

AS124410

Using Revit and A360 Rendering for Presentations and Virtual Reality

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Learning Objectives

- Learn how to properly model system and loadable families for rendering and beyond
- Learn how to properly light a model
- Learn to generate various types of visualizations with Revit as well as with the cloud
- Learn to generate renders and panoramas in the cloud and discover how to use them with VR

Description

This class will cover guidelines, best practices, and workflows to capitalize on the time spent modeling in Revit software. Attendees will learn how to generate various types of visualizations that will lead up to rendering in the cloud, and then how to use them for virtual reality (VR). They will learn best practices on proper modeling techniques, workflows, and some of the tools available in the cloud render service. Topics covered will include the various types of visualization available, A360 rendering (what it is and why use it with Revit), what it takes to get a great render, best practices for loadable and system families, light fixture use, setting up scenes, materials overview, preparation of the view, render settings, cloud tools, benefits, and tips and tricks.

Speaker

Victor has been working in the architectural industry for 18 years for small, medium, and large firms in the NYC metro area. After graduating from New York Institute of Technology in Old Westbury, I have worked as a job captain, network administrator, CAD manager, and BIM manager. I am currently a Digital Design Specialist at Gensler's NYC office focusing on BIM as well as visualization, virtual reality, and augmented reality as the Northeast Regions Creative Media leader. I am a Microsoft Certified Professional, and a Revit Architecture and Maya certified professional. I currently teach Revit at LIIT Technical school in Hackensack NJ and have also taught Revit Architecture at the New York School of Interior Design.

Co-Speaker

In 15 years of experience in architecture, Islay has approached each role from designer, project manager, and Digital Design Manager with a focus on integrating innovative design with the

functional and technical requirements specific to each project. Islay has expertise in BIM, digital workflows, and resilient design. Working along the Florida coast from 2002 until 2008 provided exposure to new codes and how those impact our need to build focused on the environment. This work continued at an elevated level during Islay's time in southern coastal states, with a primary focus on rebuilding the city's public realm along with hardened structures for public shelter and for emergency response personal operations to FEMA specifications after Hurricane Katrina. Since she joined Gensler in 2011, Islay has worked as the Digital Design Manager building a team of specialists focusing on researching new technologies and how to best integrate them with the design and delivery processes. Leveraging digital tools allows thought and process development around the performance of design, in addition to the design data created, computational processes, and a shift in the future of how architecture is managed. Islay received Masters of Architecture and Community Design from the University of South Florida in Tampa, FL in 2008 and Bachelors of Architectural Engineering from the University of Southern Mississippi in Hattiesburg, MS, graduating from the Honor's College with the distinctions of Special Honors and Magna Cum Laude in 2001. She is registered as an architect and is certified by the National Council of Architectural Registration Boards, and has Revit certification with Autodesk. In addition to membership in the American Institute of Architects, the New York City Chapter, and the New York City Revit Users Group, Islay has taught at the New York School of Interior Design.

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The Project

Cadillac HQ NYC

Stereo panorama of project on A360

Figure 1: Cadillac Stereo Panorama

What is the Cloud?

Cloud rendering in **A360** takes advantage of virtually infinite computing power to create photorealistic and high-resolution **virtual reality** images in less time than rendering locally.

How and Why: Building on well modeled Revit files means that creating virtual reality scenes is very accessible utilizing Autodesk's cloud rendering service.

Benefits:

- Ease of use
- Speed of rendering the scene using A360 (virtually infinite computing power)
- Intuitive workflow
- Clear communication tool
- Always have up to date renders of your current design
- Quickly generate renders after last minute changes
- No need to remodel or recreate anything because of a different environment (no exporting necessary)
- Ability to share with others
- Universal access – content on smartphones via internet
- Immersive for the client who might not understand space and scale from 2D documentation

Why work this way?

Because doing something twice is wasted effort...



Figure 2: Correct and Continual Monitoring of Phasing Helps File Management

Additional benefits of rendering in the cloud:

- Cloud rendering frees up your system so you can continue to work while the render jobs runs
- Batch render at anytime
- Images are accessible anytime/anywhere and can be placed into a private A360 project for sharing with project teams and clients
- Great for process renders

- Largest image size is 4k x 4k (16 MP)

What does it take to get a great render from Revit?

- Proper modeling of system families i.e.: walls, floors, ceilings, etc.
- Proper modeling of loadable and in-place families i.e.: furniture, specialty equipment, doors, etc.
- Setting view properties like phase filter
- Turning off content you don't want rendered
- Accurate modeling of light fixtures
- Development and application of materials
- Setting the project location and sun settings
- Defining your render settings
- Adjusting exposure and using other settings in the cloud

Interior of a design project: Leveraging VR in the interior spaces of designs helps people understand the first-person point of view through the immersive process. Understanding the human scale of the space is very important for the architects to communicate with the clients during the design stages. At the human scale in VR materials are very close to the viewer meaning that the texture and materiality are experienced in detail. VR also provides a new method for working through design options not only of the designed space but also of the materials and finishes. Within the interior of a space lighting is a critical component, understanding the impact how the lights interact with materiality and geometry is a great feature when working toward a design understanding with clients.

Workflow

Users should spend a little time setting up some things on the frontend. With these settings in place, it will save the user and project team time as the project is being developed.

Views should be set to the proper phase in a project so objects are displayed properly as the team works towards generating visualization content.

We recommend having dedicated views, named according to, and assigned to specific design options. This way users will know which option needs to be active while modeling.



Figure 3: Correct and Continual Monitoring of Phasing Helps File Management

Work in 2D and 3D views simultaneously which helps expedite the building of your model. This makes it easier to adjust objects as needed like soffits for raised ceilings and stair railings once the object is placed. This workflow helps avoid having to constantly searching the browser for views which reduces productivity.

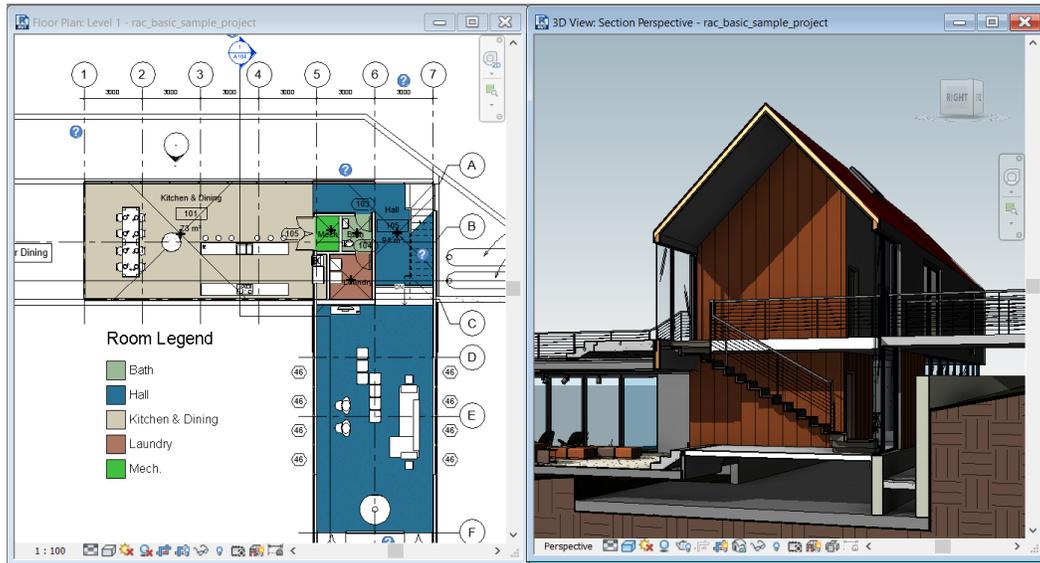


Figure 4: Working in Plan and 3D Together

Make use of the **Selection Box** tool which will quickly create section boxed 3D views of selected objects.

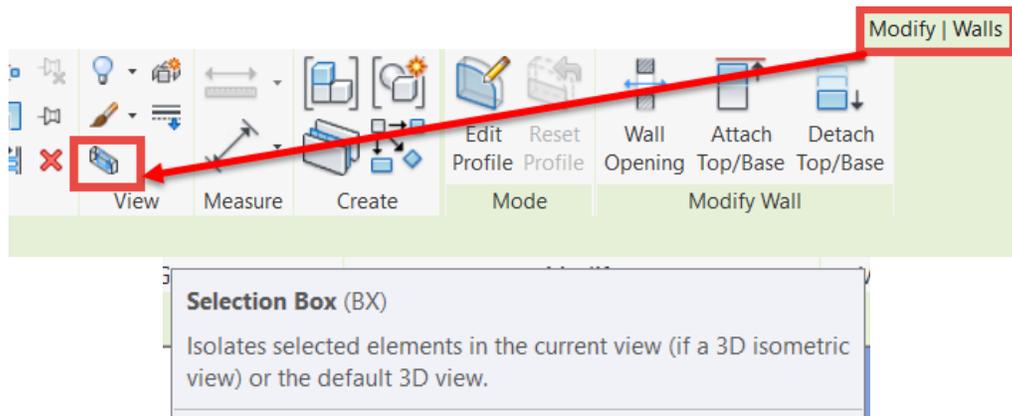


Figure 5: Selection Box Tool Will Isolate only the Selected Elements in a 3D View

Proper Modeling

Getting started with VR scene creation means having a well modeled file, this is especially important since viewers will be immersed in the VR space that will be generated. Geometry, lighting and material details will be close to the viewer and there will be 360 degrees of design to take in. Here are some of the basics that should be considered to save time and ensure a successful workflow.

Best Practices – out of the box (items that can be the same no matter which process used; cloud, GPU, Live, or local CPU).

Proper modeling is the foundation of a good render regardless of your choice of visualization tool. Typical as the saying goes, garbage in, garbage out. We suggest taking the time to model objects properly the first time.

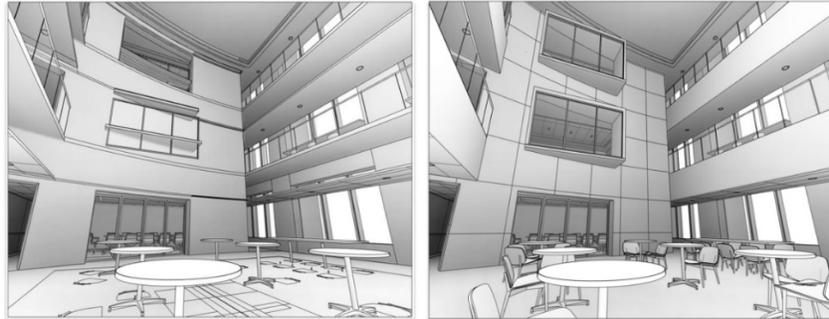


Figure 6: Clean and Aligned Modeling, Before and After

Ensure all geometry such as faces of walls, floor boundary lines and ceilings are aligned as it should be built. Make use of tools that help with this effort such as the Align, Pick Line, and Join Geometry tools.

Always ensure objects are **aligned properly** like the edge of floors to the faces of walls. Use the alignment tool and the pick edge tool to ensure this. Try to avoid tracing things by eye as that usually ends up in misaligned faces. That kind of sloppy modeling can result in artifacts when rendering:

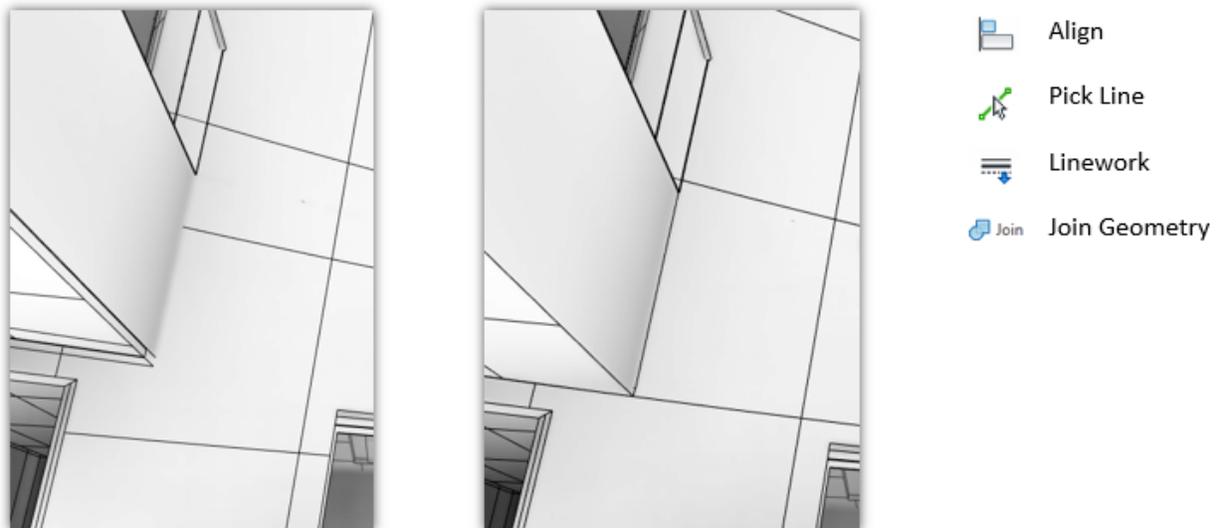


Figure 7: Alignments of Geometry Edges Are Important to Not Distract the Viewer

Verify view settings and make sure you are placing objects on the **correct phase**. Check properties palette settings so objects are placed on the **correct workset**. Have **dedicated views** which makes it easier to place objects on the correct design option as you're modeling. Creating a View Template is a time saver as this could be loaded into a template file for repetitive use to across a team, office or firm.

Remember that redundancy is wasted effort and it's always best to avoid having to do something twice. Clean modelling will also make usage of **view templates** more advantageous so that multiple views can be batch rendered later.

Always **model to 1:1 scale** and how the design would be **built in the field**. That means that each ceiling is its own individual object, not just one giant ceiling for the entire floor. Rendering algorithms are based on real world factors. This will ensure proper light calculations when it comes to things like reflection and glossiness.

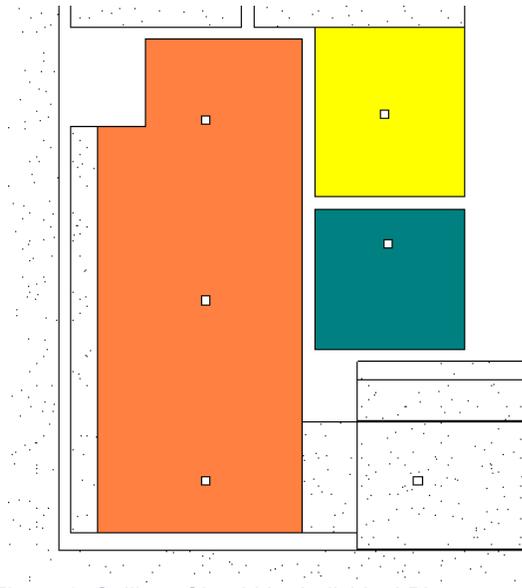


Figure 8: Ceilings Should be Individual Pieces

Avoid any overlapping surfaces, especially if they have different materials, or are different categories. A typical example is a slab and finish floor topping both aligning at the floor level, this will cause flickering in the view.

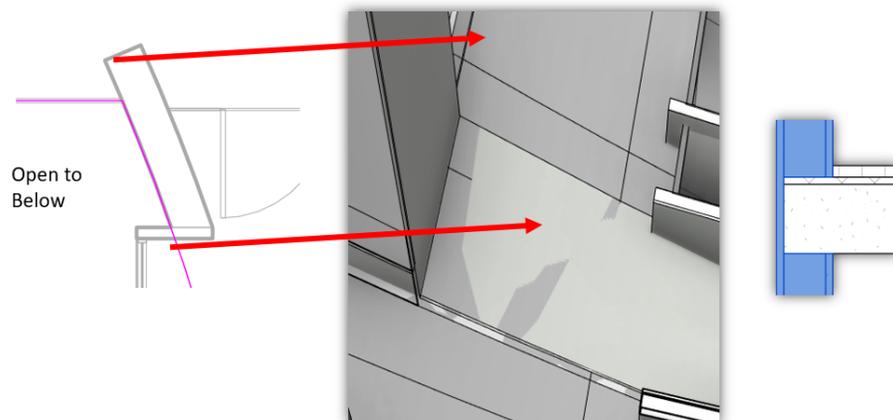


Figure 9: Overlapping Surfaces Can Cause Flicking and Issues When Rendering

Cut holes for Openings in ceilings for columns and use the shaft tool on floors for stairs. Editing elements to have surfaces at the correct construction intersections will create clean

edges. Doing these kinds of things will help bring out more detail in a render making it more realistic.

