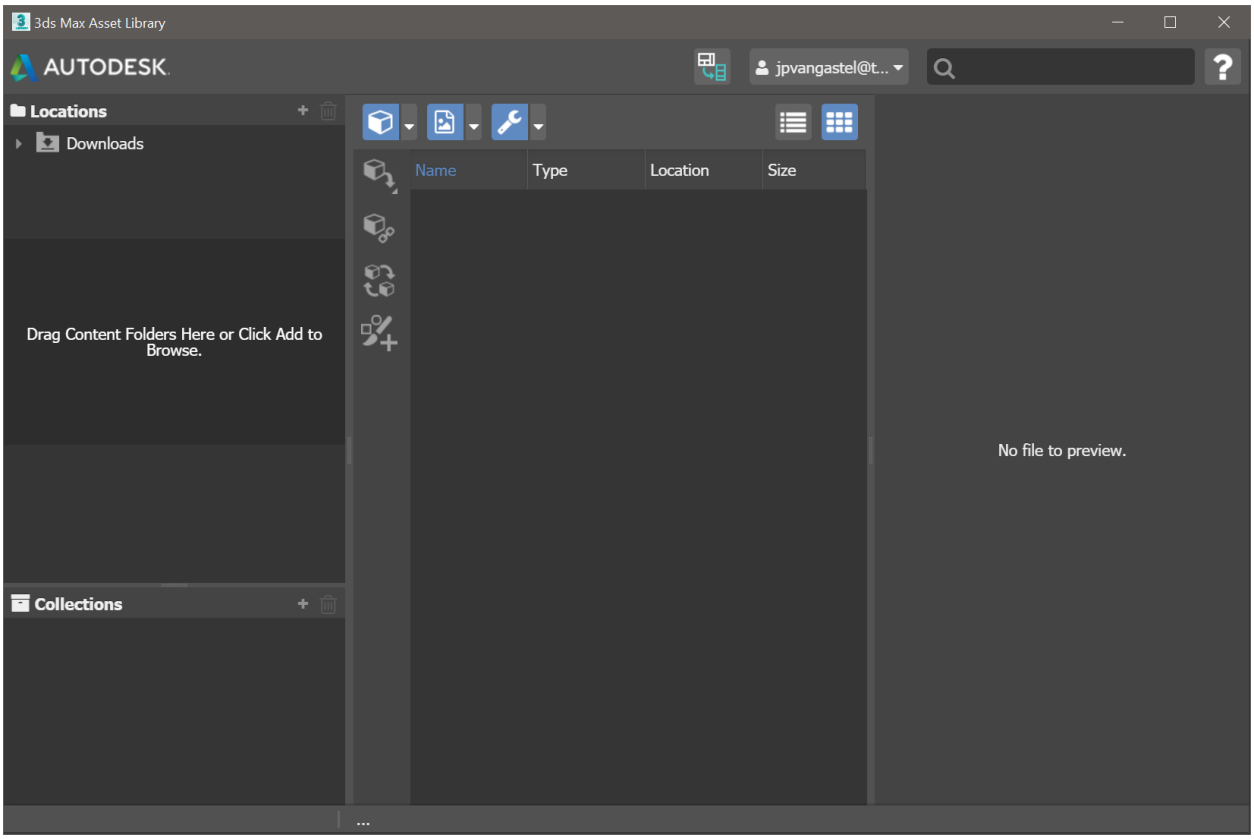
Learn how to set dress your InfraWorks project with 3D cars and 3D vegetation by using the 3ds Max Asset Library

A very important task of your 3ds Max project is called 'set dressing'. Placing 3D vehicles, trees, plants, flowers and 3D people gives a sense of scale to your 3D render. 3ds Max does have a library filled with 3D vehicles but they or only part of the Object Placement library of Civil View and a bit hidden. It's much better to generate a separate library with assets which can be managed by the 3ds Max Asset Library. The 3ds Max **Asset Library** is not installed by default

but can be downloaded from the **Content menu** of 3ds Max.

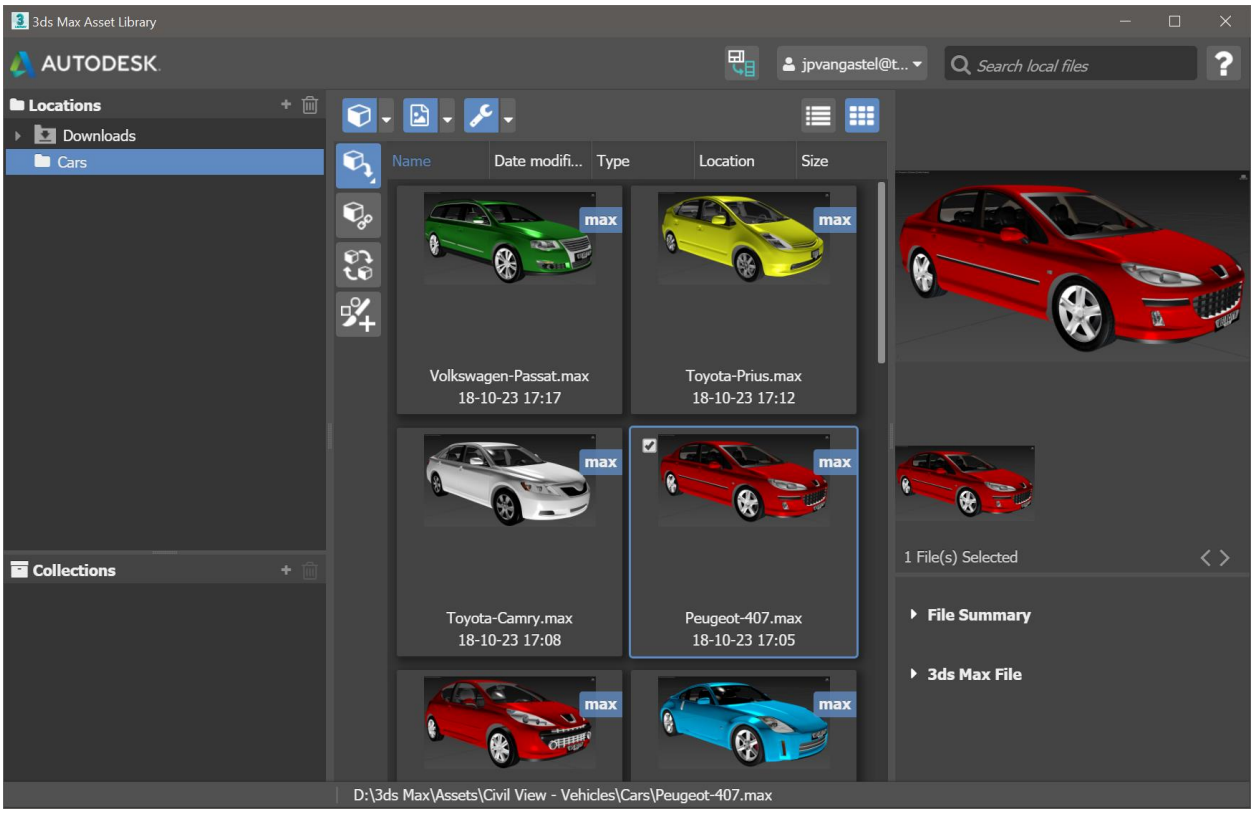
The Asset Library is not installed by the 3ds Max installation and should be downloaded

After downloading and installing the 3ds Max Asset Library you do get an additional application on your windows desktop. The 3ds Max Asset Library works as a standalone application.



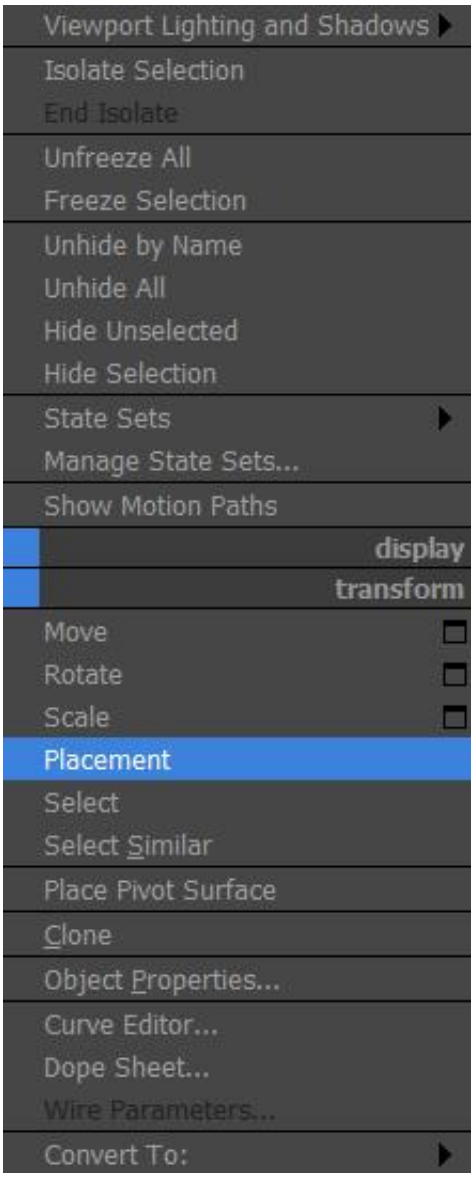
The 3ds Max Asset Library

Your own folders filled with 3ds Max assets (.max scene files) can be dragged from the Windows File Explorer straight into the Locations folder. 3ds Max will setup a **path mapping** to the content folder. From the Asset Library you can drag any asset into the 3ds Max viewport. By default, you're importing/merging the .max file into the current 3ds Max scene. There's also an option to replace the current selected object in the 3ds Max scene or to start the Object Paint based on the incoming object.