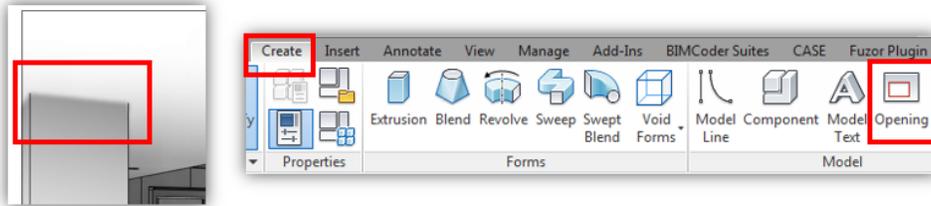


Figure 10: Edges and Intersections Help Views Look Correct

Place objects in the **proper Levels and Z axis**. This ensures proper contact **shadows** and increases the level of detail further. Floating chairs or workstations immediately draws the viewers eye to the issue:

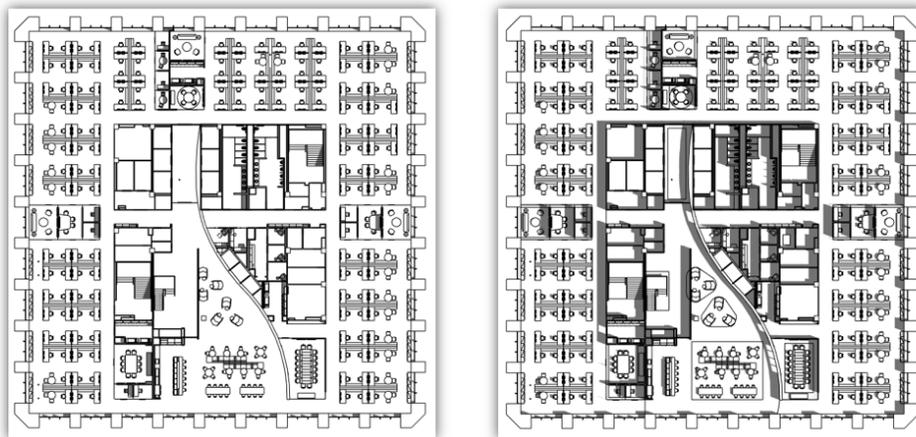


Figure 11: Proper Modeling Is Important For Shadows and Lighting Behavior

Use the **decals** tool to add things like artwork or miscellaneous branding as needed. And don't forget about tools such as **sweeps and reveals**, though use them sparingly as they will impact model performance:

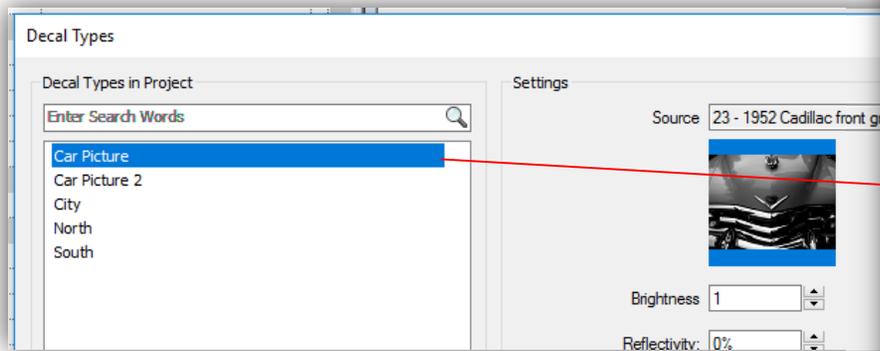
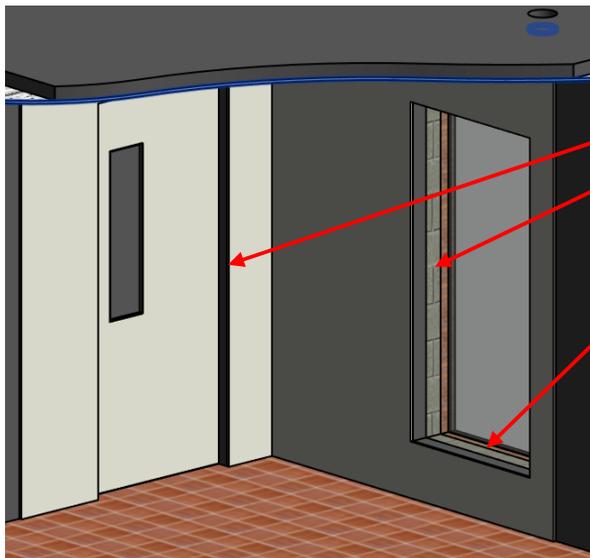


Figure 12: Use Decals to Add Detail

Some families will also result in having to use the paint face tool such in the case of windows in a multi-component wall:



Tip: Cutouts created by some families (Ex: without a modeled frame) sometimes need to have faces painted so that materials show correctly

Figure 13: Use Paint Face Tool at Cutouts

Fill in areas like dropped ceilings in early phases to prevent light leaks.

If a project is missing content due to the stage it's in or because you have a new user working on the model, create visualization content like thick ceilings or floors so a space looks more complete when rendered. Place that content on a **visualization workset** that is off by default:

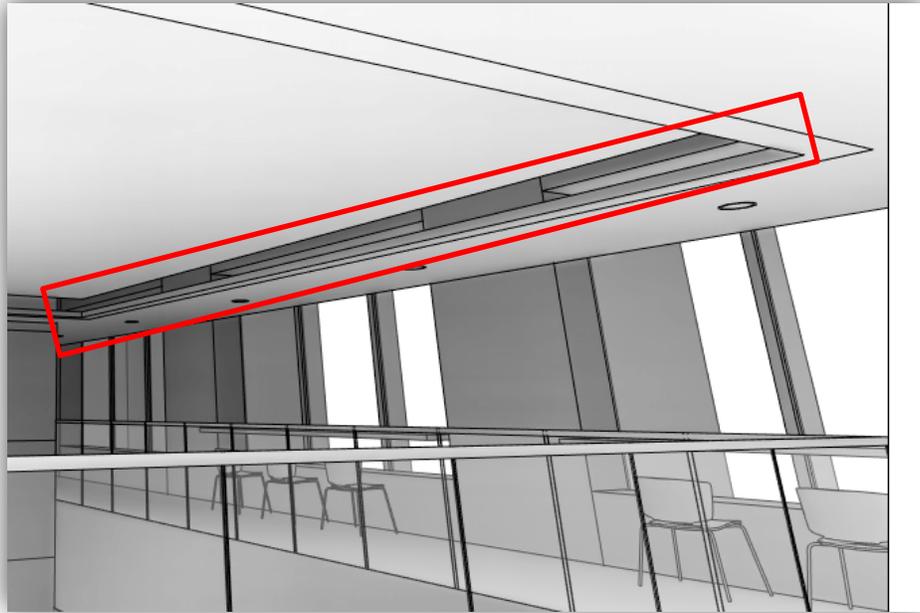


Figure 14: Fill in the Scene

Families

When it comes to setting up system families for renders, there are a few things to keep in mind.

System Families: Multiple materials should almost automatically mean multiple components.

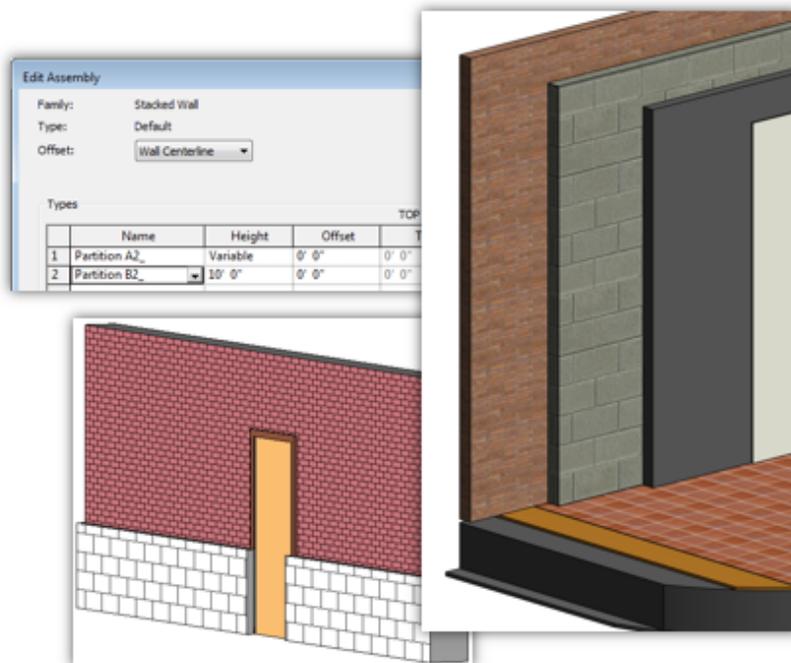


Figure 15: Multiple Materials Means Multiple Components

Make use of tools like Create parts, Split Face, Stacked Walls, and Paint Face tool, though use the latter tool sparingly.

Each material in a system family that is viewable in a render will need a **dedicated component**.

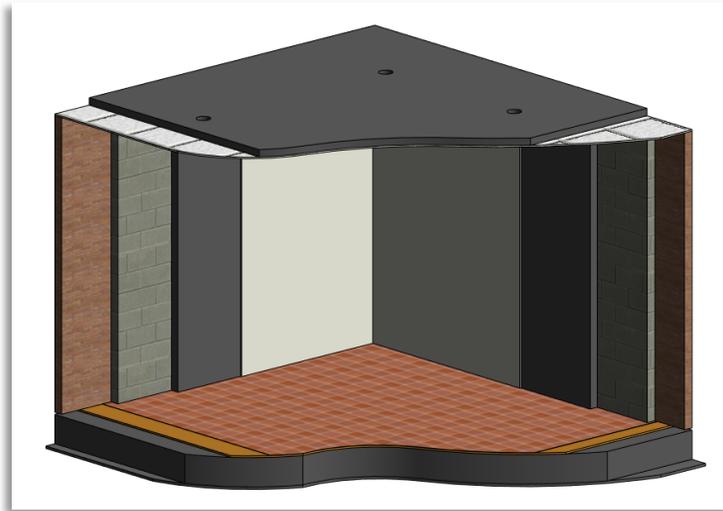


Figure 16: All Visible Components of Systems Families Require Material Assignment

Loadable Families: are a bit more involved. The better your families are created, the smoother the process will be and the better your renders will look.

For best results and a smoother workflow, use Revit **native geometry** which is much easier to work with when rendering. It is possible to make use of SketchUp, Rhino, and DWG files, though it may impede the workflow we are describing if those files are not modeled correctly (Ex: ensure that all objects in a **DWG are set to ByLayer**):

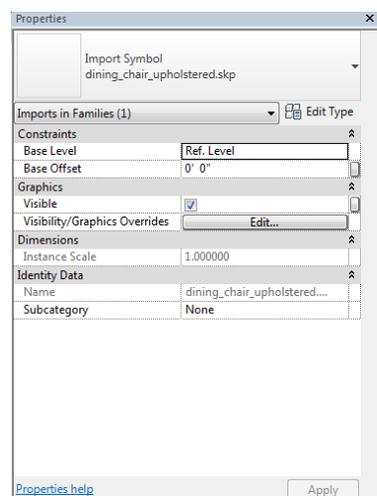


Figure 17: Avoid Non-Native Revit Geometry as Much as Possible

Remember **not to over model**. As the saying goes, less is more. The lighter your families the **faster your renders will complete**. This also translates to a better running model which will save you time in other areas like opening views.

Use tools like pick lines and align to make sure faces line up properly.

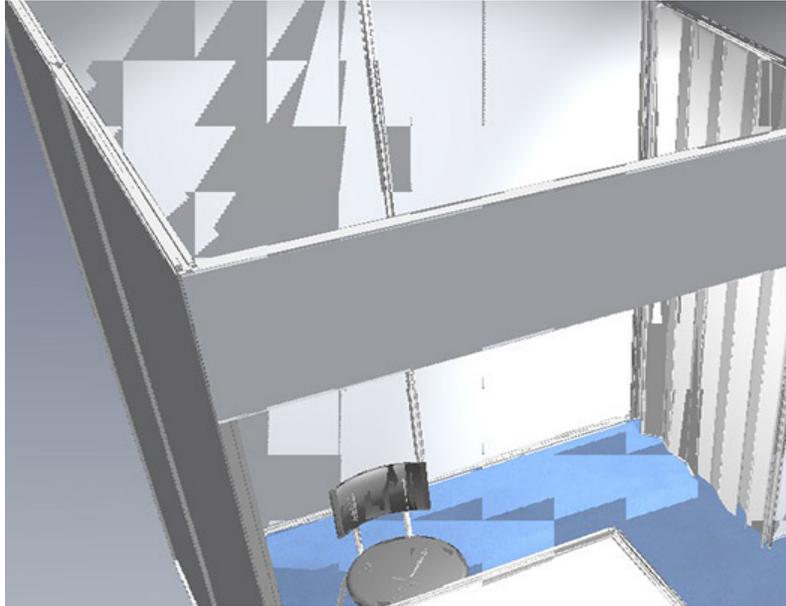


Figure 18: Poor Modeling Results in Artifacts in Renders

For maximum flexibility, ensure that all objects in a family that require a specific material are modeled as separate objects. In this example, there are 6 different materials that make up this single family, so each material requires a separate piece of geometry.

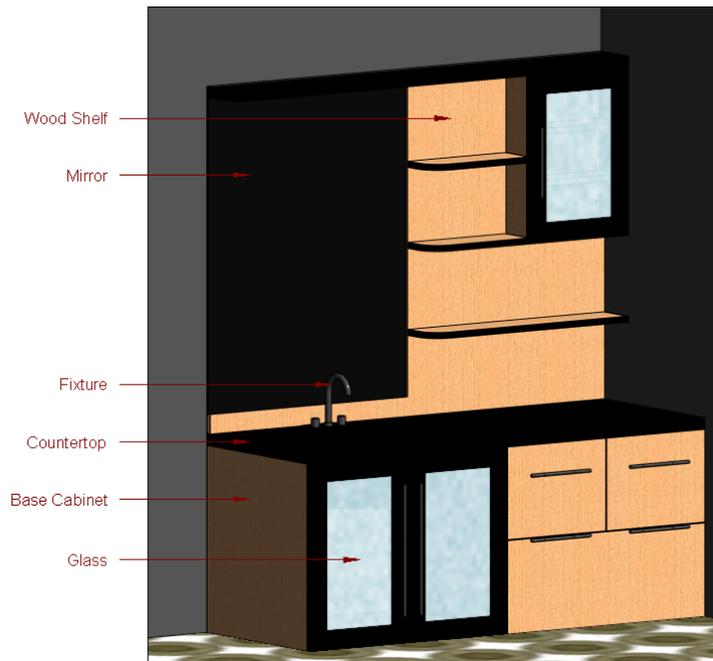


Figure 19: Multiple Materials Means Multiple Pieces of Geometry

Create **nested material parameters** so they can be assigned in the project. An exception would be a family from a manufacturer that only offers their product in let's say red. In that case you don't need to nest your material parameters.

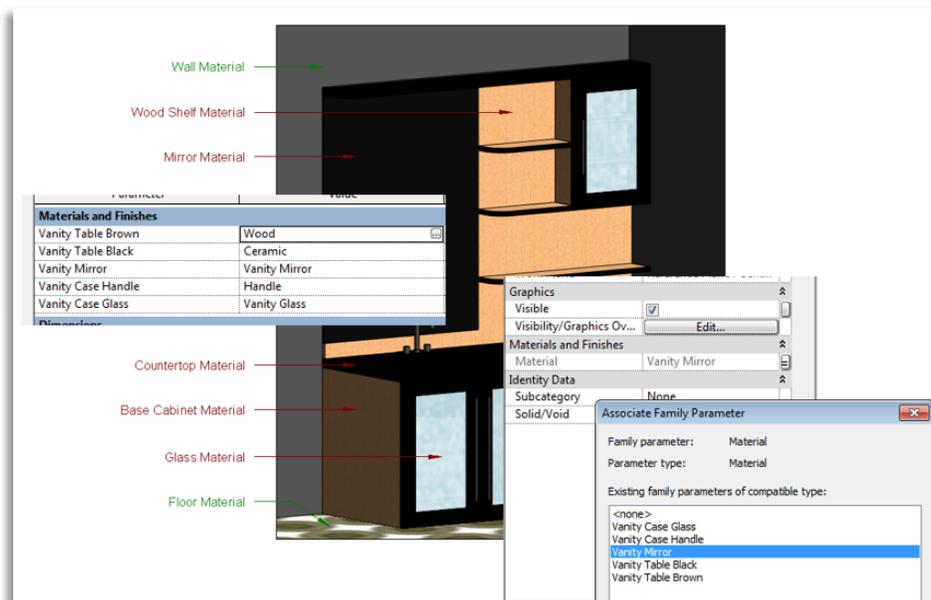


Figure 20: Nest Material Parameters

Tip: It's best to have **multiple family types** in 1 family then to have multiple families for multiple types,, if possible. And always purge your families and save them in the proper project folder before loading them into your project file.

When modeling **In-Place families**, the steps that we covered under loadable families applies. If the family needs to exist in more than 1 place, the family should be modeled as a standard loadable family using the proper template. Avoid copy/pasting In-Place families which will result in multiple individual duplicates of the original family. This means if there are updates in the future multiple In-Place families would require the same edit.