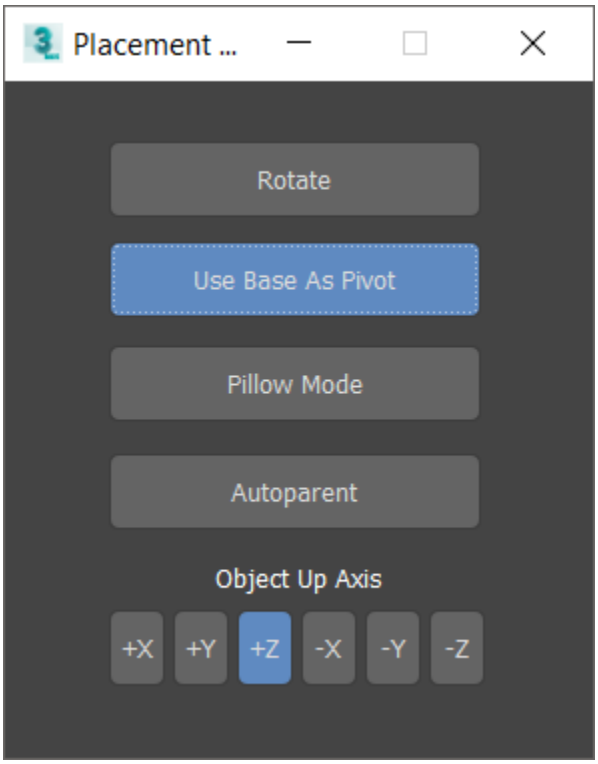


The Cars folder location is a path mapping to a location on the local hard drive

To easily place your 3D assets in the 3ds Max scene the **Select and Place** or **Placement** would be the best option available. The Select and Place is originally developed by Ikea in Sweden and can be found in the **Default Quad menu** (Right mouse button in the 3ds Max viewport) or in the **Main Toolbar**. With the 3D asset selected and the Placement tool active you can easily reposition the 3D asset which will start snapping on existing surfaces. By default, the Placement tool is using the actual **Pivot point** of the 3D Asset. You might change this behavior to snap always to the base of the object independent of the Pivot point location. This can be done with **right-clicking** on the Select and Place option in the Main toolbar.

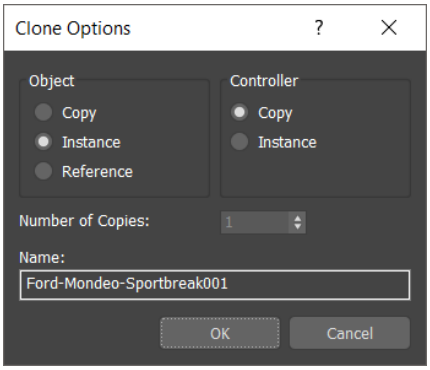


The Placement tool available in the 3ds Max default Quad menu

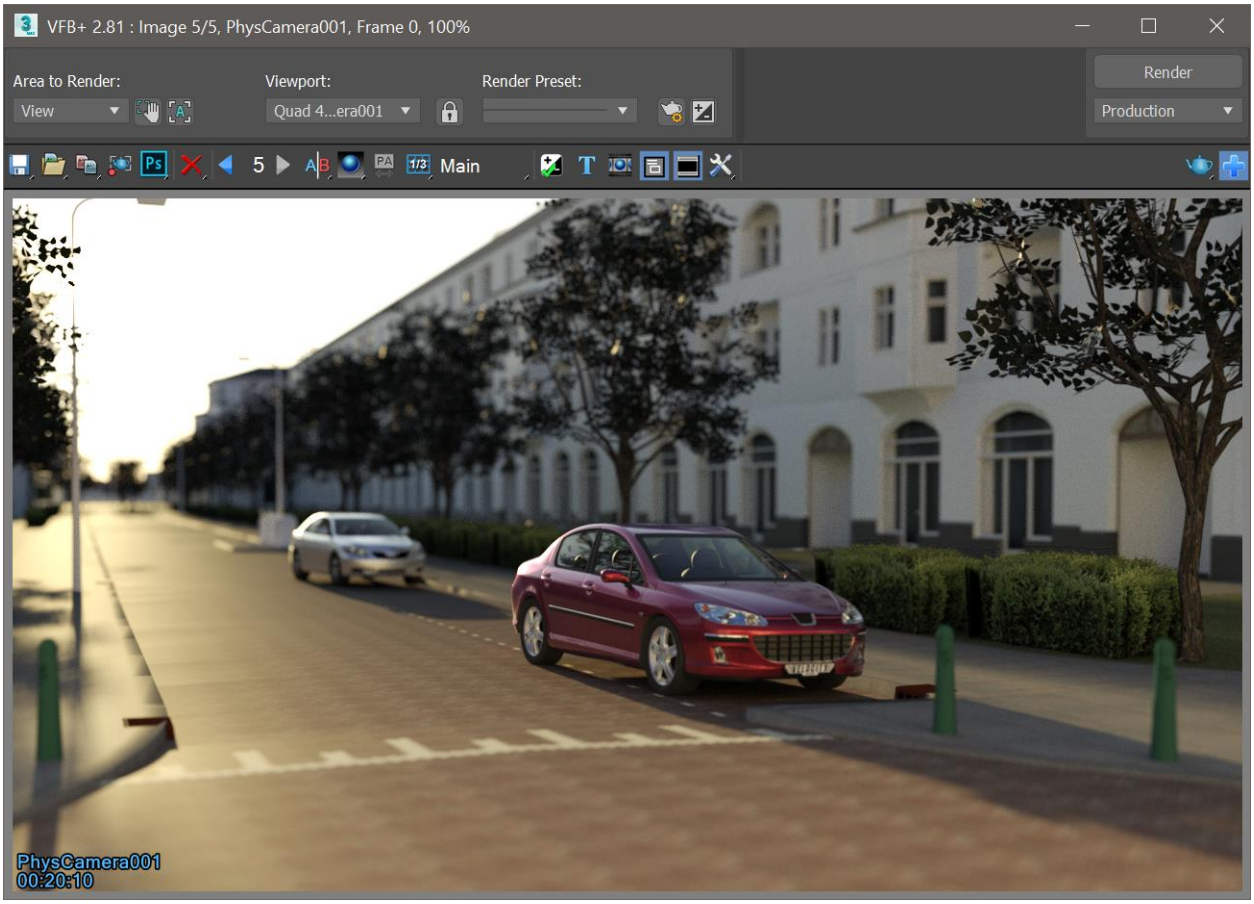


The Placement options dialog box

In the Placement settings dialog box, you also find the option for **Rotation** and which Axis is the Up Axis. This last option is also completely based on the Pivot point location of the selected 3D asset. With the keyboard combination **Shift** + the Select and Place you easily can copy an object in the 3ds Max viewport. The default **Instance** option doesn't copy the object in the database and is the preferred copy option.



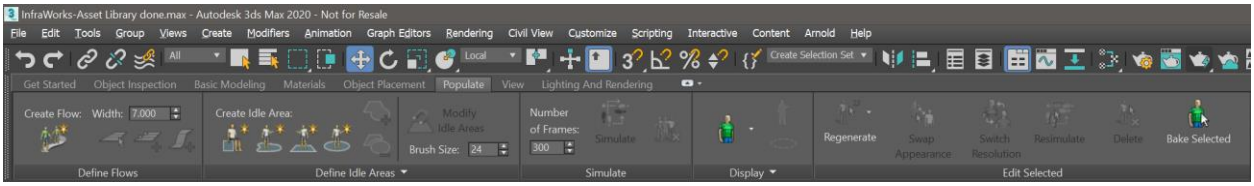
The default Clone option Instance is the preferred choice when cloning objects



High Quality vehicles placed in the 3ds Max scene by utilizing the Asset Library

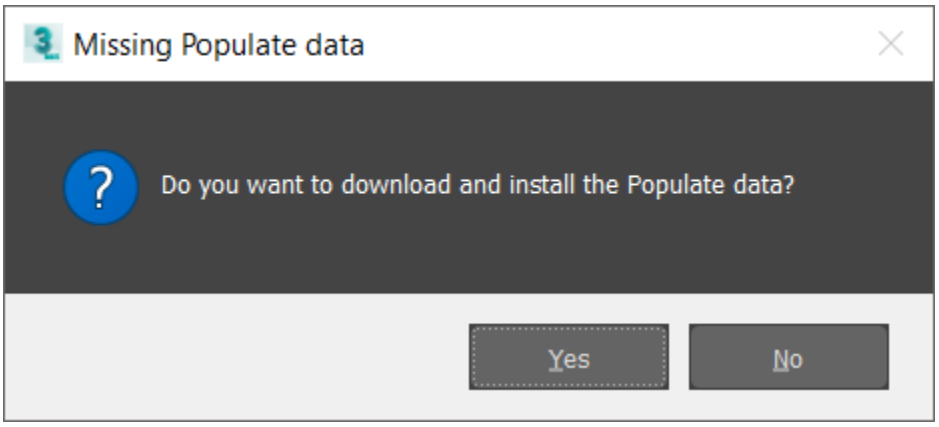
Populate Characters

If you want to populate your 3ds Max scene with 3D characters you can utilize the Populate tools available in the **Populate tab** of the ribbon. The Populate 3D characters can be placed based on a **Flow** if you want to have walking or running 3D characters. You can also add an **Idle area** with seated or moving 3D characters.



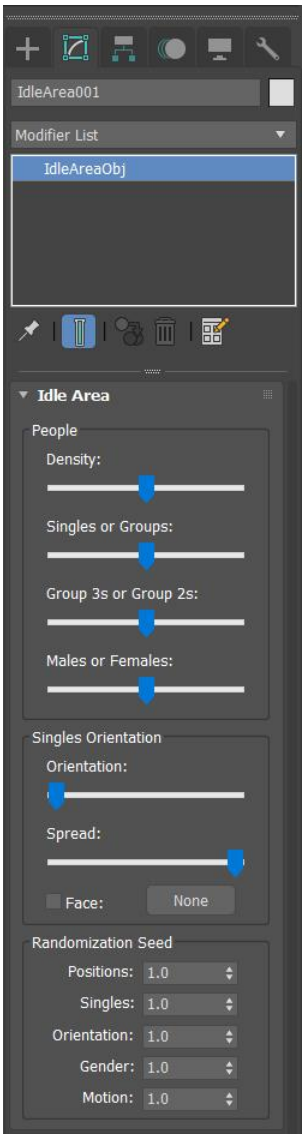
The Populate ribbon tab available in the 3ds Max Design Standard workspace

The database with the 3D characters is **not installed by default**. For the very first time you active the **Simulate** tool a download will automatically start.



The Missing Populate data message when activating the Simulate button the first time

There are many options available in the Populate ribbon tab. If you want to load in another motion you can use the **Resimulate** option with a populate character selected. If you want to have a higher quality, you can use the **Switch Resolution** option. With a Flow or Idle Area selected in the 3ds Max scene or Scene Explorer you have many self-explanatory options available in the 3ds Max Modify panel.



Idle Area parameters visible in the 3ds Max Modify panel

Keep in mind though if you change any parameter in the 3ds Max Modify panel you have to use the **Resimulate** option in the Populate tab of the ribbon to update your 3ds Max populate characters.

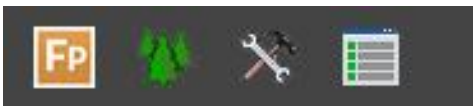
Populate characters added in the 3ds Max scene

3D Grass with Forest Pack

Creating 3D grass in 3ds Max is quite challenging, and that's an understatement! There are tools available in 3ds Max for creating decent looking grass in 3D, but it takes too much time to set it up. The industry standard tool for creating vegetation like grass, trees etcetera is **Forest Pack** from iToo software. https://www.itoosoft.com/forestpack

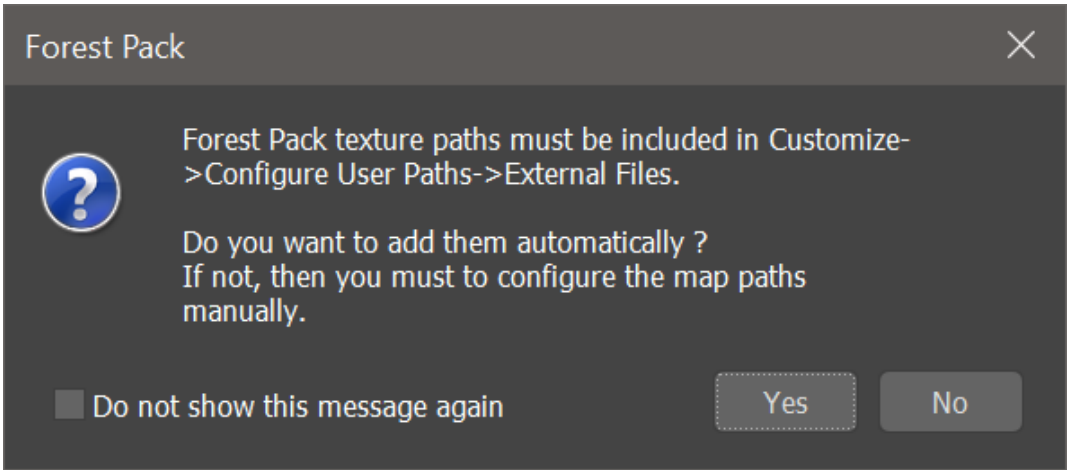
Forest Pack has a **free version** and a **paid version** available. The free version only **supports flat surfaces** and you can only have a maximum of **3 scattered distribution** objects in your 3ds Max scene. The library itself is limited to two different presets. Besides those limitations you must render with 3ds Max scene with the **Arnold render engine**. The ART renderer is not supported!
To avoid warnings about not supported maps when the Arnold render starts you should enable the **Legacy 3ds Max Map support** in the **System tab** of the Arnold renderer.

After setting up Arnold as the current renderer you can start using the Forest Pack plug-in in 3ds Max. When Forest Pack is installed in 3ds Max you do get a **Forest Pack toolbar** with the available options in the upper right corner of the 3ds Max User Interface.



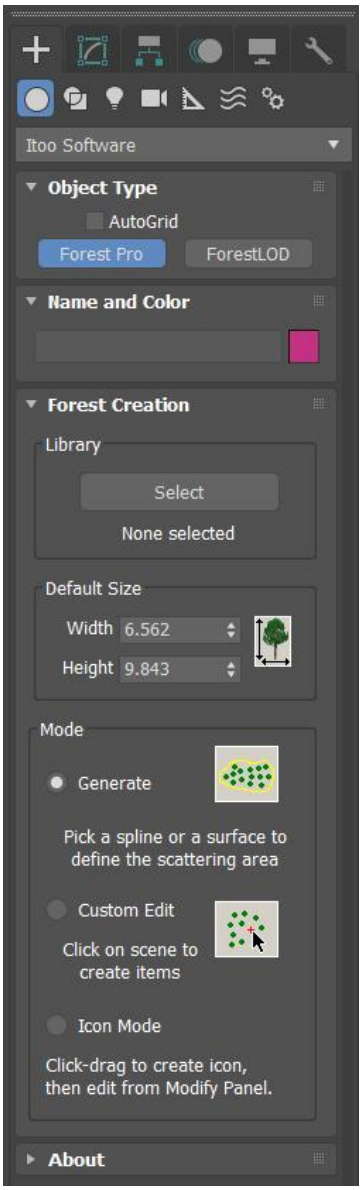
The Forest Pack toolbar

For the very first time you do start the Forest option in the toolbar (the most left one) you do get a warning that 3ds Max needs to add some **external paths**. When selecting Yes in the Forest Pack dialog box this will happen completely automatically.



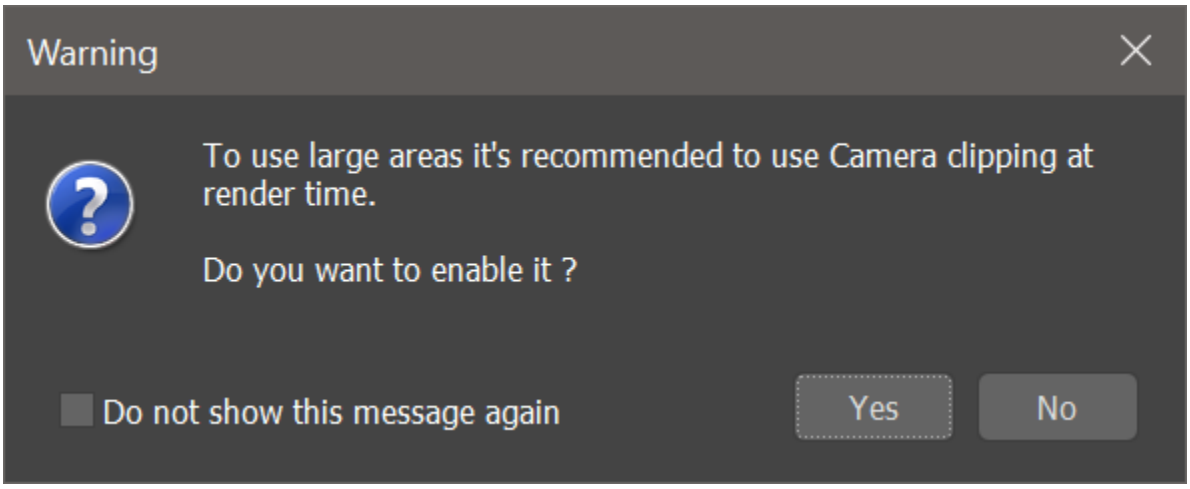
Forest Pack texture paths will automatically be added

After selecting Yes in the Forest Pack dialog box, Forest Pack will automatically import some objects which are invisible in the 3ds Max viewport. The next step is to select an object in the 3ds Max viewport. This can be a 3D object or a spline (2D) object which will be used as the scattering object. If you can't select the object you might have to switch to a Perspective view and just orbit your 3ds Max scene a bit.