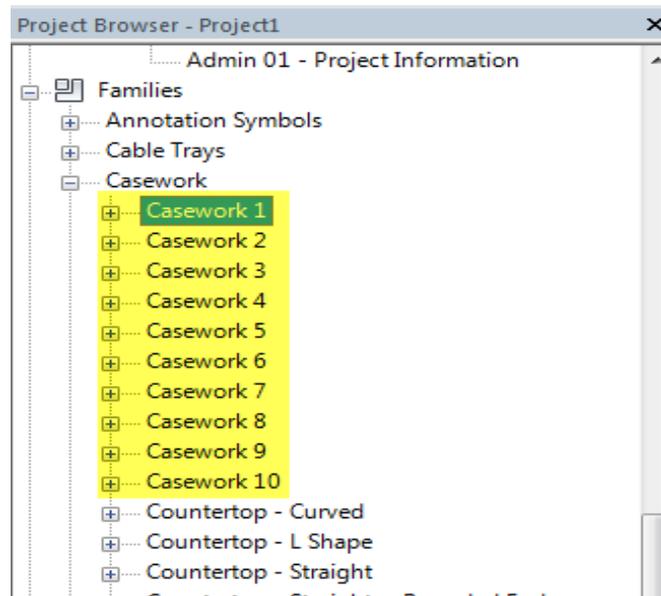


Figure 21: Copied In-Place Families Are Individual Families and Not Multi-Selectable

In general, InPlace families should only be used for one of a kind conditions or for complex system families:

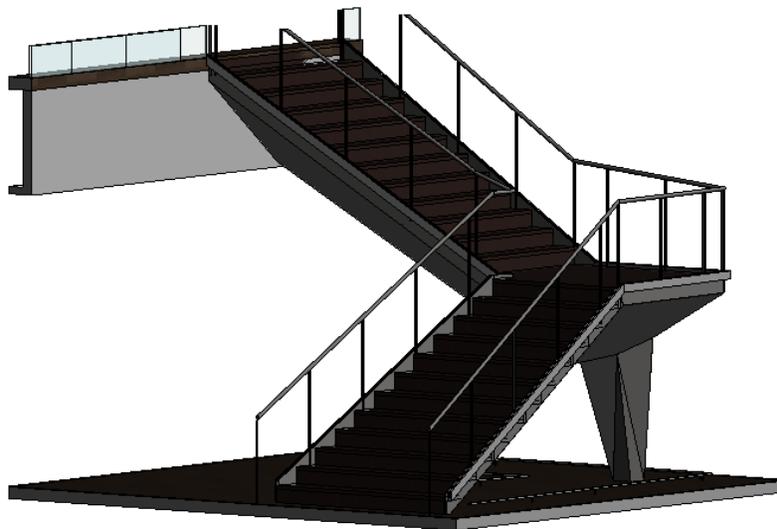


Figure 22: InPlace Families for Unique One-Off Design Pieces

Maximize Materials

Some materials have properties like weathering and relief maps, some can use reflectivity and bump maps and it's useful to know how each parameter renders differently:

Category: Material Parameter

- Ceramics: Finish Bumps and Relief Pattern
- Concrete: Bump
- Fabrics: Bump
- Flooring: Bump (Terrazzo), Finish Bump (Vinyl)
- Gas: Bump
- Glass: Bump (Glass Brick), Relief Pattern (Glass Matte, Glass Frosted)
- Insulation: Bump
- Masonry: Relief Pattern (Brick), Finish Bumps & Weathering
- Metal: Relief Pattern (Aluminum), Bump (Chrome)
- Misc: Render, Beige, Smooth (Finish Bumps & Weathering), Bump (Asphalt Shingle)
- Plaster: Bump (Plaster)
- Plastic: Finish Bumps and Relief Pattern (Acrylic)
- Stone: Finish Bumps and Relief Pattern (Stone), Bump (Rubble)
- Tile: Finish Bumps and Relief Pattern (Tile, Porcelain), Finish Bumps & Weathering (Ceramic Tile)
- Woods: Bump (Walnut), Relief Pattern (Pine, Scots)

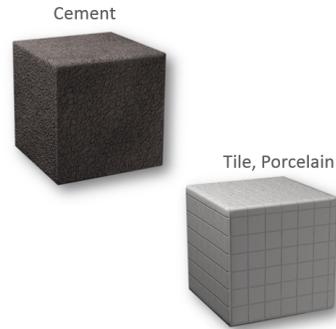


Figure 23: Know Which Parameters are Available in Each Material Type

As an example, this slide shows the difference between a bump map and a relief map when rendered using the same base image. Relief patterns (most woods) are similar to embossing (darker areas in a B & W image) and result in shade and highlights:

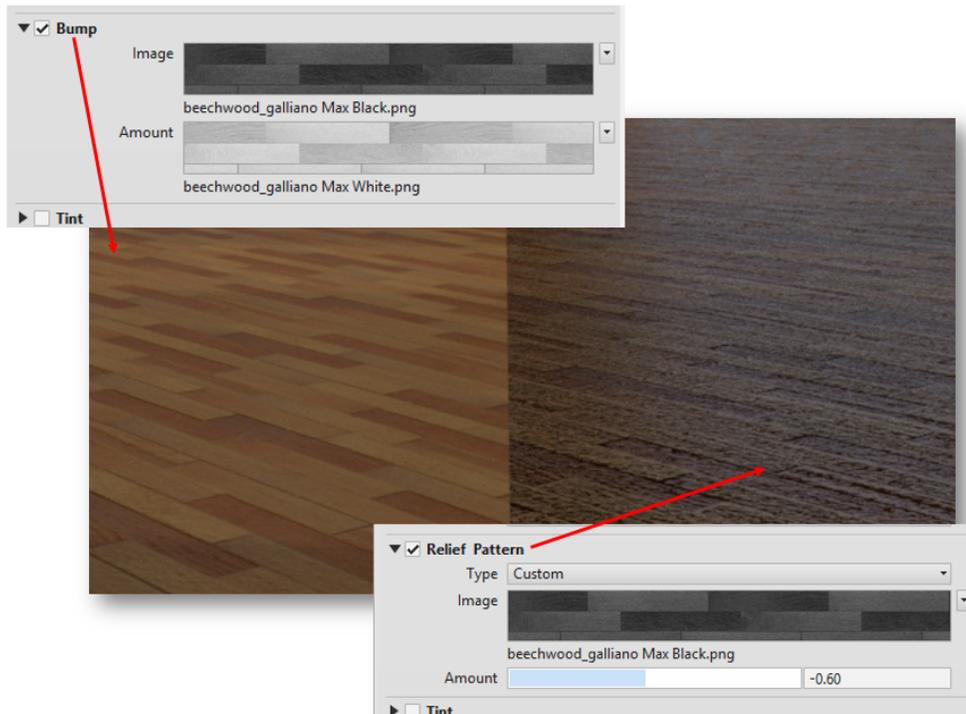


Figure 24: Know Your Material Parameters

A bump map simulates a bumpy or irregular surface and should be a black and white image at least 512 by 480 pixels (darker colors, the greater the bump; use map or slider to control amount).

When utilizing maps for reflectivity and glossiness, remember that lighter colors render more opaque and darker shades more transparent. Grey and colors will result in partial transparency. For a sharper result use a B&W image, white areas will be 100% opaque and black areas 100% transparent.

Use a single asset applied to multiple materials if there is a need to make use of various surface or cut patterns:

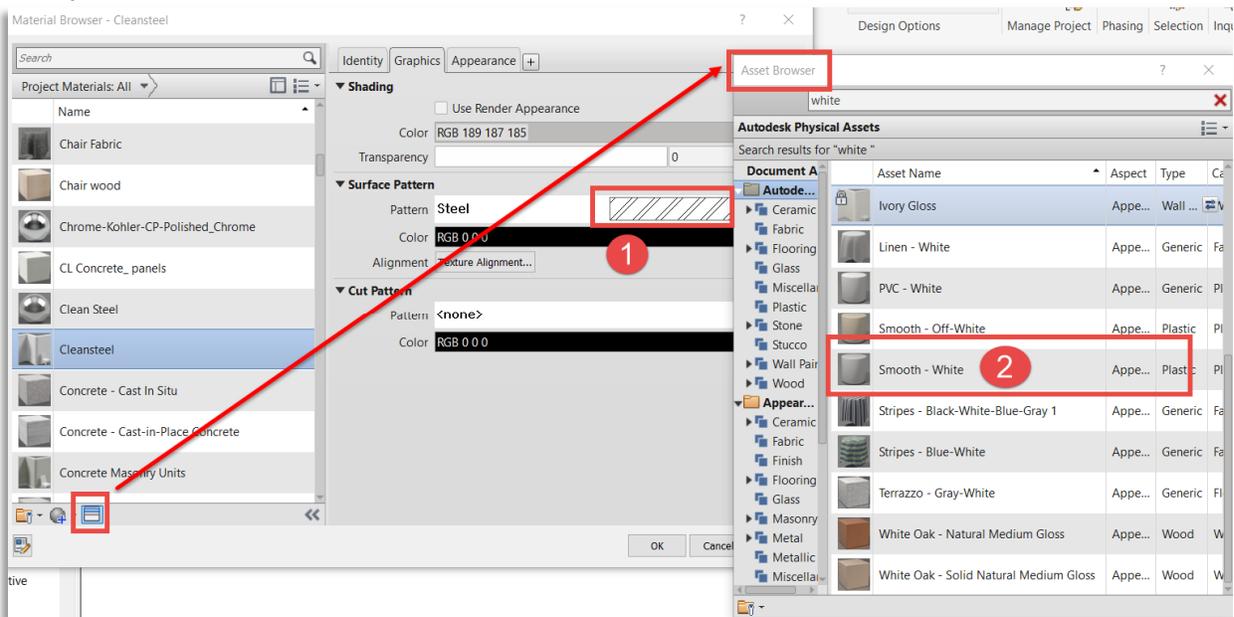


Figure 25: Material Assets Help Manage Dual Functionality

Tip: White model renders can be generated by applying an asset set to white to multiple materials if you need varying surface patterns. This way you can still get ACT or Gyp BD patterns to appear while still being able to render out a white model at any given time. More on this later

Make use of the Cutouts parameter to avoid heavy modeling for detailed objects:

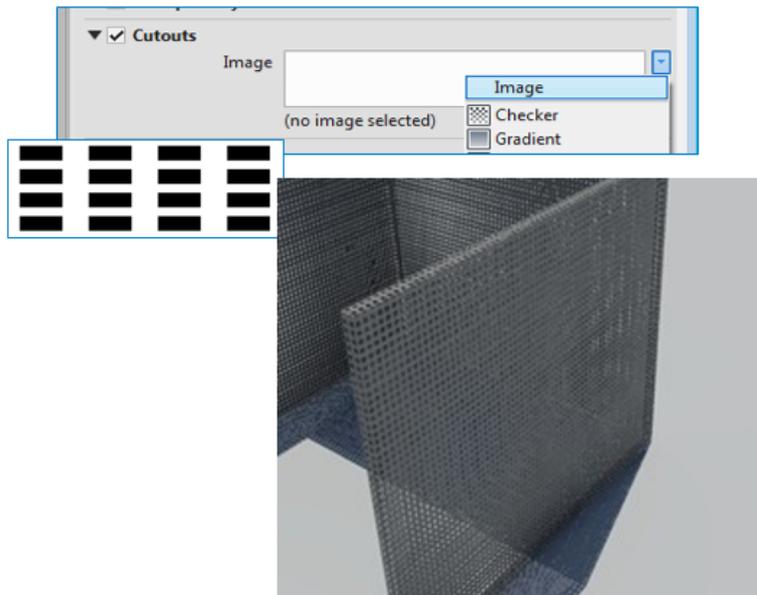


Figure 26: Use Cutout Parameter to Avoid Heavy Modeling

MATERIAL LIBRARIES

We've heard that choosing materials from the AEC library are the best way to go when selecting materials, but in our experience, it comes down to the functionality you are looking for. Most of the time we select materials from the AEC library, but if you don't require the analytical properties for a material, you can either choose from the Autodesk library or simply create a new material from scratch.

Have a material sample file for reference ready for users to look at. This will help them pick the material they are looking for faster the first time.

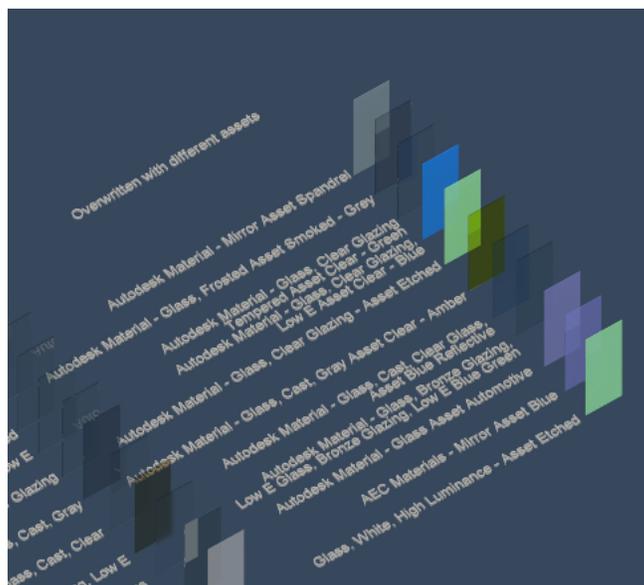


Figure 27: Material Render Sample File

Tip: Have a material naming convention established. This will help make material assignment and organization easier when bringing your Revit model into MAX, Stingray, or other VR developer tools.

Maximize Parameters: Make use of all **available parameters** by assigning images. There is quite a difference between applying an image for the color and no other parameters, and applying an image for the color and a B & W image to the other parameters:

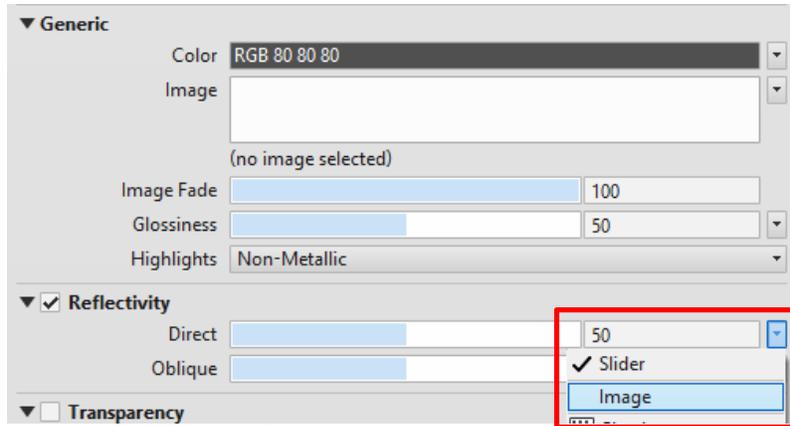


Figure 28: Assigning Maps

Review the tooltips for each parameter if you aren't sure what it controls, and test, test, test! (tool tips must be on in Revit options):



Figure 29: Read Tool Tips

A sample material used in our project:

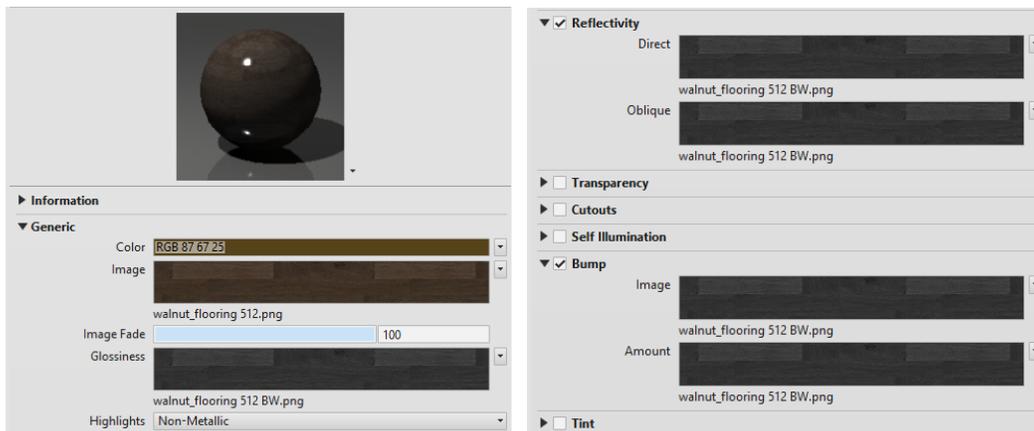


Figure 30: Maximize Material Parameters with Maps

Make sure all custom materials are placed on a network share so that all team members can render the model when needed:

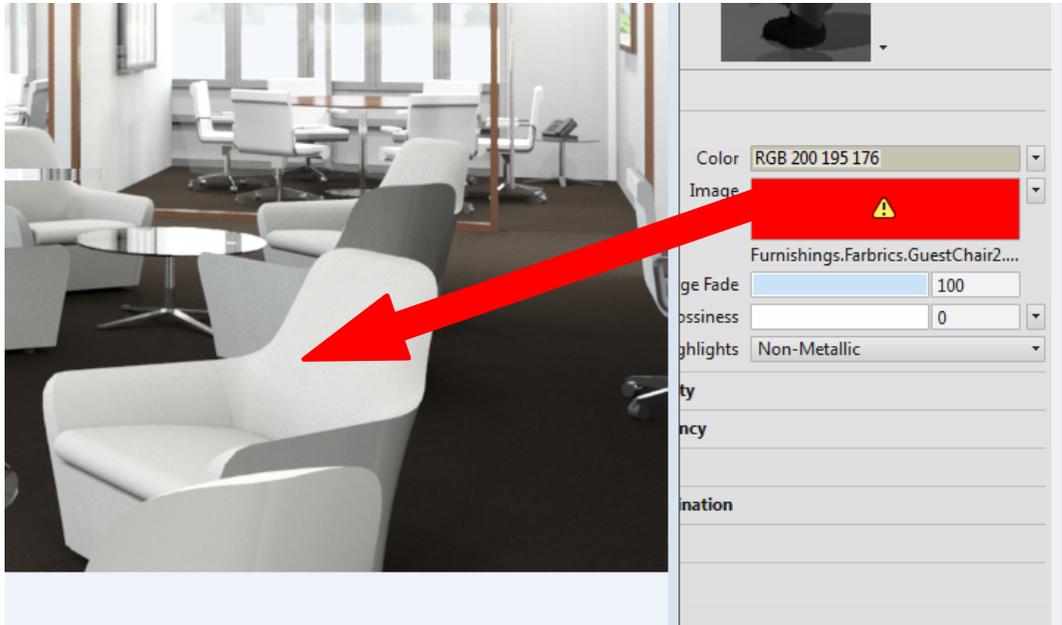


Figure 31: Save Custom Maps on a Network Share

Make sure you use **TILE-ABLE IMAGES** for your materials. That will make a huge difference in the quality of the render. There are lots of Photoshop tutorials on the web that will walk you through the process.