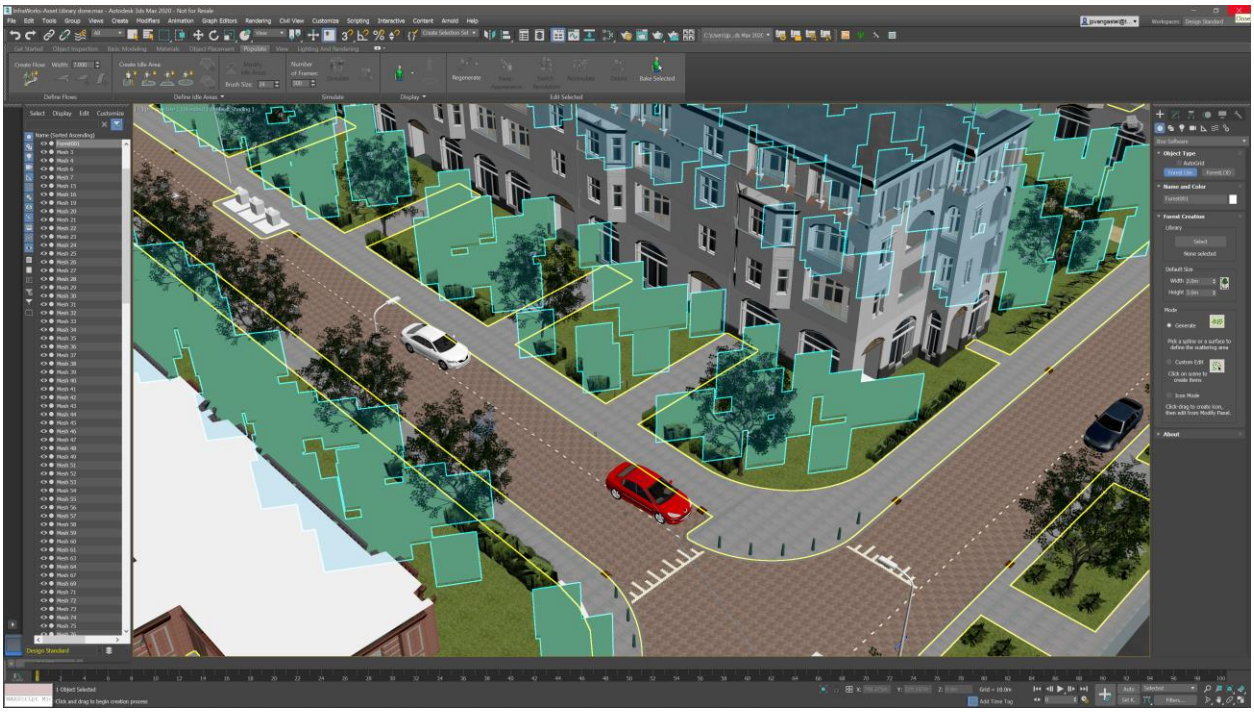
The Forest Pro parameters

After selecting the spline or surface you can get a warning about large areas. With large areas it's always recommended to use **Camera clipping** at render time. Always choose **Yes** to enable it.



Camera clipping will automatically be activated one larger areas

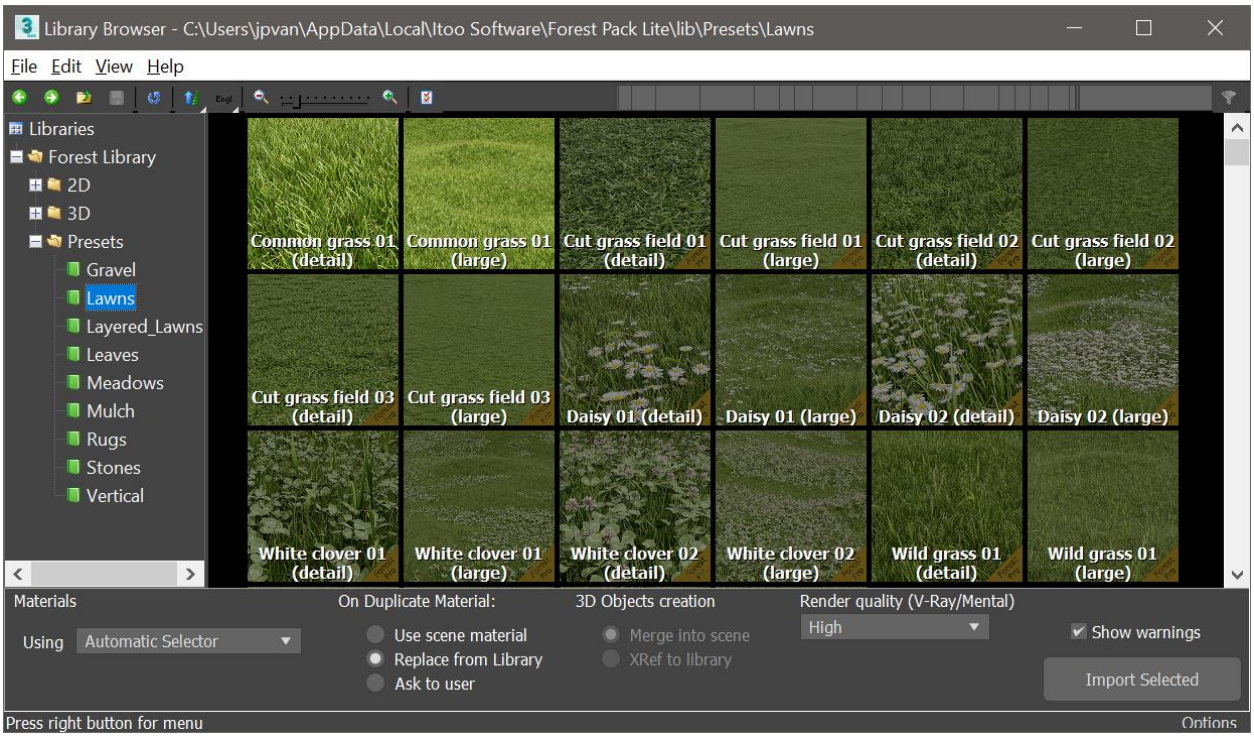
After activating Camera clipping Forest Pack will import a Forest object in the 3ds Max viewport and acts like low-resolution proxy.



Low-resolution proxies placed in the 3ds Max scene

When opening the **3ds Max Modify panel** with the Forest object selected you do get access to all the Forest Pack parameters. In the **Library** you will find some very handy presets for grass creating 3D grass.

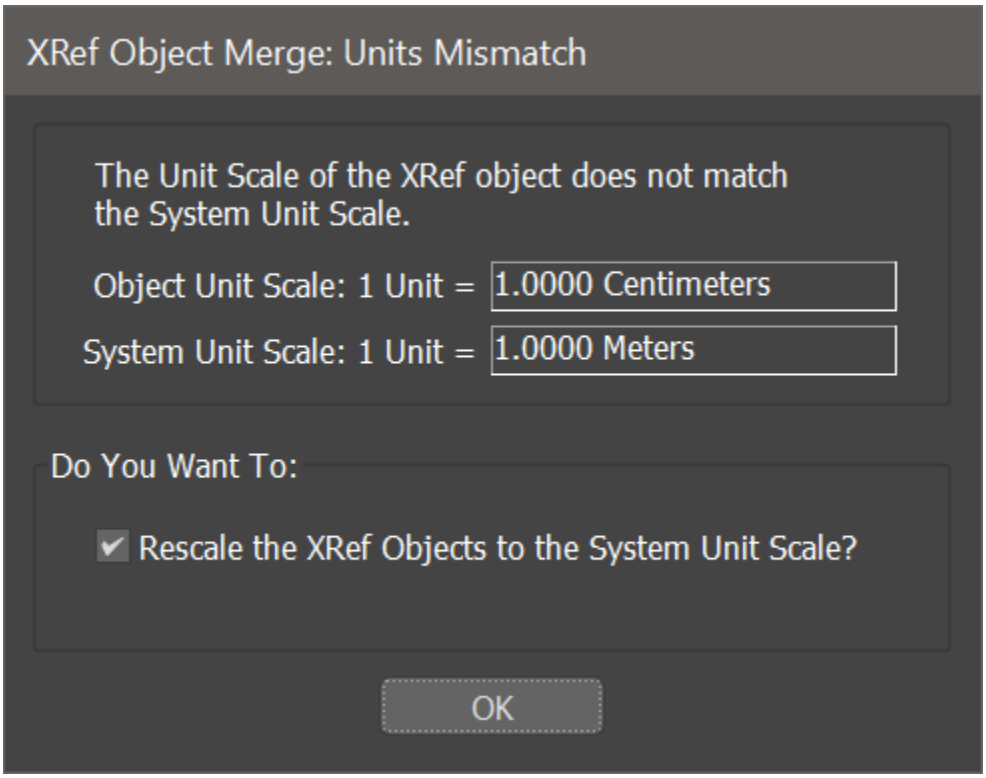
The Library button will show the available presets



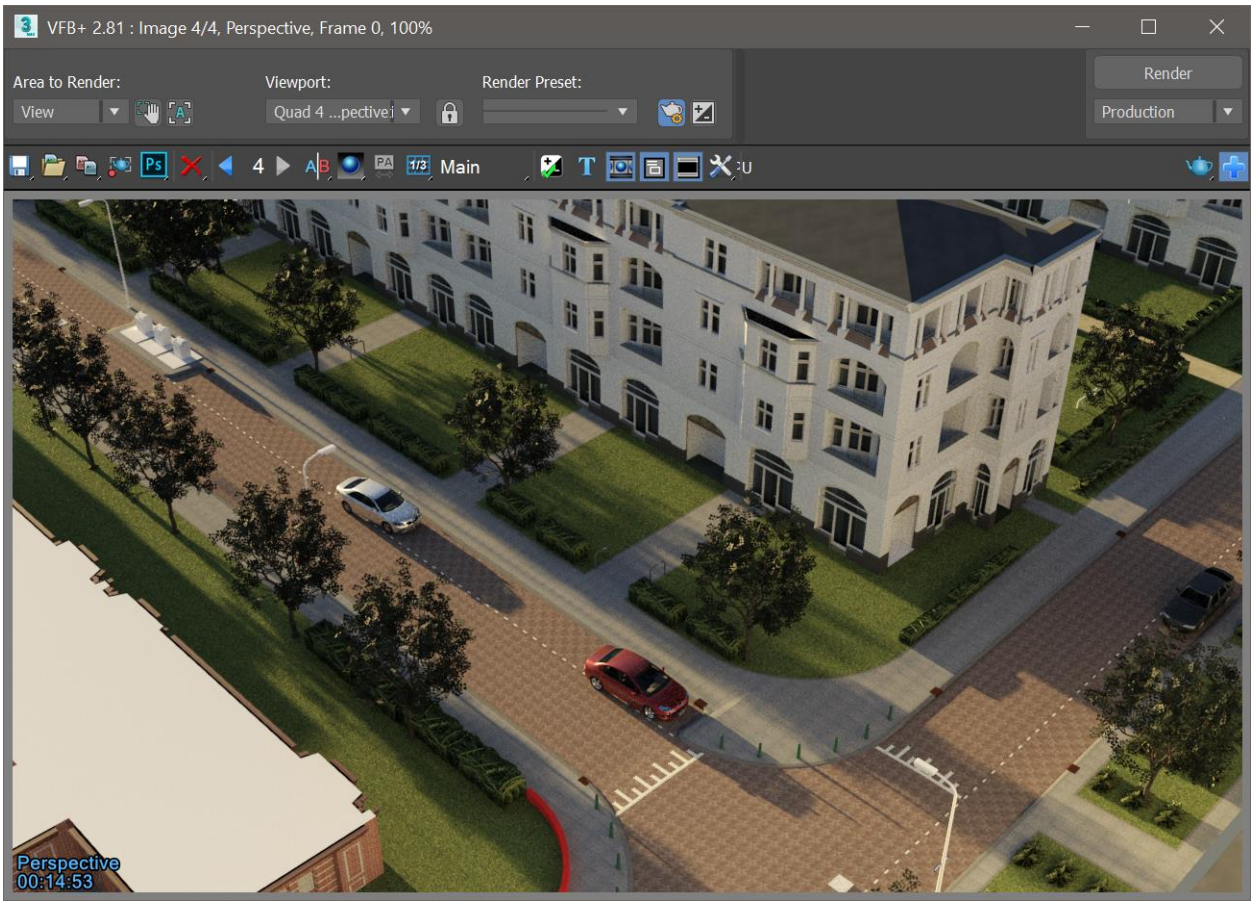
The brightest presets are available in the free version of Forest Pack

By double clicking on a preset or selecting the Import Selected button you're importing the preset.

In the **Xref Object Merge: Units Mismatch** dialog box you should always accept to **Rescale the Xref Objects to the System Unit Scale warning**.



The XRef Object Merge: Units Mismatch should be respected by clicking on the OK button



3ds Max scene rendered with Forest Pack

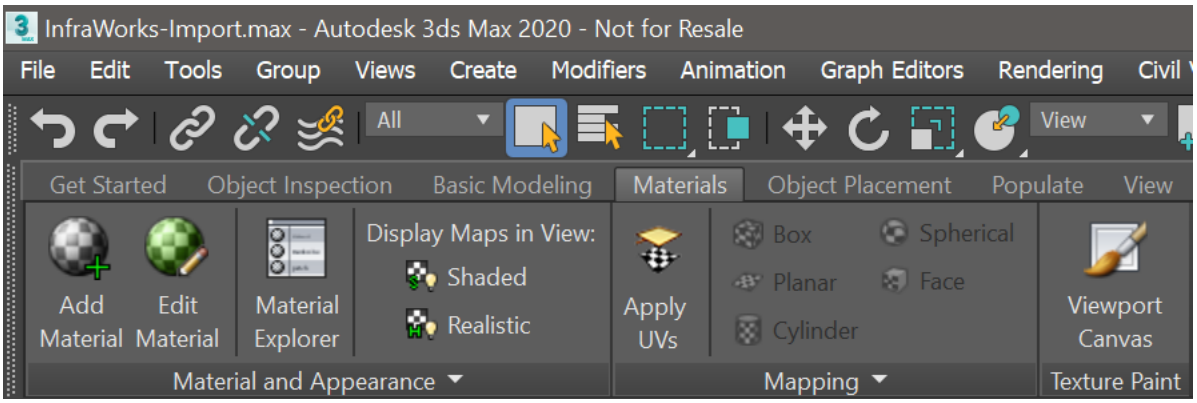
Besides using presets from the Library, you can also add your own 3D trees, plants or flowers as scatter objects. Based on settings in the **Transform rollout** you can add randomness to all your vegetation. The distribution itself is based on a greyscale texture which can be set in the **Distribution** rollout of the 3ds Max Modify panel. Forest Pack is a very easy to use plug-in and to have a better understanding of the use of the plug-in you can watch the video tutorials provides by the developer on YouTube. https://www.youtube.com/user/itoosoft/videos