Figure 32: Tile-able Maps

Save your materials to a library to share it or use for future project work:

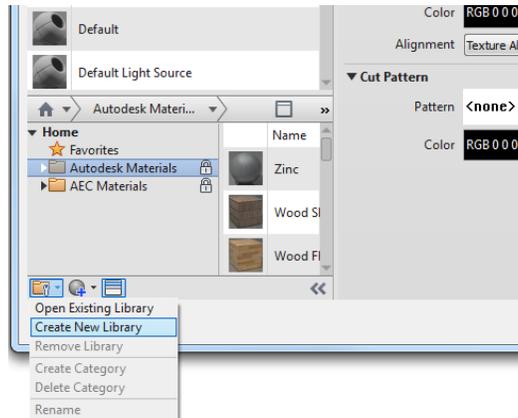


Figure 33: Save Custom Maps on a Network Share

TIP: Do not render pure white or pure black.

TIP: All materials reflect light, which varies, but not all materials have glossiness. Materials that do not have glossiness are materials like carpets, ACT, gypsum board, or matte materials.

TIP: Use the Paint Faces tool to add further detail to the edge of an object, like a glass edge or a wooden deck.

Lighting

Lighting is one of the trickiest parts to achieving a nice render. As with any visualization software, it's not so much about rendering it 100% true to life, as it is about rendering it for that wow factor. Part of our workflow involves using lights in a way they aren't intended to be used, just so the client gets a better feel for the space. In some cases, we do not have a lighting design, so we place **fill lights** as needed to brighten up the space. Those lights are placed on a **visualization workset**, so they don't show up in RCP's or any views we are running lighting analysis on.



Figure 34: Before and After Editing Lights

Proper Light Modeling

Light fixture modeling of light families is super important. Basically, what was covered with **loadable families** applies to lights with a few caveats:

- Less is more. The fewer parts (fewer faces) in a family, the lighter the model. This will result in faster render times and overall higher performance
- For best results, use only Revit geometry in families
- Make sure all faces of geometry are aligned that need to be and avoid any overlapping surfaces, especially if they will have different materials
- Do not over model. There is no need to model every single part of a family if the family is not going to be extremely close up in a render
- Use the opening tool in your family if your family needs to cut a wall, floor, or ceiling
- Always model to real world scale
- Use the AEC material library when creating materials
- Assign material parameters to all parts of the family
- Multiple materials require multiple pieces of geometry (housing, lens, brackets, etc.)
- Always purge families before loading into your project

You want to keep your families as light as possible and cleanly built with controls to manage the light direction, intensity, and color via nested parameters.

Make sure your **light source is placed and locked at the proper locations** so that your lights look more realistic in your render. Place them just below the designed geometric enclosure and make sure they are not obstructed. If they are placed within solid geometry, no light will be emitted, and your renderings will come out black or way too dark.

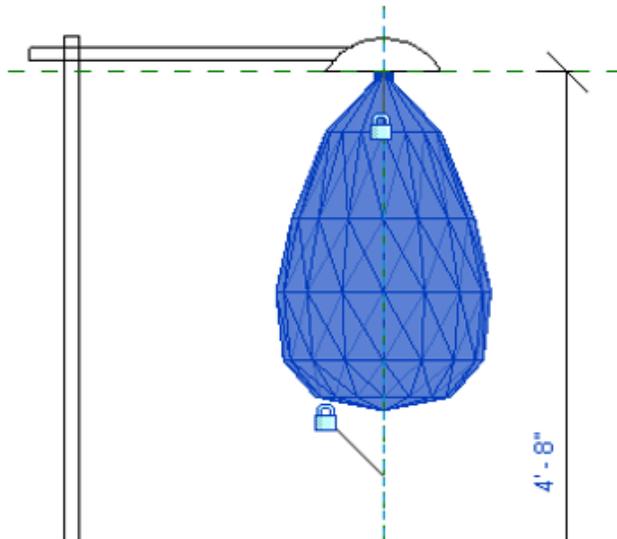


Figure 35: Light Source Should be Placed Just Below Geometry

Model and assign a material to the **lens/bulb geometry** of the light fixture and turn on the Self Illumination parameter. This will appear to render your lights on. We typically use the Glass, **White, High Luminance AEC material** for this and set it to a **value of 10,000** or higher to achieve a glow when rendered.

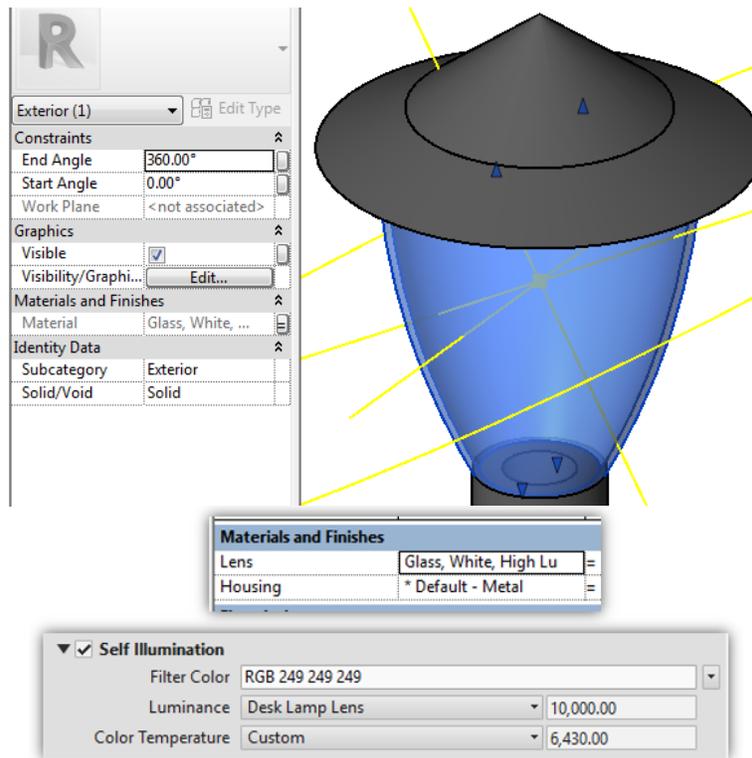


Figure 36: Self Illumination Parameters

Adjust the light source shape to match the kind of light you are using. Choose the Photometric Web option to get access to the Photometric Web file parameter to choose an IES file:

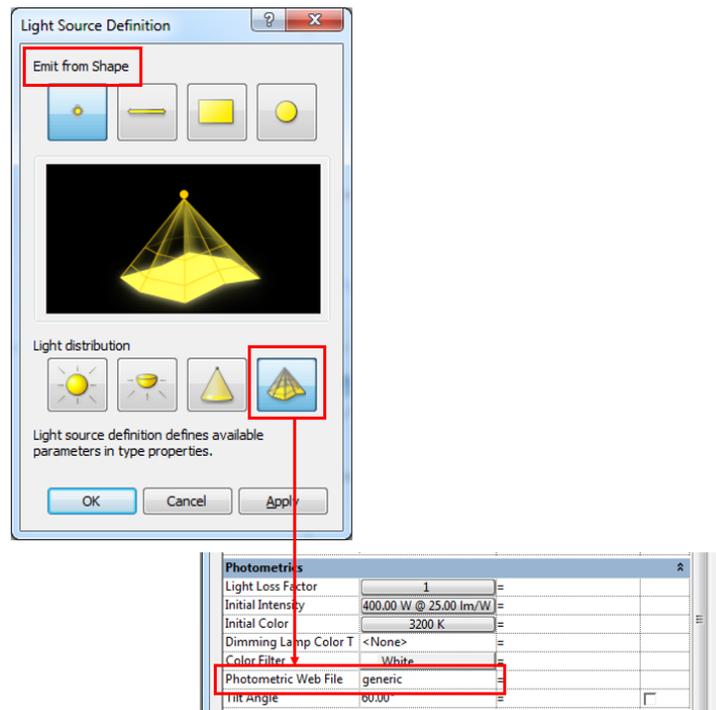


Figure 37: Light Source Shape and Photometric Web File Parameter

When it comes to settings, we typically use wattage and set the **efficacy between 3x to 4x the wattage**. So, if we have a **60-watt light fixture the efficacy will get set to between 180 to 240**. This is to ensure your lights aren't too bright at the point they emit from, and it helps to spread the light in the space.

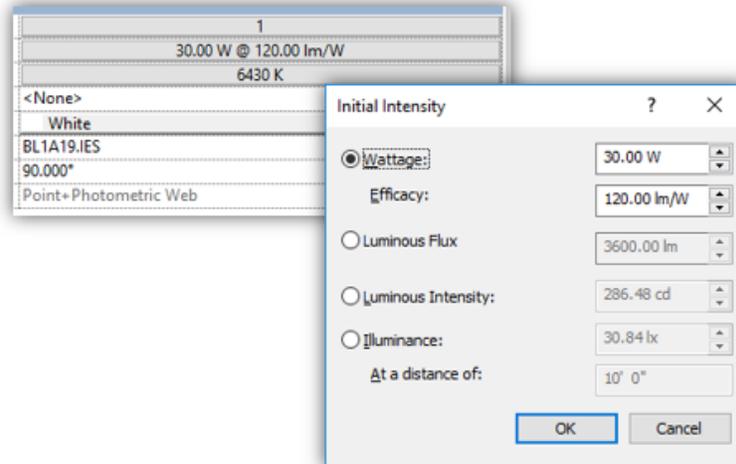


Figure 38: Set Light Intensity

Tip: According to Revit help, Luminous Flux provides more accurate lighting in rendered images over Wattage and Efficacy. The difference is noticeable. Wattage is a bit sharper and luminous is a softer overall light when rendered.

Rendering using the fluorescent (Daylight) setting will render the materials closer to what you have specified. After verifying the materials, try rendering with different color temperatures as light is never truly 100% white. A different color temperature may add additional realism to your render:

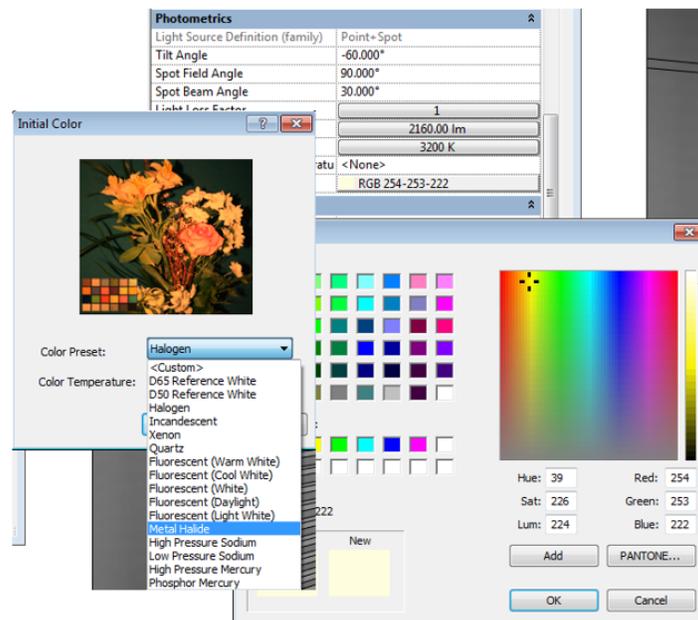


Figure 39: Light Type and Presets

Sample color temperature values:

Light Type	Color Temperature
High Pressure Sodium	1800 ° K
Sunlight, evening	2000 ° K
Incandescent	2400 ° K - 2800 ° K
Florescent (Warm), LED Lamps	3100 ° K
Studio Lamps and Photofloods	3200 ° K
Metal Halide	4000 ° K
Florescent (Cool)	4100 ° K – 5000 ° K
Florescent (Cool)	4100 ° K
Sunlight (Noon, Clear Sky)	5600 °K
Xenon Short-Arc Lamp	6200 ° K
Sunlight (Overcast)	6500 ° K
Monitors and Screens	6500 ° K-9300 ° K

Figure 40: Color Temperature Values

Use Light Groups as a broad way to control your lights. Groups will allow you to dim and/or turn on or off multiple lights at once. Turn off lights you don't need to see rendered. Groups also help control amount of rendering power needed resulting in faster renders:

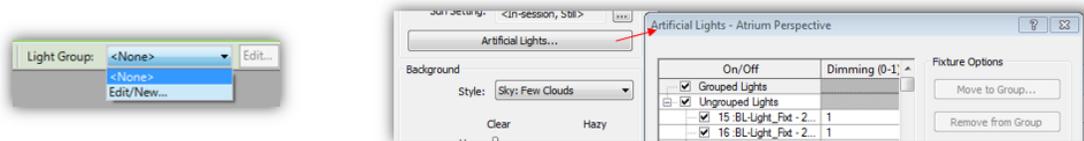


Figure 41: Light Groups Control

Industry Standards Regarding Lighting

Autodesk recommends using **IES files** which can be obtained from most lighting manufacturers. If an IES file is not provided, you can use one that is as close to the lighting specs as possible. It is even possible to create your own custom IES file and there are some tutorials on the web if you search for them.