Learn how to build the best materials, realistic and non-photorealistic

Physical Material

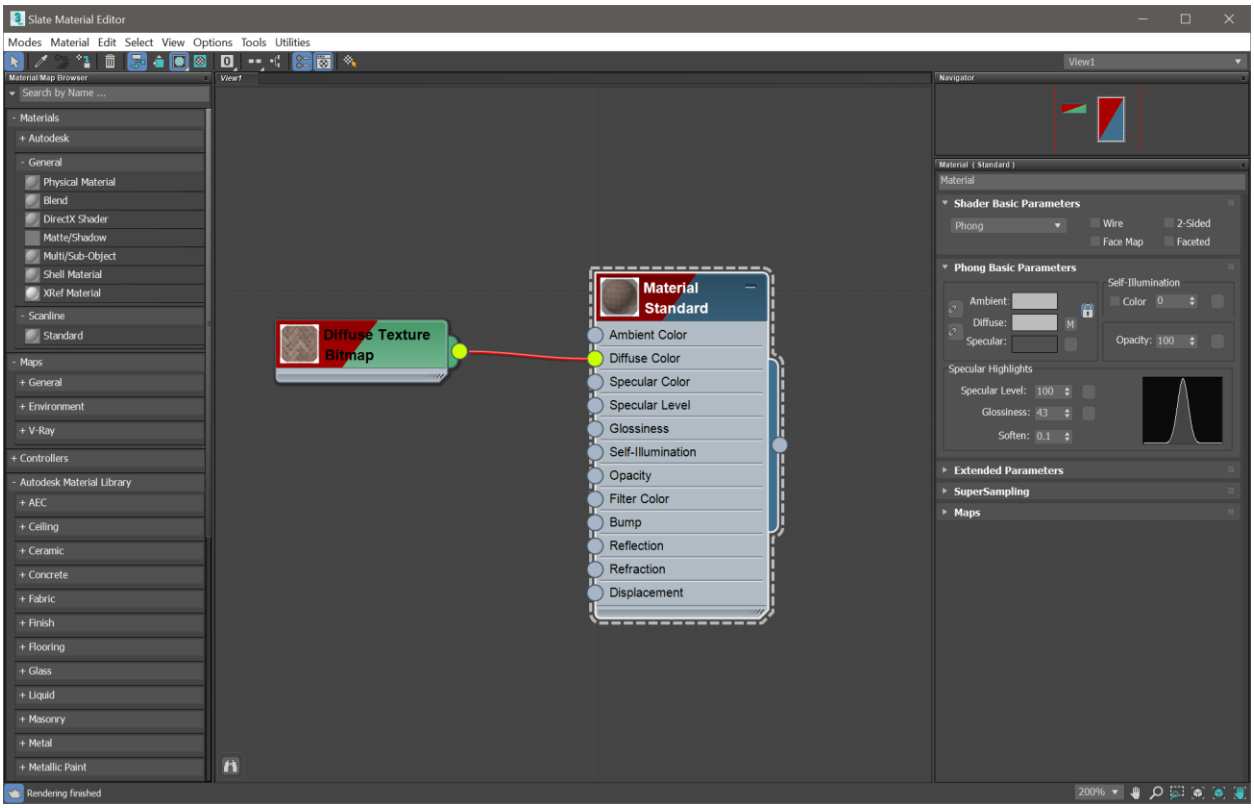
When you import an InfraWorks file format into 3ds Max your InfraWorks materials are brought over to 3ds Max as **standard materials**. Standard materials are legacy 3ds Max materials and should be converted with the 3ds Max Scene Converter. Although ART can render standard materials the Arnold render engine does not support standard materials so you should always convert your Autodesk materials into Arnold ready materials if you want to render with Arnold. A much better material in 3ds Max for rendering with both ART and Arnold is the **Physical Material**. It's not only faster for rendering but it also provides a much better quality. The Physical Material is a user-friendly material and acts and does provide you almost all the

physical aspects of a real-world material. It's quite easy to manually change a standard material into a Physical Material. Based on a selection in the 3ds Max viewport or in the Scene Explorer you can Edit the assigned material by using the **Edit Material option** in the Materials tab in the ribbon of the Design Standard workspace.



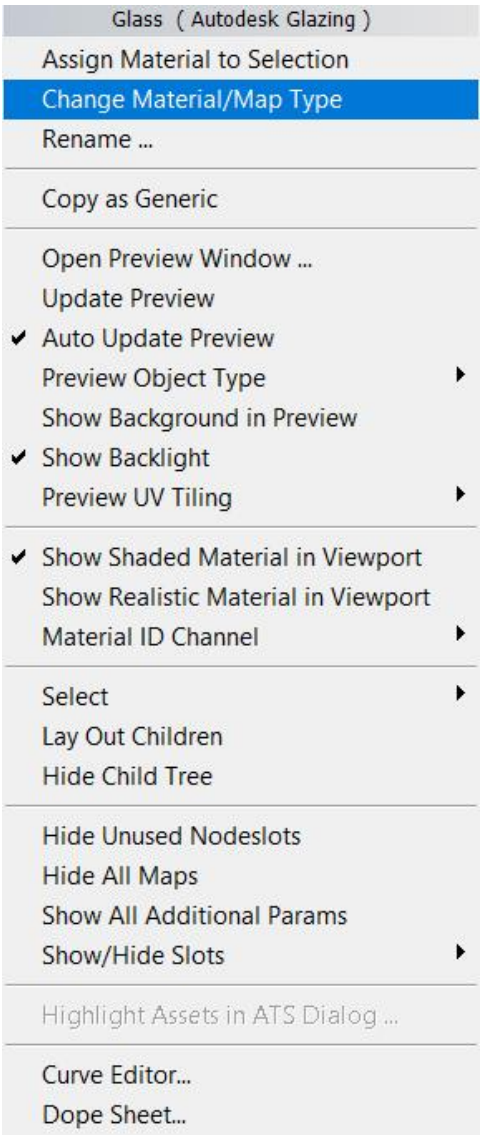
The Edit Material button found in the Materials tab of the Design Standard ribbon

This will open the **3ds Max Slate Material Editor**. The Slate Material Editor consists of three important parts. At the left side you have an overview of all the available materials and maps based on the current render engine **(Material/Map Browser)**. The **View** (grid) in the middle is your working area where you build your materials. At the right side of the material editor User Interface you will find the **Parameter Editor**. When double clicking on a material the material will be surrounded by a dashed line. The dashed line means that the material is active, and the belonging properties are showed in the Parameter Editor Editor on the right side of the Slate Material Editor.



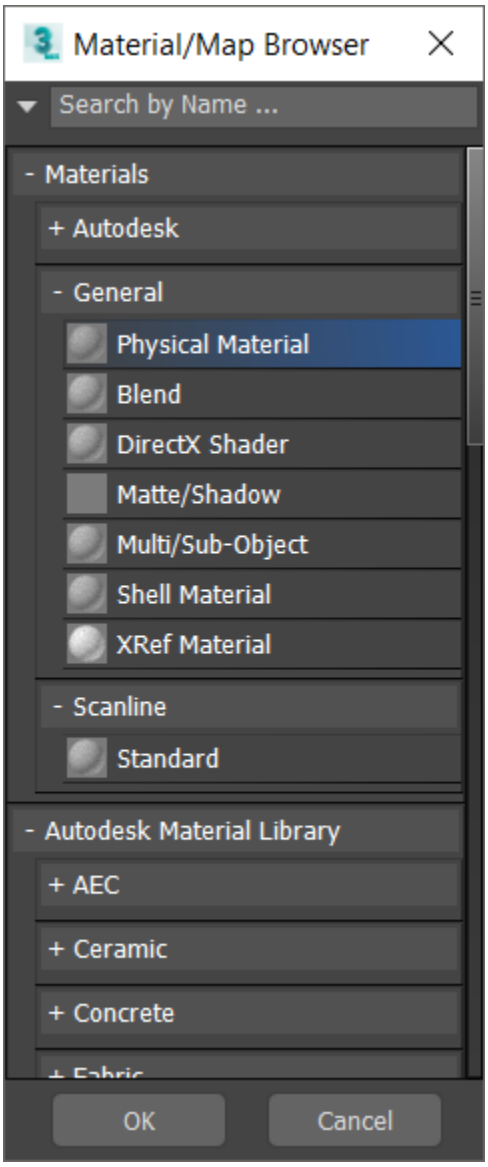
The standard material loaded into the Slate Material Editor

Every material holds a right-click menu where you can **Change the Material/Map type** into another material type.