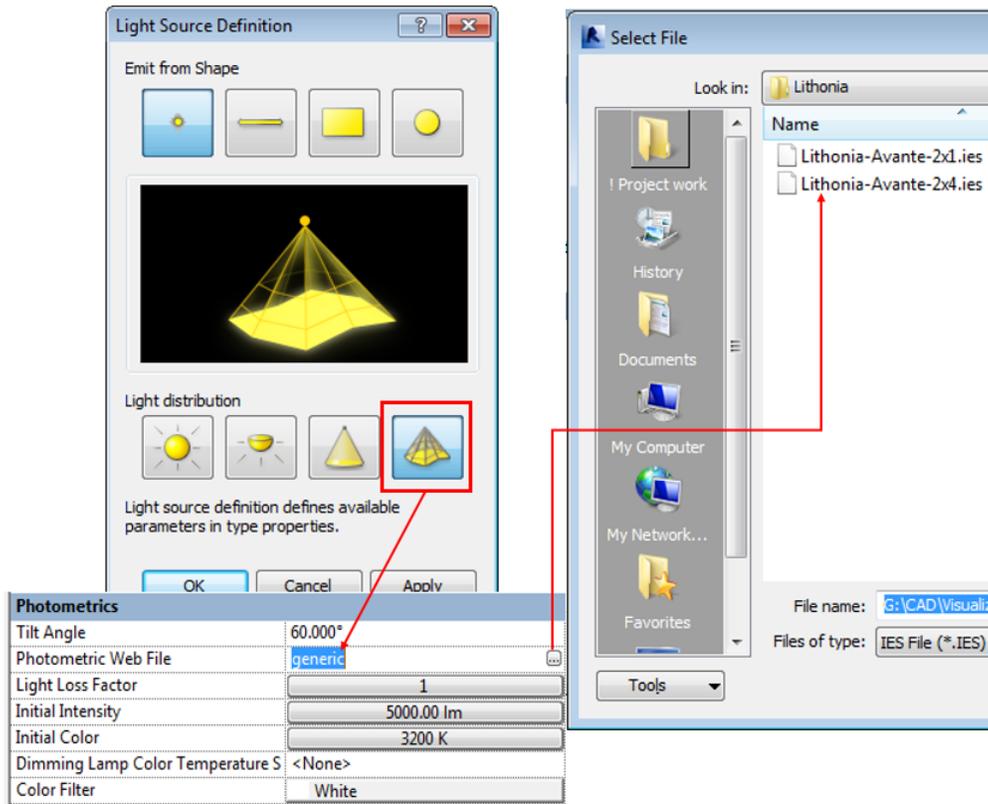


Figure 42: IES and Photometric Files Link Specific Data to Revit Light Source

You can use a free IES file viewer to see how the IES file will render:

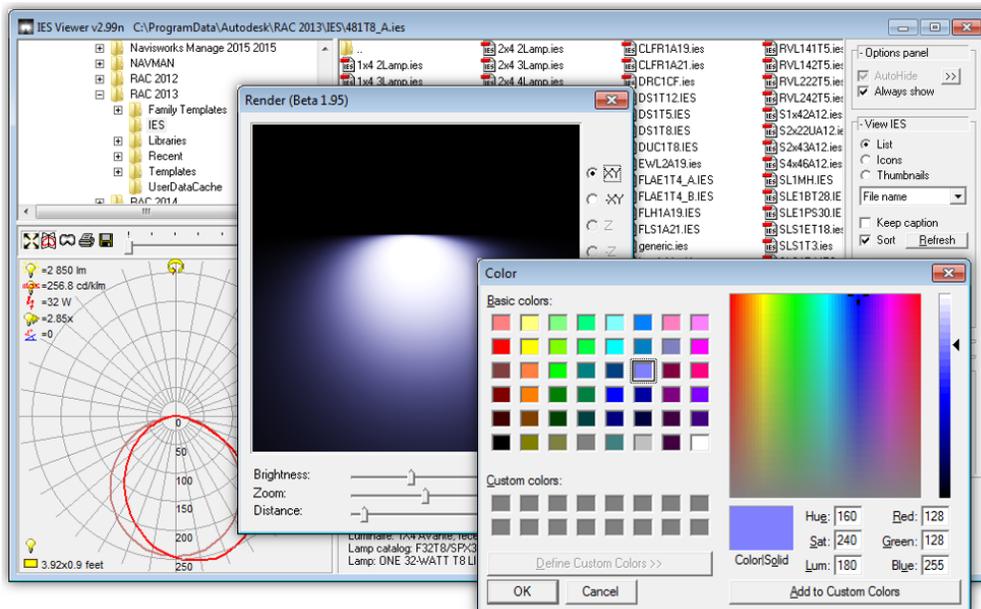


Figure 43: Free IES Viewer for IES Files

<http://www.photometricviewer.com/>

Build an Environment

Entourage families help bring out additional detail. Content should be placed on a separate workset. Don't bloat your project file with too much fluff. Some of it can be added in post processing if needed.



Figure 44: Adding Entourage

There are a couple of ways to set up an environment in your model so it appears in your render. One way is to create walls and then assign a **material with a mapped image** to it or create and apply decals to those walls. By adding a custom environment you're adding more realism and detail to the renders which will improve the overall quality:

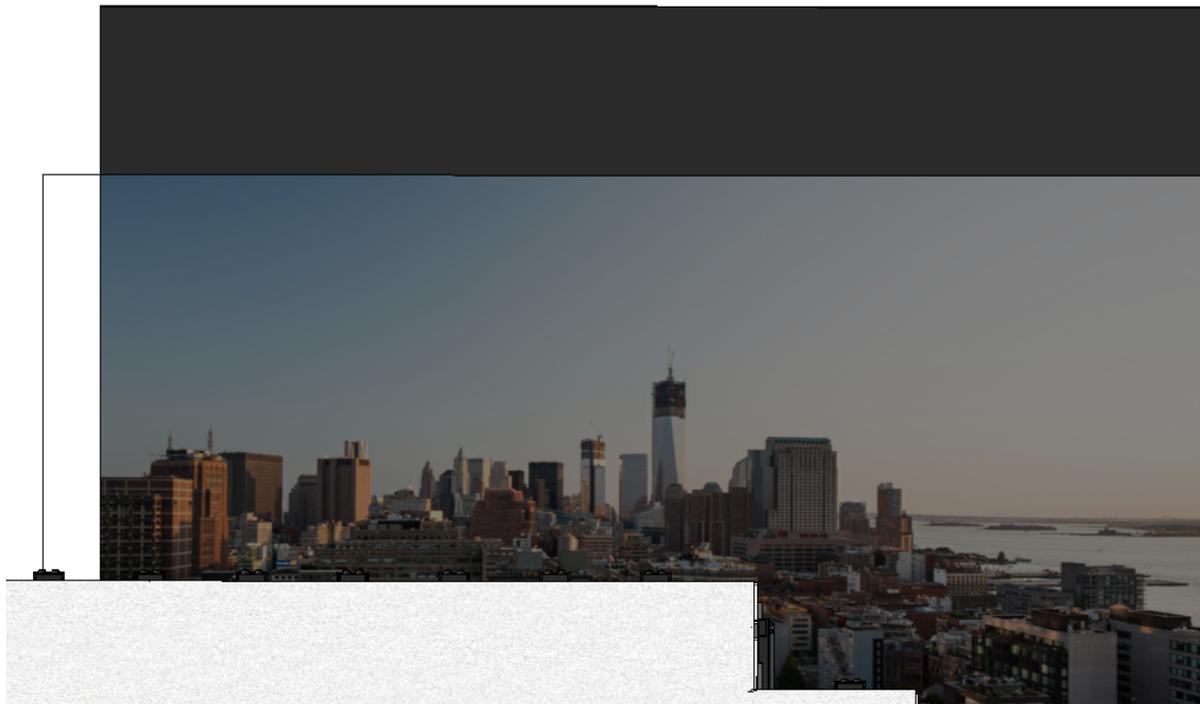


Figure 45: Custom Environment

Tip: Blur the background image so when it renders, it is slightly out of focus.

Choose a custom background either in the render settings dialog or in the Background area in Graphic Display Options window:

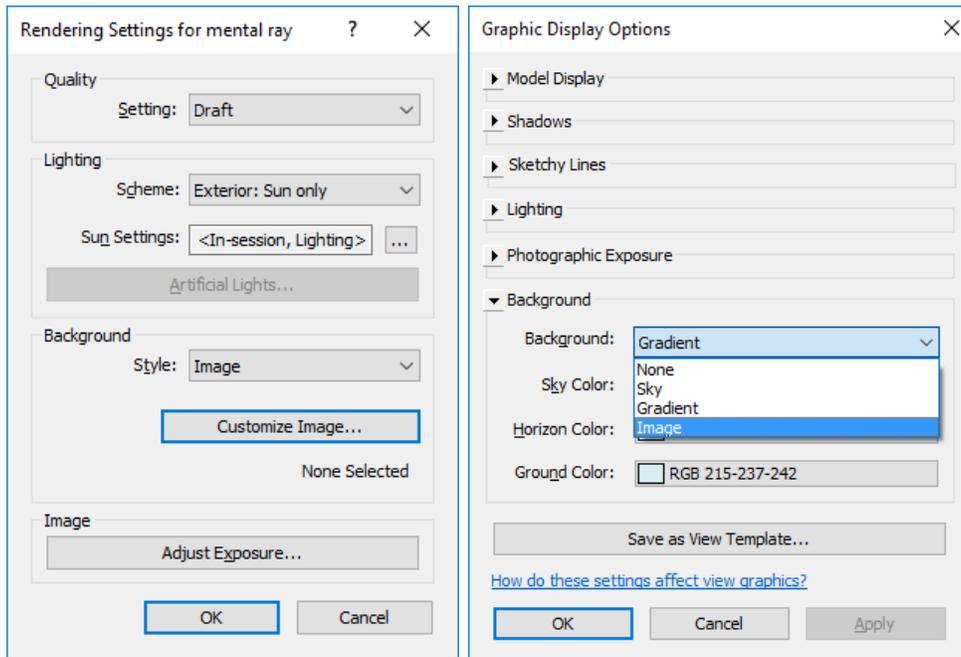


Figure 46: Customize Your Background

Note that applying a background image for either option is only for still renders, not for panos.

There are also some **preset environments** available in the cloud that can be used in your renders as well. We will look at those settings and how to use them a bit later when we cover the tools in **A360 cloud rendering**.

Set a date, time of day, and ground plane level to get realistic shadows:

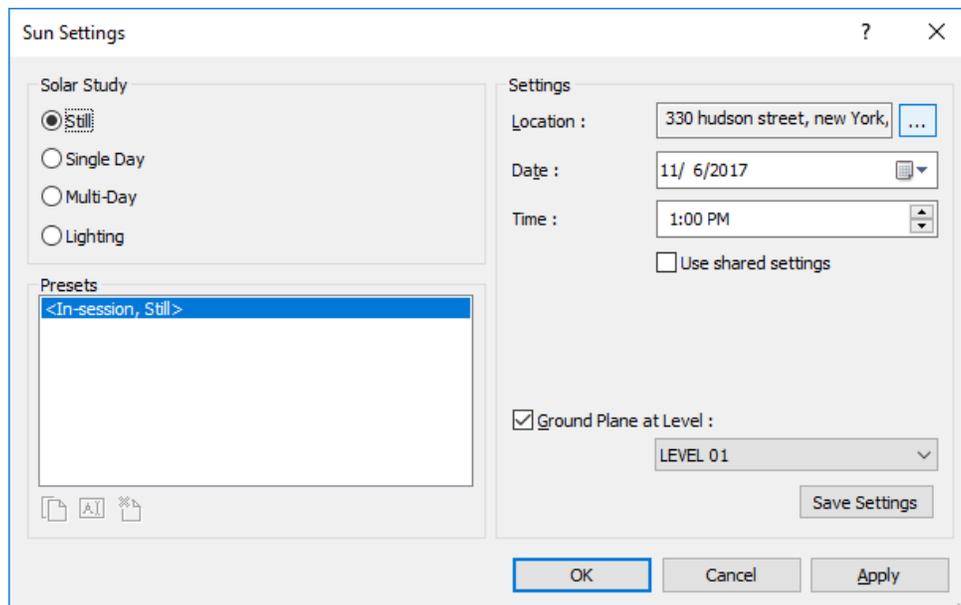


Figure 47: Set Date, Time and Ground Plane

Entering real world coordinates to set the true north project location in your Revit model will result in more accurate shadows should you be doing shadow/solar studies and/or illuminance renders:

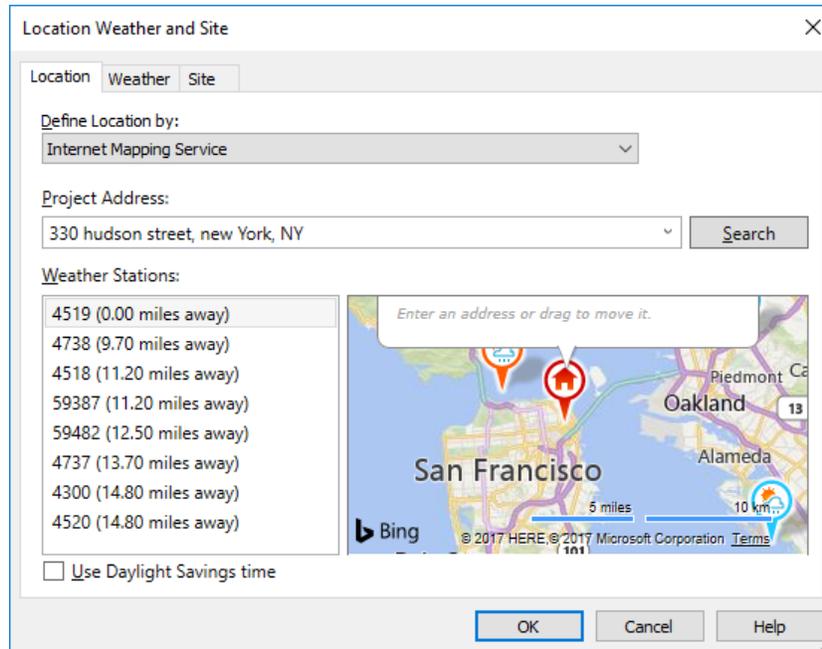


Figure 48: Location Settings Dialog

View Creation

Create a **3D camera view**. Placing a Revit Camera requires thought, you want to place the camera in a location, where there is interesting design surrounding the viewer.

Create A View

- Place your camera
- Geometrical Composition Guides...
- Adjust camera elevation before other settings
- Turn on far clip to reduce redraw time
- Keep views on hidden line until you're done with adjustments to your camera!

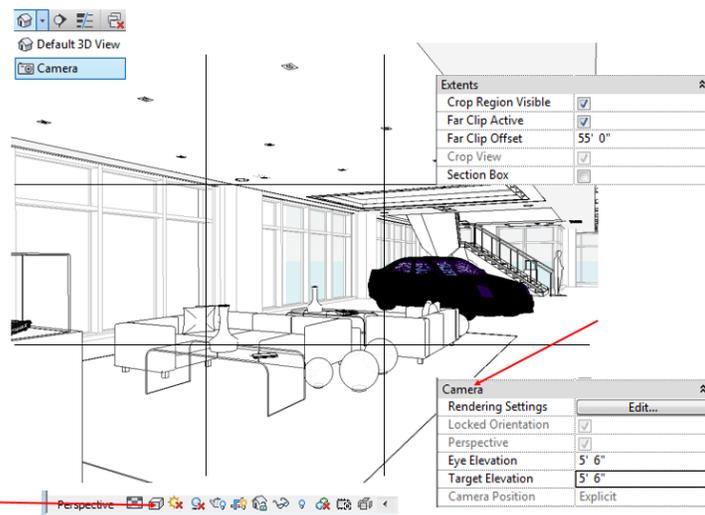


Figure 49: Place your Camera

Try to keep a distance from walls and other objects when placing the camera and think about the view in 360 degrees. Use the “Look” and “Walk” tools, after placement, to view the space and see what is visible before producing a panoramic view. This will help get a feel for the 360 degrees scene you will be creating.

After placing your 3D camera, you can use the available tools on the navigation wheel to further adjust the view as needed. Try to avoid using the pan and zoom functions with the mouse as this may result in distortion of the camera.

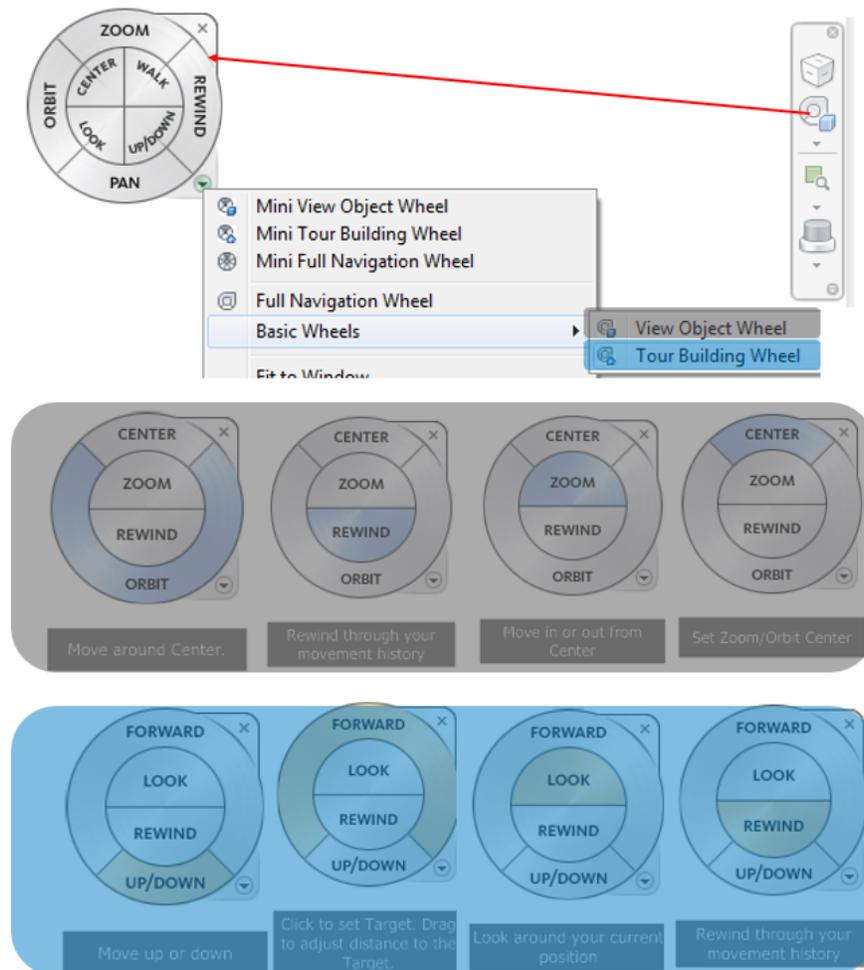


Figure 50: Use the Navigation Wheel Tools

Crop Region: When it comes to adjusting the crop region, we have noticed that there is **less of a chance of view distortion** if it's selected and adjusted by clicking the Crop Size button in the ribbon. The camera **adjusts uniformly** when it's adjusted this way. Dragging the grips of the crop region too far will result in stretching of the lens and warping of the geometry in the view. As for the dimensions of the Crop Size, we typically stick with a **2:1 ratio** which results in a more pleasing image since we tend to render everything in HD or 1080 or higher. Leave the view set to a course detail level so 3D data is kept to a minimum. We will add to why we use this level of detail a bit later.