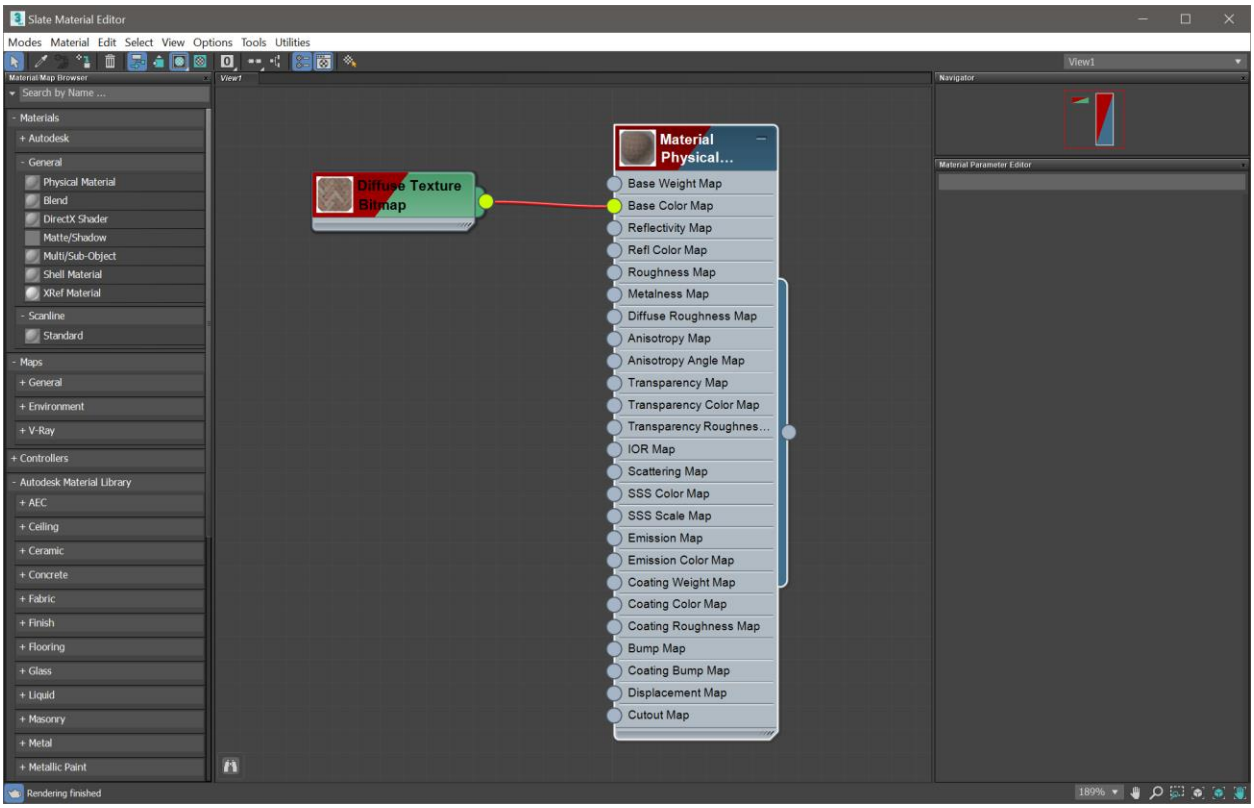
The material right click menu

The Physical Material is part of the General materials roll-out and it might be a best practice to collapse the Autodesk materials category since we're not using them in 3ds Max anymore.



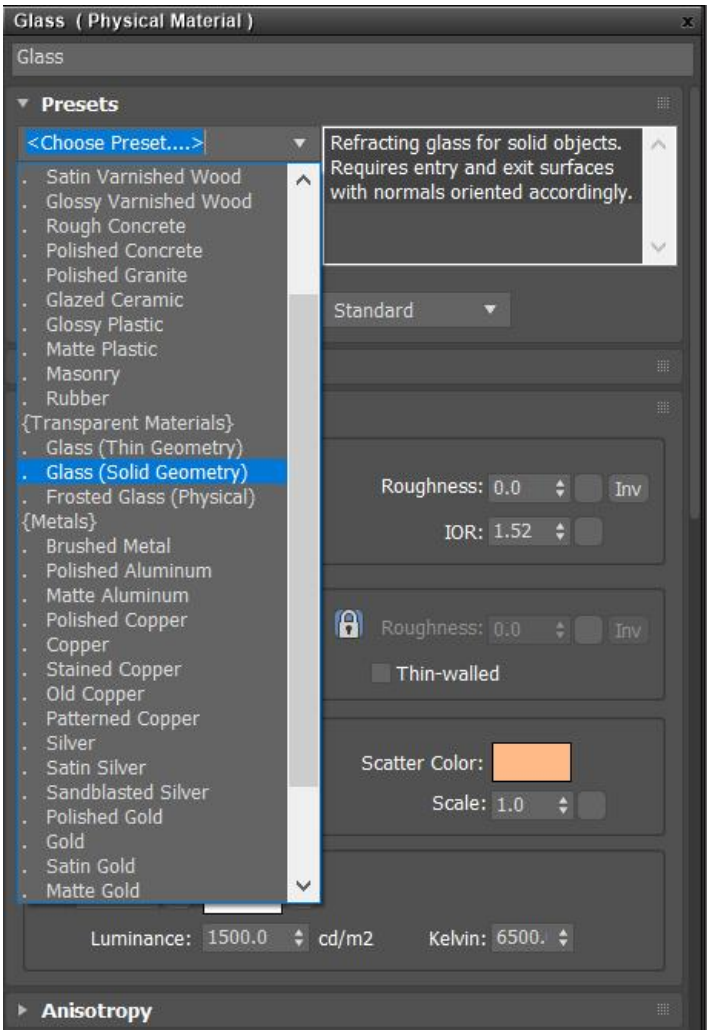
Physical material is the preferred material in 3ds Max

When you change the material type you must double click the material to activate the material and be able to change the belonging parameters in the Parameter Editor.



The standard material manually converted into a Physical material

After changing the standard material into a Physical Material, the material will start with a default grey material. In the Presets roll-out of the Physical Material you can find many good presets which can be used as a starting point.



Many presets are available in the Physical material

The Physical Material consists of four parameters roll-outs only when the Material mode is set to standard. By default, the Basic Parameters are showed.

Base Color and Reflection

Base Color is the color of the object defined in 32-bit RGB color values. If you have any old 8-bit RGB color value, you just can divide this value by 255 to get the corresponding 32-bit value. The **Metalness** value is 0 by a non-metallic material and 1 when it's a metallic material. The **Roughness** parameter controls the amount of roughness of the reflection. A higher roughness yields into a blurrier material like Brushed metal. The amount of reflections is based on the actual **IOR** (Index of Refraction) and the corresponding value for many materials can be found on the internet.

https://pixelandpoly.com/ior.html

Transparency

When a material is transparent you use the **Transparency settings**. 0 means no transparency where a value of 1 creates a full transparent material. The color of the transparency is set by the **transparency color** and not in the Base Color value. If you don't want to have any kind of refraction in your transparent material, you simply activate the Thin-walled option. The **Depth** parameter enables absorption into the material. If the depth is 0.0, a traditional computer graphics model of transparency is used, where light becomes colored at the surface and is not affected by travelling inside the medium. Therefore, the object's thickness has no affect.

Sub-surface scattering and Translucency

This parameter models scattering of light inside the object. Unlike transparency, which makes the object see-through, sub-surface scattering is about transporting light within the material without being able to see through it in any meaningful way. Light is bounced around and different wavelengths are absorbed differently, allowing the light to become colored the further it travels in the material.

Sub-surface Scattering

The Sub-Surface Scattering (SSS) parameter shares its energy with diffuse shading, so increasing its weight fades from normal diffuse shading to shading with SSS. The SSS Color is the color at the surface, essentially the colorization of the entire SSS effect.

The **Depth parameter** defines how deeply light penetrates the object. **Scale** is a pure linear scale to depth that can be texture-mapped, allowing the scale to change across the object. When the depth is 0.0, the shading is effectively identical to pure diffuse shading. The higher the depth, the more light penetrates the object.

The **Scatter Color** parameter defines how light gets tinted as it travels inside the medium. Technically, the depth multiplied by the scale is the *mean free path* of scattering within the medium and the scatter color is an additional scale factor for the red, green and blue paths.

White surface color with Scatter Color=blue, green and red respectively
Generally, red light scatters further than green, which scatters further than blue. For this reason, the default Scatter Color of 1.0, 0.5 and 0.25 is a reasonable starting point.
When **Thin-Walled mode** is enabled, it becomes classic **translucency**. This is because SSS is a volumetric effect and Thin-Walled mode has no volume.

Emission

The Physical Material supports an **emissive** component, additive light on top of other shading. Emission identity is defined by the weight and color multiplied by the luminance and tinted by the Kelvin color temperature (where 6500=white).

Anisotropy

Anisotropy is an effect seen in materials such as brushed metal, where a grain direction gives the visual effect of having a different surface roughness in different directions. Highlights and reflections appear "stretched" in a particular direction.
The **Anisotropy** parameter defines how "stretchy" the effect is. In principle, it is the ratio between the horizontal and vertical roughness values. This means a value of 1.0 is not stretched. The anisotropy effect can be rotated using the Rotation parameter, where 0.0 to 1.0 is a full 360-degree rotation.

Coating

The Physical Material has a feature to coat the material. It acts as a **clear-coat layer** on top of all other shading effects. The coating is always reflective (with the given roughness) and is assumed to be dielectric. Reflectivity is based on the Fresnel equation from the given **Coating IOR**, and reflections are always white. The coating layer can also have differing **roughness** values.

In the real world, when a material is coated there is a certain amount of internal reflections on the *inside* of the coating. This causes light to bounce onto the surface multiple times before escaping, allowing the material's color to have an enhanced effect. An example of this is varnished wood. This effect can be achieved using the **Affect Underlying Color** parameter.

The coating itself can also have a **color**. This is the color of the coating layer's transparency. The coating also has an **Affect Underlying Roughness** parameter. This causes the coating's roughness to influence the underlying layer's roughness, simulating the blurring effect of being seen through the top layer. The Coating parameter also has a **separate bump map**.