Crop Region Adjustment

- It is best to select the crop region and click the Size Crop icon in the ribbon to specify the size of the region. Editing this way will keep camera distortion to a minimum

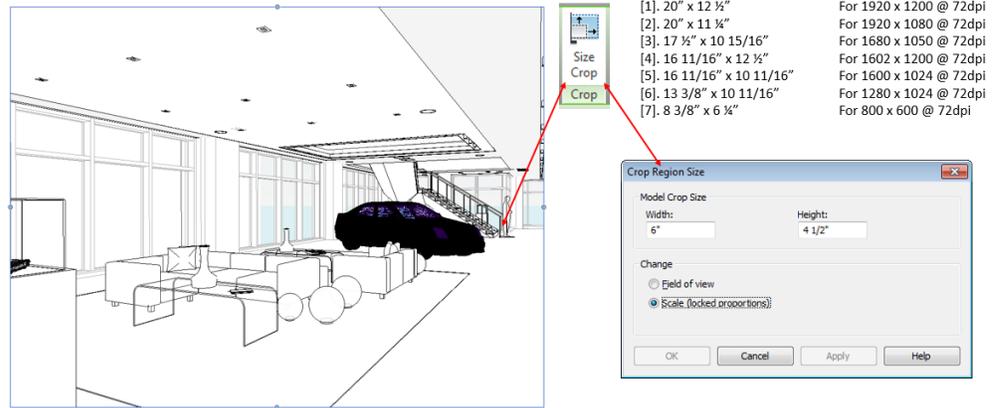


Figure 51: Adjusting Crop Region Size

For additional camera tools like increase/decrease focal length available that will allow you to tweak your view even further. To get to these additional tools, you click the little black arrow on the lower right corner of the navigation wheel:

Additional Camera Tools

- Fit to window
- Restore original Center
- Increase/Decrease Focal Length (camera angle)
- Move Crop Boundary
- Re-Center Crop Boundary

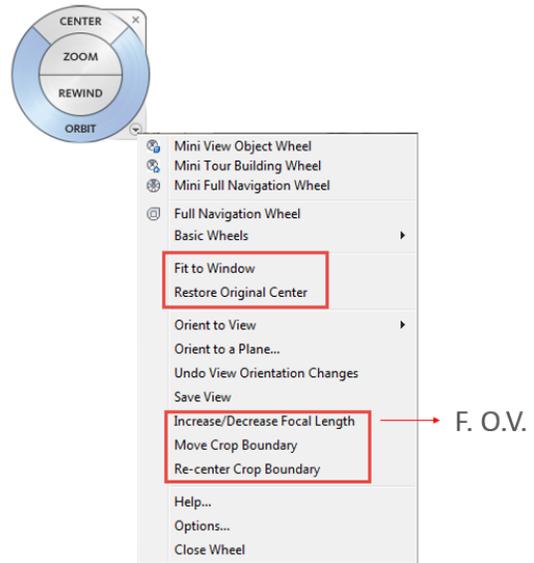


Figure 52: Adjusting Crop Region Size

Turn on the **section box** in each view. Have the perspective view, floor plan/RCP, and 3D view open and tiled. This way, you'll be able to select the crop size/camera or right click the perspective view in the browser and choose Show Section Box to easily adjust the section box in the 3D view. The **view cube** can be used to view the model orthogonally while adjusting the section box. This makes it much easier to align the box properly. Make sure you encompass all required walls, floors, and ceilings of the space you want to render so that there are no light leaks. The main purpose of using the section box is to keep rendering time to a minimum by excluding objects you don't need to see:

Section Boxes

- When needing to export or render part of a model, use a section box to define the area. Section boxes limit the amount of geometry that needs to be processed
- Section boxes are viewable in all views. Right click view in browser with 3D view open
- Use orthogonal views with view cube to adjust faster

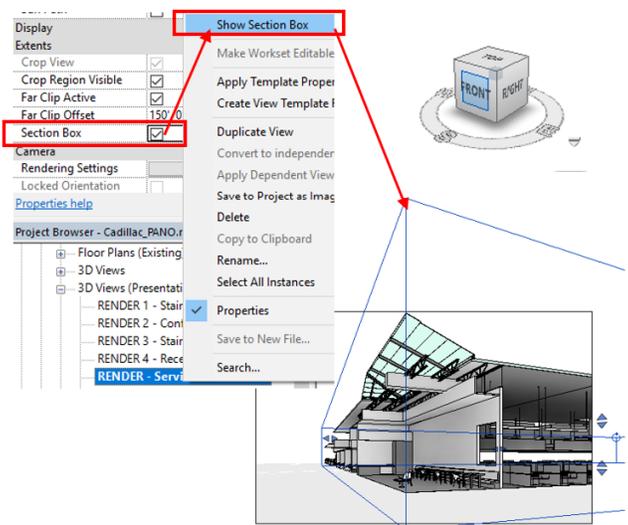


Figure 53: Section Boxes Help Control the Scope in a View

View Settings

Turn off what you don't need. Turn off what you don't need to see like worksets, categories, or linked files. Typical categories to turn off are lines and shafts. As mentioned earlier, the view should be set to a course detail level, categories you don't need should be unchecked, and specific categories like structural framing, ducts, pipes, or furniture, etc. set to fine if families have content set to display in a higher detail level. Make sure any objects that are needed for visualization are turned on like visualization worksets. Continue with the analytical tab and uncheck the top box. Do the same for Imported categories if you are not using any 3D DWG's in any families. These adjustments will limit the amount of 3D Data that Revit needs to regenerate when opening a view or rendering:

- **Categories**, manage categories to only have what is required
- **Level of Detail**, Course for view, Medium and Fine for categories
- **Linked DWG's**, though if you have imported 3D DWG's in families, you'll need to leave Import objects checked
- **Worksets**, open/close the worksets required for the scene to save time
- **Linked RVT**, turn on or off any linked files you need

- **Design Options**, set any design options you need. Note that if you have multiple design options you should have dedicated and named views for each option. Not only does it make working with design options easier, but you can then do batch rendering by sending multiple views to the cloud.

View Settings

- Turn off any unwanted categories such as lines, DWG's, or other content you don't want to see
- If in use, turn on Visualization workset
- Set your phase filters
- Set specific categories to higher detail level

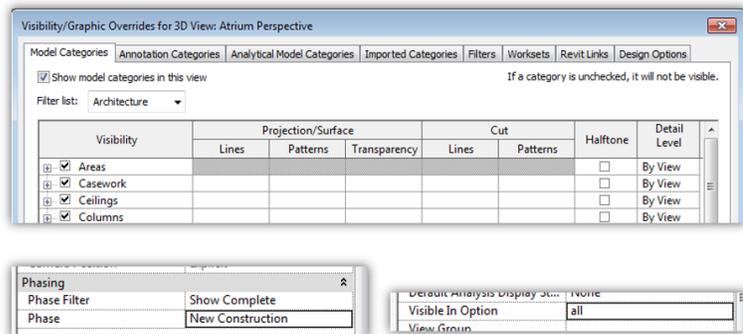


Figure 54: View Settings

Remove any material overrides in the graphic override tab in phasing. Set any design options if any are in use. And make sure linked files are mapped to the proper phases:

View Settings

- Remove any material in graphic overrides tab
- Set the correct design options if any
- Make sure linked models are properly mapped regarding phasing

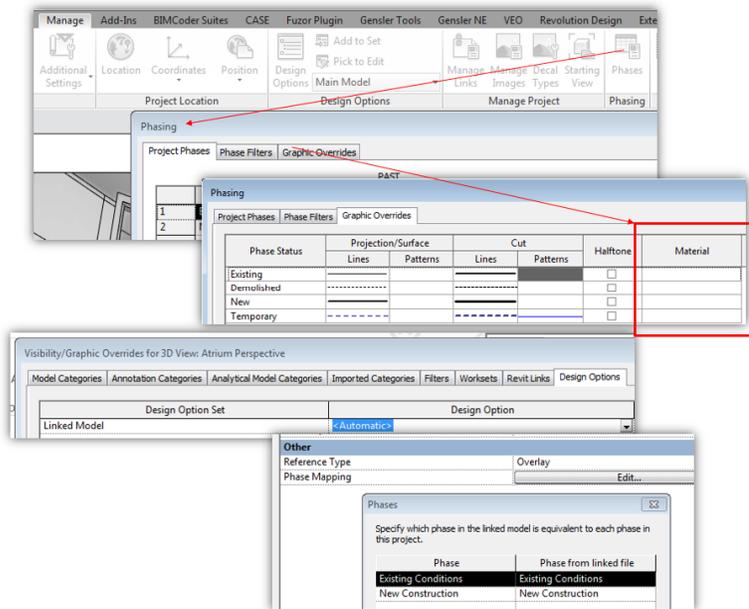


Figure 55: Phase Settings and Phase Mapping

Set the **rendering settings** as you would for a still image. The only 2 areas you need to adjust here are Lighting and Image. As mentioned earlier you could add a custom background here as well, but it would only work if you were rendering a still image. The Engine, Quality, and Output Settings are for rendering local only.

Render Settings

- Click the edit Render settings button on the properties palette of the 3D view or the Render button on the view tab
- Adjust exposure settings prior to submitting to the cloud or adjust after initial render
- Very important: Set the type of lighting scheme you need (interior or exterior)
- Turn on, off, or dim artificial lights

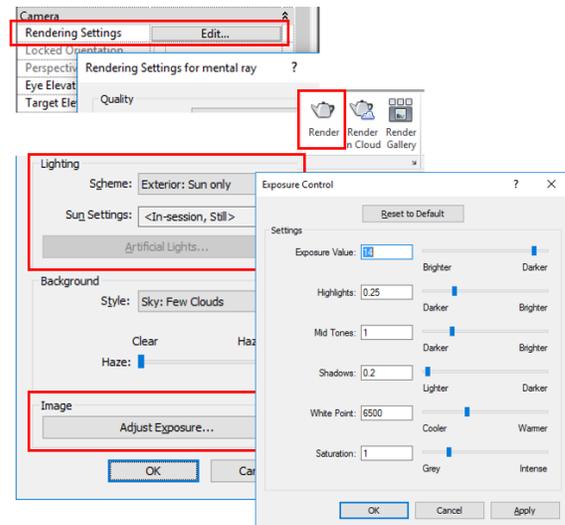


Figure 56: Preliminary Revit Render Settings

Note: We will touch on this in a bit, but, if you already have an idea of your exposure settings, you could edit them here. These will transfer to the cloud which could reduce the number of times you need to re-render in the cloud. Technically, after adjusting the exposure, you could also render straight to a pano though you run the risk of having to recreate the pano again if the settings don't work well for you.

Visualization Styles

Getting quick presentation material out of your Revit model is quite easy. Let's take a look at a few settings you can use to achieve various styles:

Using the visual style control which is found at the bottom of a 3D view, you will be able to generate several different visualization styles for presentations quickly:

Visualization Styles

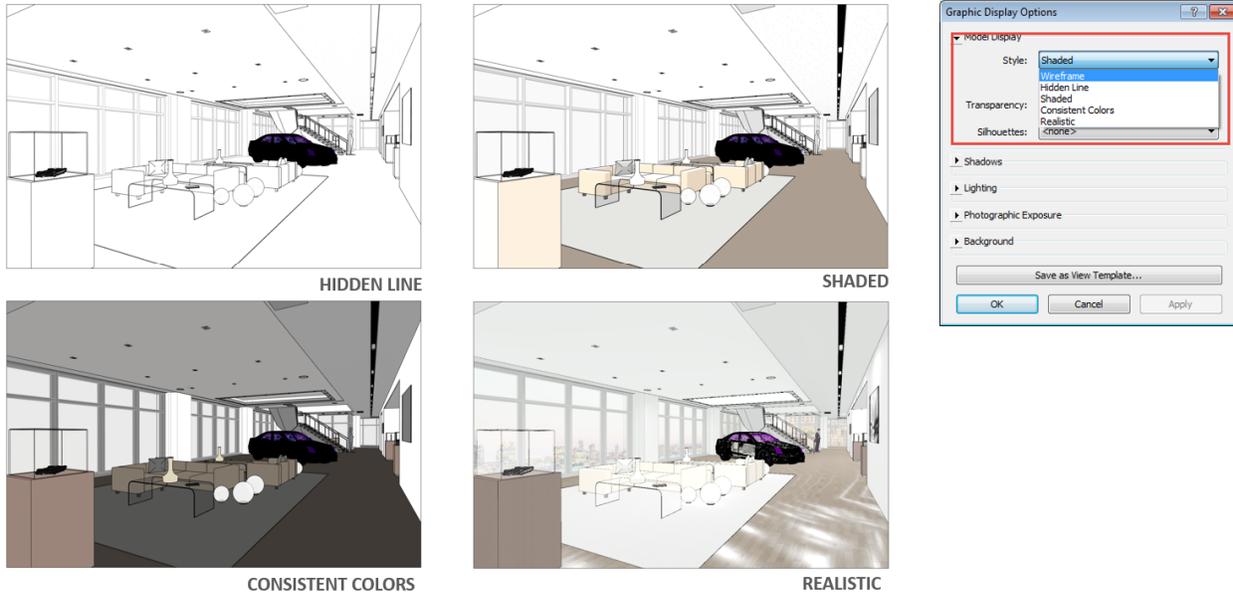


Figure 57: Hidden, Shaded, Consistent, Realistic

Note: Different sliders work with different styles. The shadow slider only works when the Cast Shadow option is turned on. And the Sun and Ambient sliders only work when the style is set to shaded or realistic.

Adding Shadows

- Shadows slider only works when Cast Shadows is turned on
- Sun and ambient sliders only work with shaded style

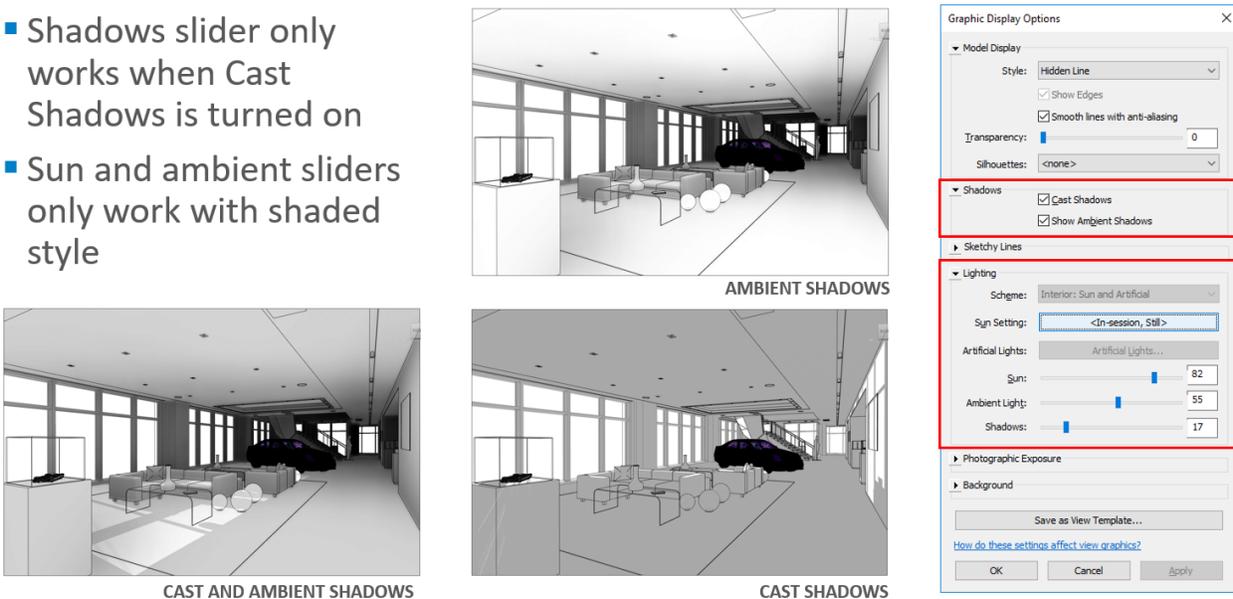


Figure 58: Cast and Ambient Shadows

Sketchy lines, transparency, silhouette overrides can be combined with shaded, consistent colors, or hidden line styles to create even more visualization styles.

Additional Options

- Sketchy lines nor silhouette overrides will render out in the cloud



SHADED WITH SKETCHY LINES



CAST & AMBIENT SHADOWS, SKETCHY LINES



HIDDEN LINE, SILHOUETTES AND TRANSPARENCY

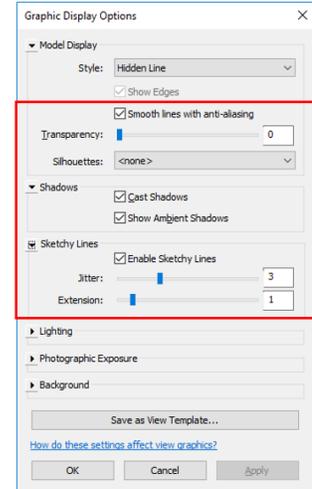


Figure 59: Cast and Ambient Shadows

Note: Sketchy lines nor silhouette overrides will render out in the cloud

There is also the option to add a custom background using a color, gradient, or image.

Background Options

- Applying a custom image here will not render it in the cloud



CUSTOM IMAGE



GRADIENT BACKGROUND



SKY BACKGROUND

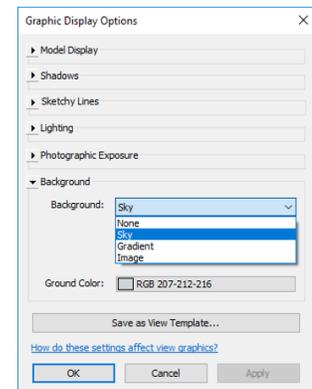


Figure 60: Cast and Ambient Shadows

Don't be afraid to export your images and develop them further by applying filters in post processing software.

Bonus trick: Setting a design option current and turning on shadows and ambient shadows will yield yet another visualization style:



Figure 61: Bonus Visual Trick

White model renders are possible and easily done by setting all loadable and system family material parameters to <By Category> (except for glazed geometry like curtain panels or glass doors) and then applying a white material to the category through object styles. White materials that use maps instead of colors alone seem to render a bit better.

White Model Render

- Set all loadable and system families to <By Category> (except for glazing) and apply a white material to the category in object styles. Use shadows and ambient shadows for added affect

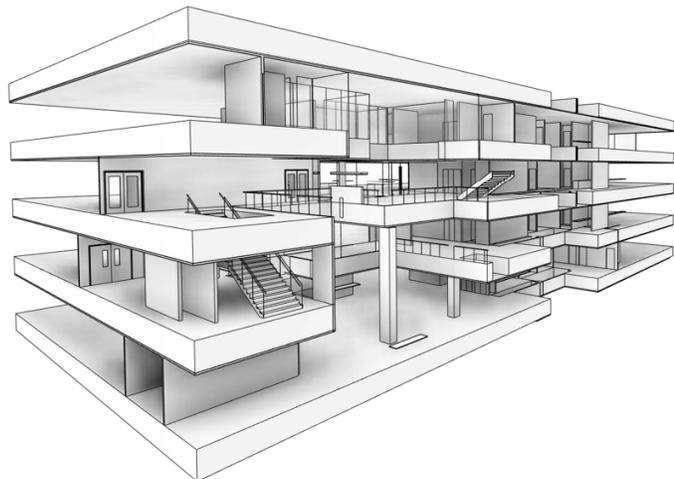


Figure 62: Preliminary Revit Render Settings

A360 Cloud Rendering

Once the Revit model is prepared most of the work is completed, now onto the fun part of creating some virtual reality views!

Submitting Views to Render Still and VR

Log into Autodesk 360 with your info at the top right of Revit:

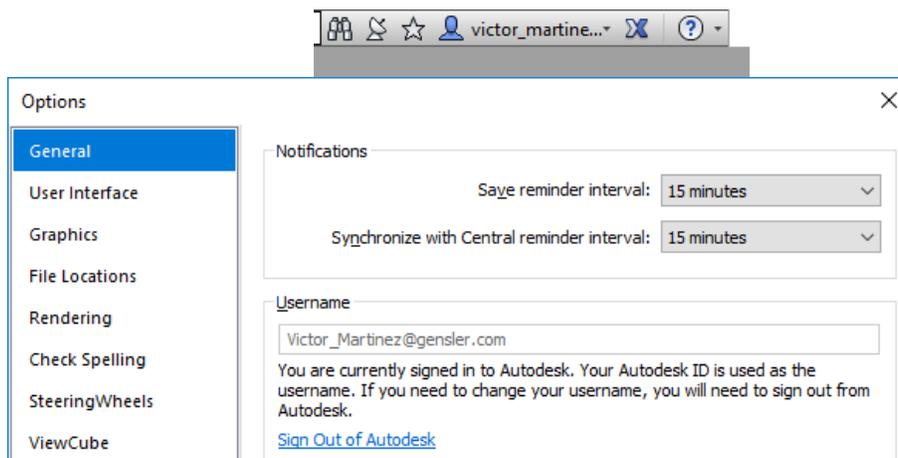


Figure 63: A360 Login

Tip: If you are using worksharing, make sure your Revit username is the same as the login name for A360, otherwise you will not be able to render the file at first.

From the View tab, in the graphics group palette click "Render In Cloud"



A dialog box will appear with some instructions, you can select "Don't show this message next time" and then select "Continue".

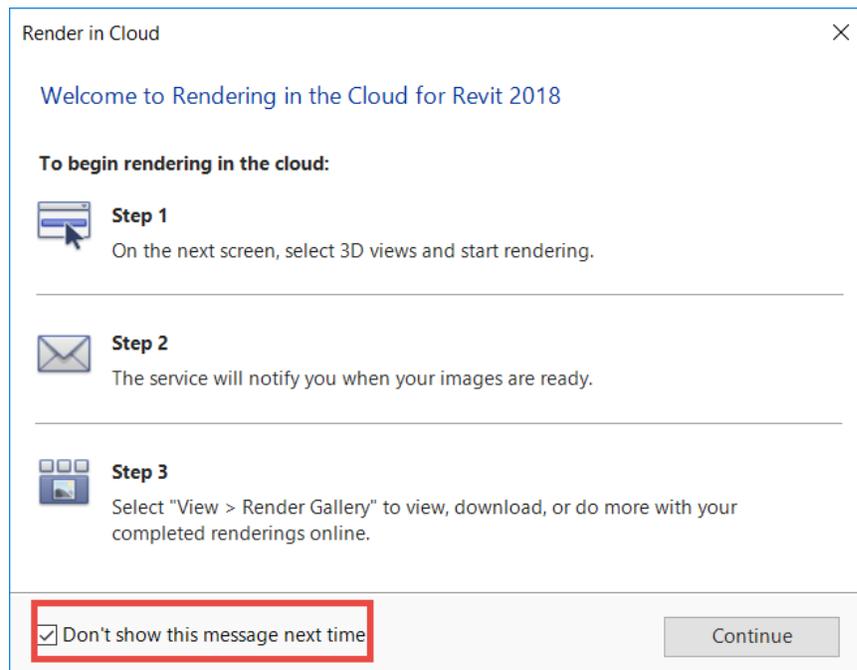


Figure 64: Render in Cloud Opening Dialog

Preliminary render options:

- List of 3D views
- Output Type
- Render Quality
- Image Size
- Exposure
- File Formats

Choose to render a still image:

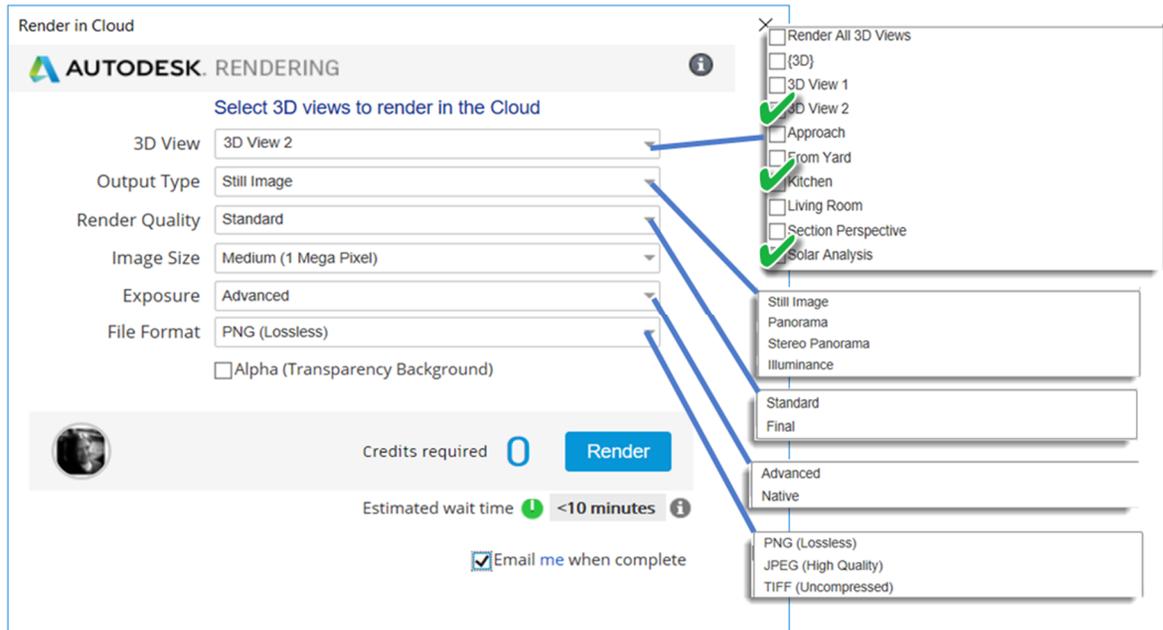


Figure 65: Preliminary A360 Render Settings

- From the 3D View section choose the View(s) to render. Notice that it is possible to batch send multiple 3D Views at once.
- From the Output Type section you can choose Still Image. You can also render Panorama, Stereo Panorama or illuminance views from here as well. All views are viewable in most internet browsers.

Tip: Using this method also allows **additional post processing** steps of editing the image prior to converting to a VR ready image. The adjustment of exposure is NOT available if the scene is first rendered as a panorama or stereo panorama.

This method also allows for the creation of still images to place in presentation decks as well as panoramas to enter into interactive presentations and finally stereo panoramas for viewing with VR headsets.

Note: Stills can be re-rendered into panoramas or stereo panoramas but it is not reversible, panos and stereo panos cannot be made into still images.

- From the **Render Quality** section choose either Standard or Final. Keep an eye on the "Credits Required" (accumulative) while selecting the next settings, the higher quality settings will use more credits and might not be needed just for draft and test renderings.

There are two Render Quality settings, each with a different balance of three variables: eye rays, reflection samples, and lighting accuracy.

Setting	Eye rays variable	Reflection samples variable	Lighting accuracy variable	When to use	Speed
Standard	4.0	1	Low	More accurate than Draft. Perfect for quick visualization during design.	4x
Final	32	16	High	Lower noise and broader tonal range than High. Perfect for archival rendering, when speed is not a priority.	20x

NOTE: Speed comparisons are relative. The overall rendering time for any image is a function of render quality, image resolution, and complexity of the scene.

Figure 66: Render Quality Settings

From the **Image Size** select the Image Size required. There are 4 possible options:

- Small: Small is 0 credits and the lowest quality setting. It's a good way to double check your view is correct and things are looking ok before increasing to the next level of quality
- Medium: Typically, we kickoff our renders at medium which is 0 credits since it's a little more helpful in seeing how things are developing
- Large: Large is 3 credits and should be saved until after verifying your view is looking good in one of the smaller sizes.
- Extra-large: Extra-large is 5 credits and is better quality
- Maximum: Maximum is 8 credits and will yield the best quality and largest size possible to render

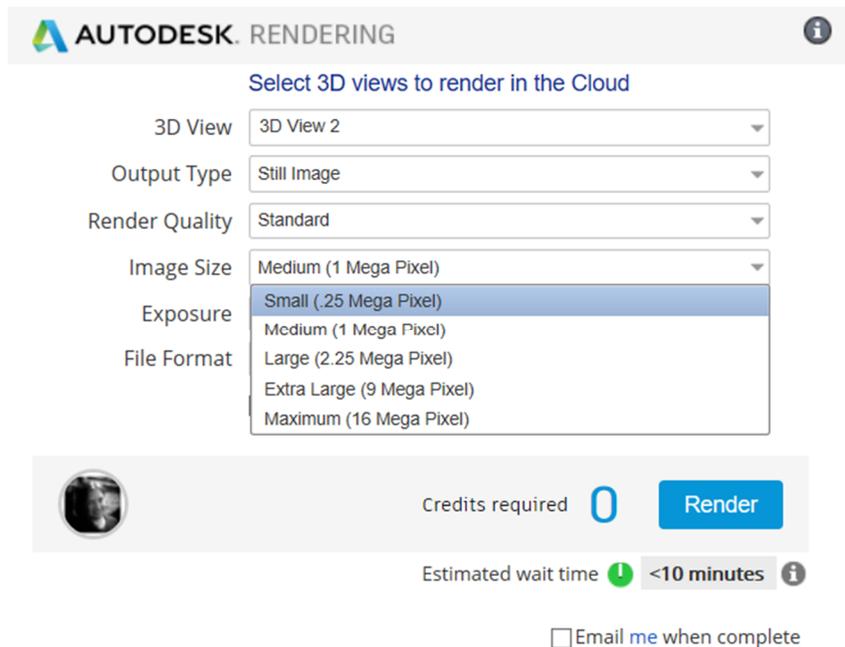


Figure 67: A360 Render Size

Select the **Exposure**, there are 2 render settings when submitting a render job, Native and Advanced. After tweaking the settings in the cloud with either, they end up looking pretty close. As a starting point, we render using the native option which is what we settled on to develop our process, but either setting will be fine for the initial render.



Figure 68: A360 Exposure Options

There are 2 Exposure settings: Advanced and Native. Neither add additional credits to your render job, and it's user preference as to which to use. Typically we use Native when starting our process. Native will use Revit exposure settings and Advanced is intended to simulate correct lighting conditions.

Select the **File Format**. A JPEG will be rendered with the selected environment used in the cloud in the next steps, and the PNG and TIFF will have an alpha channel for background replacement and post processing.



Figure 69: A360 File Format Options

Tip: Set your Revit view to black to be able to render an environment in the cloud and not have the environment bake into reflections in the render.

Choose the **"Email me when complete"** to be notified by email once the rendering is complete.

Click the Render button to submit the job to the cloud.

Tip: If the waiting window appears for a long time when submitting the render job, check that there is no dialog underneath waiting for user input.

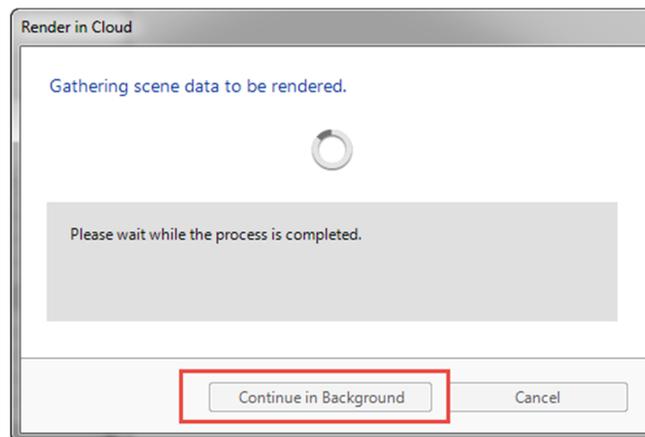


Figure 70: A360 Submission Dialog

Click View Completed Renderings or the Render Gallery Button on the view tab to open the Autodesk Rendering website:

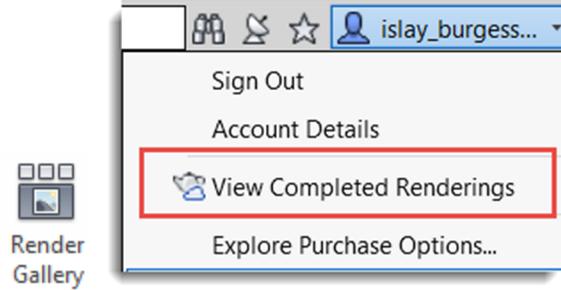


Figure 71: Open the A360 Gallery

When the initial render is complete, re-render the image using one of the default environments (use the Transparent Background option to get an alpha channel). This will apply image based lighting (IBL) to your scene:

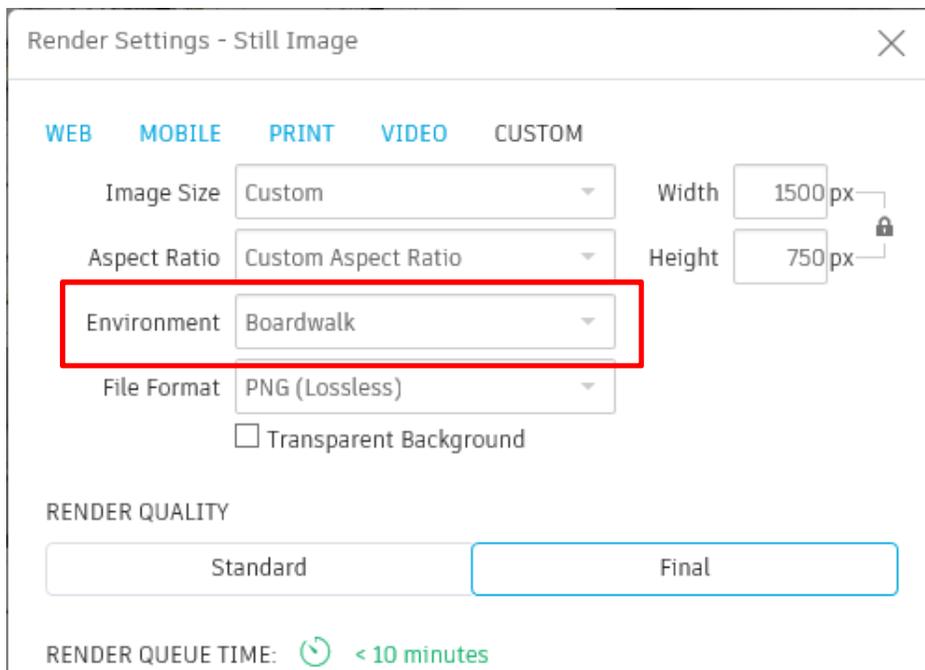


Figure 72: Re-render the Scene With a New Environment

Re-render again after adjusting the exposure:



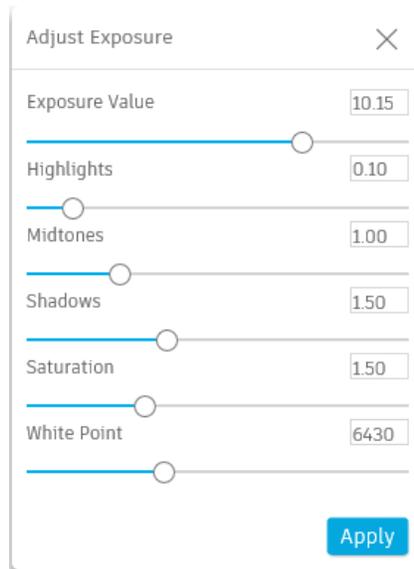


Figure 73: Re-render the Scene With a Adjusted Exposure

Click "Apply" after making any adjustments to reprocess the view.