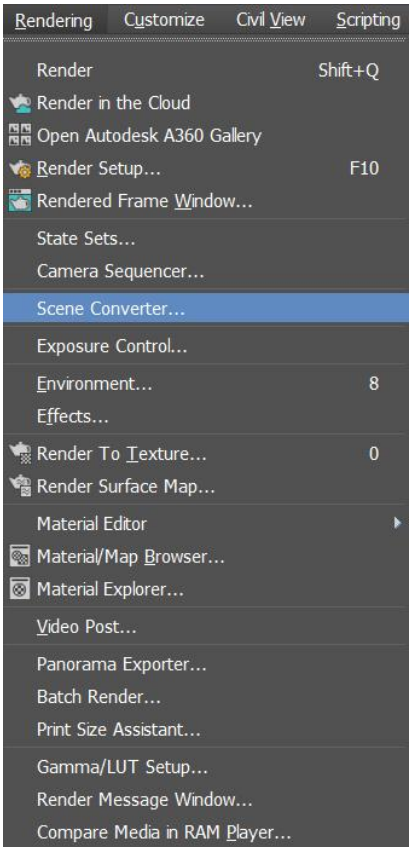
If you want to know more about the Physical Material, there is a very good video tutorial available on the **3ds Max YouTube Learning Channel**.

https://www.youtube.com/watch?v=48YtLmJCPzE

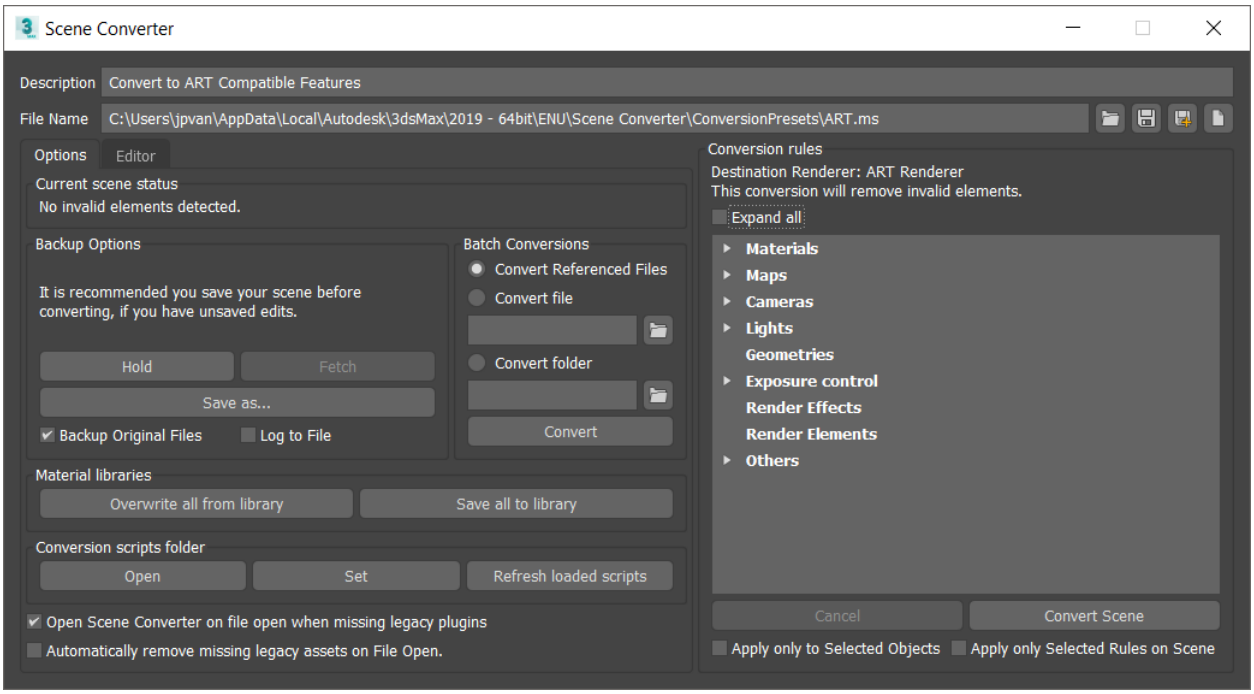
Almost all the Physical material parameters can be controlled by using textures. If you're looking for better textures, you might want to start by using Roughness maps and Normal maps. These kind of texture maps are not being used in InfraWorks. On https://www.textures.com/browse/pbr-materials/114558 you can find an amazing collection of textures which can be used within a Physical Material. After downloading the textures, you want to use you can easily drag them from the Windows File Explorer into the 3ds Max Slate Material Editor. In there you can make the proper connections. Roughness goes into the **Roughness map** of the material; a metallic map goes into the **Metallic map** of the material and the normal map goes into the **Bump map** of the material.

Scene Converter

Besides manually changing your standard materials into Physical Materials you can also benefit from the 3ds Max **Scene Converter** to automate this. The 3ds Max Scene Converter can be found in the 3ds Max **Rendering menu**.

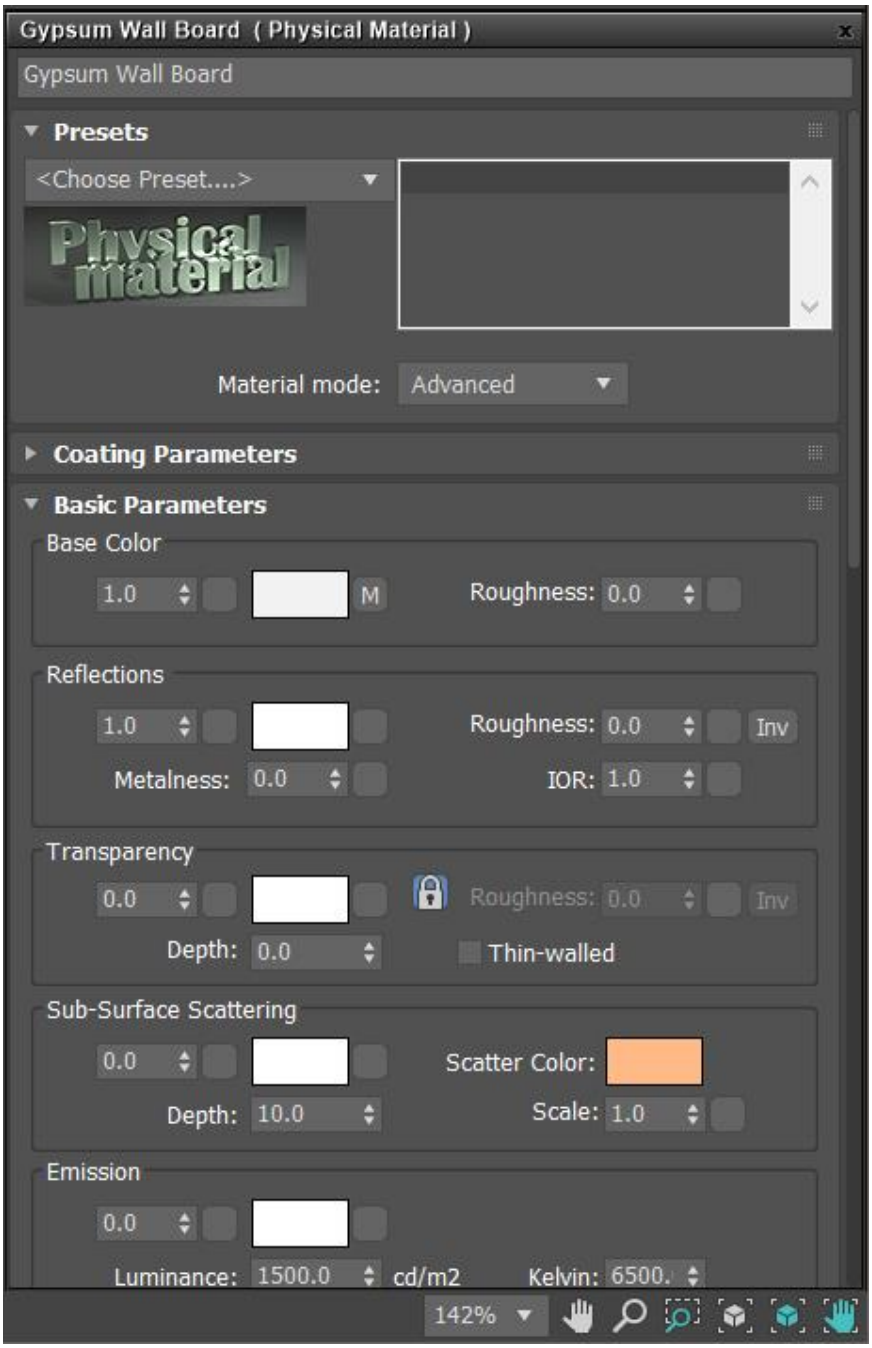


The 3ds Max Scene Converter in the 3ds Max Rendering menu



The Scene Converter dialog box

The 3ds Max Scene Converter makes a Backup of the original 3ds Max file by default and will also remove legacy plug-ins when opening a 3ds Max scene file.



Physical Material mode set to Advanced after utilizing the Scene Converter

3ds Max tools and scripts

VFB+

http://www.monotoneminimal.com/vfb

HDRI

https://hdrihaven.com/

3D Sky

https://3dsky.org/

V-Ray to Arnold scene converter

https://www.masd.dk/arnoldconverter

PBR Textures

https://www.textures.com/browse/pbr-materials/114558

3D Vehicles

https://drive.autodesk.com/de29c9e57/g/shares/SHabee1QT1a327cf2b7a71810583aeae0b86