Why so many renders?

Re-Re-Render Process

- Using this method allows additional post processing steps of editing the image prior to converting to a VR ready image. The adjustment of exposure is NOT available if the scene is first rendered as a panorama or stereo panorama



Figure 74: Re-Re-Render

To generate VR content, there is still one last step to go:

After the last rendering is complete, re-render your final as a Panorama or Stereo Panorama. Click "Render" and check "Email when complete" if you'd like to be notified upon completion.

Re-rendering the still into a pano will require additional rendering credits since 2 different renderings will be completed, this method just starts at the smaller end of the scale and works up to the stereo panos, allowing consistent post process editing:

Final Step for VR

- After the last rendering is complete, re-render your final as a Panorama or Stereo Panorama
- Re-rendering the still into a pano will require additional rendering credits since 2 different renderings will be completed
- Use a width that is close to the specs of the viewer you will be using

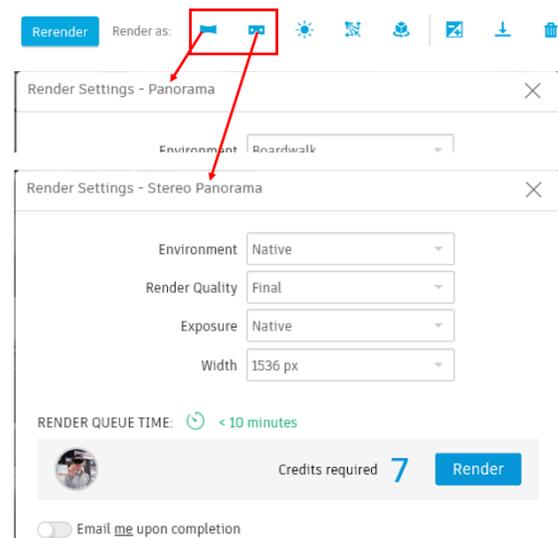


Figure 75: Re-render the Scene as a Panorama or Stereo Panorama

Panorama = A single 360 View cube map of the rendered scene (vert):

As a standard we use stereo panoramas when presenting to clients. Stereo panoramas have much more depth and users tend to feel more immersed in VR when things appear more 3 dimensional. As a minimum we use 1536 px. Anything smaller might look a bit pixelated and the larger size may not be much of an improvement due to limitations in smartphone displays. The sweet spot is matching the display of the headset you are using which also makes the images load much faster and improves anti-aliasing.



Figure 76: Panorama Vertical Cube Strip

Stereo Panorama = A dual cube image, this is specifically created for viewing in VR headsets. The image will contain two versions of the view (left and right eye), they are calibrated with small differences in the scene to help the view's 3D feel (horizontal):

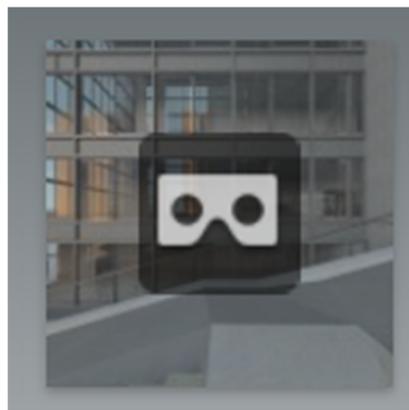


Figure 77: Stereo Panorama Horizontal Cube Strip

When the rendering is complete, click the Share icon in the upper right corner to share the pano to the public gallery, an A360 project, or via a link:

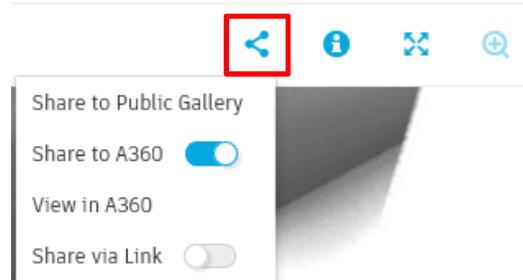


Figure 78: Sharing Your Panos

If you choose to share the panos via a link, you will get two methods, a QR code that can be scanned or a URL that can be emailed and clicked on to view with any browser:

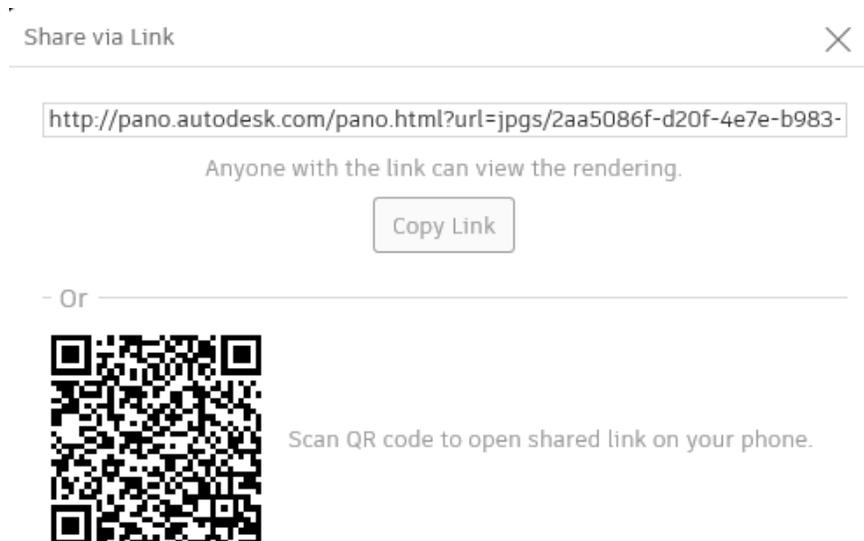


Figure 79: Viewing Your Shared Panos

Tip: For higher photorealism, you can link a Revit model or FBX export to MAX and render a panorama in the cloud from MAX. The file can then be downloaded and placed on a phone or viewed on the A360 site.

At this point you can download the final renders for use in a presentation deck. Select the view you want to download, and from the download option, choose your format and whether or not you want a Transparent Background. Transparent background will allow you to apply a custom environment to your render in post processing after downloading the file, though this only applies to stills, not panos or stereo panos:

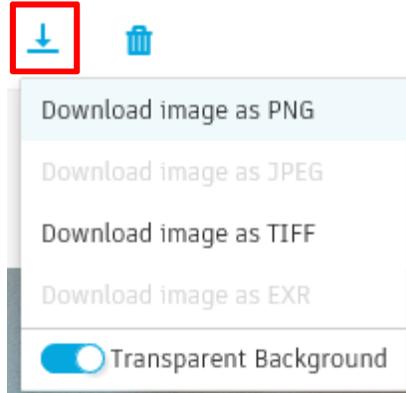


Figure 80: Downloading Your Final Still Shot

File Types: Downloading pano files

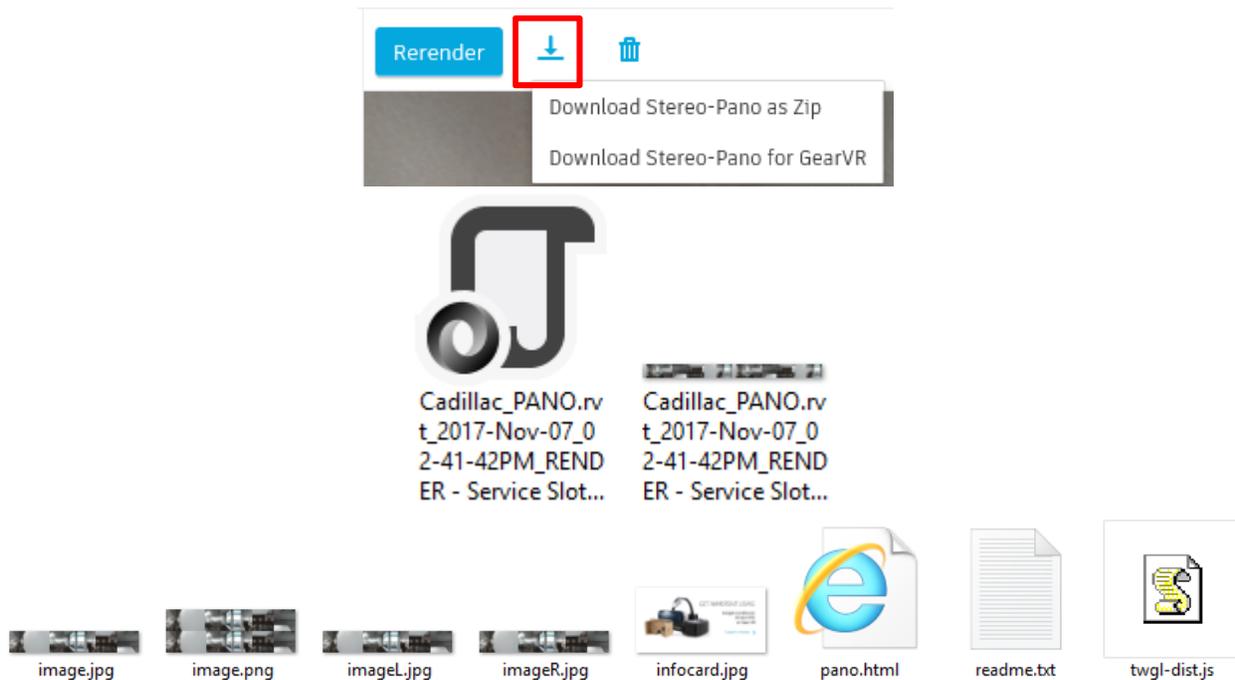


Figure 81: Downloading Your Pano Files

With everything that was covered in this session, we want to stress that you will never get a perfect render out of any visualization tool on the first try. Hence the need for some post processing. As you can see, with the images we showed, we went from a draft render to another draft with added entourage for increased detail. Once we were happy with the amount of added entourage, we proceeded to a 2nd and 3rd render. Then the final scene is further improved upon in Photoshop with some quick tilt-shift filters for a standard render.

Summary

Site functionality - reprocessing and post production summary

For the first render we usually set the lights a bit high. This has shown to give a better balance between the interior and exterior lighting in the 3rd re-render.

Our 2nd step is to re-render using one of the available environments. This introduces IBL lighting which improves the render quality. Of the environments that are available, we tend to use the Boardwalk option the most after initial testing of all 5.

Once that render is complete, we run a third render after adjusting the exposure settings. Here is where we further edit the quality of the scene which makes the biggest difference. Our settings are typically as shown here but vary depending on lighting quality and materials:

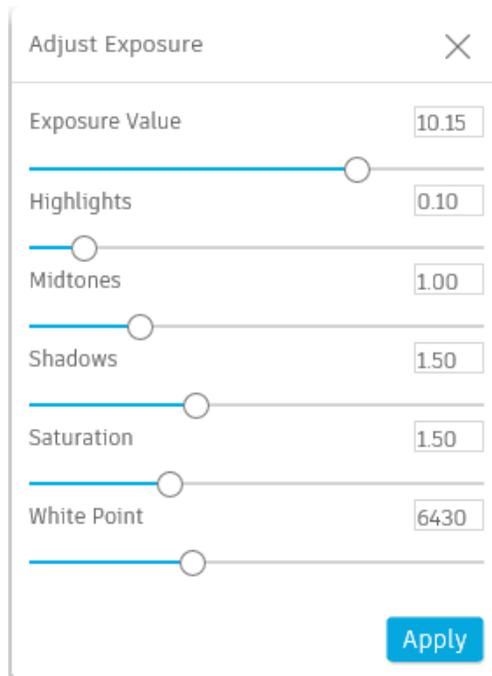


Figure 82: Adjusted Exposure Values

Additional Visualization Options

Illuminance = Illuminance analysis is for showing hot spots in your model regarding lighting (*turn off fill lights for this).



Figure 83: Illuminance Studies

Solar studies

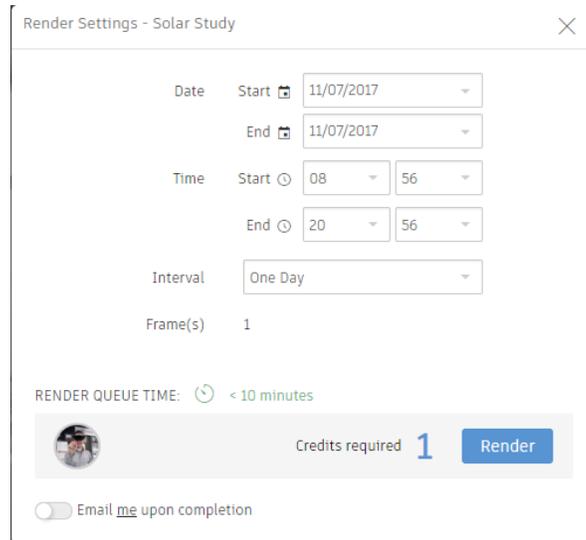


Figure 84: Solar Studies

Turntable

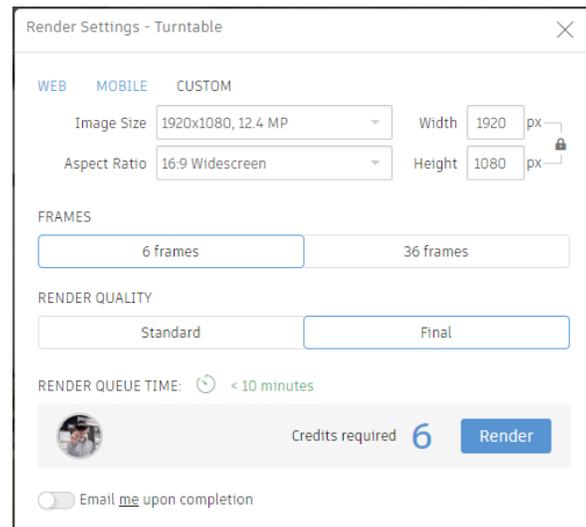


Figure 85: Turntable Animation

VR

VR tips throughout presentation

As for VR panoramas, there are tools that will allow you to edit these type of VR files like Adobe Premiere. There is also software named Black Magic Fusion that can be used and the basic version is free, whereas their Pro version is \$299. There is also Blackmagic DaVinci 12 for color grading and other editing features.

Always have a backup when presenting to a client. Whether it's having the renders on a thumb drive, having hyperlinks that can be sent to clients, having an additional 360 viewing app on a laptop such as GoProVR, or as simple as having 3 devices even if you only need 2, can be a life saver.

Use the navigation wheel to look around the view you are going to render. Make sure that all viewable areas that are going to appear in the render have been modeled.

When picking a location to render for VR, do not place cameras too close to objects. Look for a spot that is open and shows as much of a space as possible.

Grounding/Shadow for positioning... Safe client practices: motion sickness (sit vs stand, rotating chair), epilepsy, vertigo, disorientation... 10 steps...

Apps

In addition to A360 viewing there are many apps available that can be used to view 360 renders, some are better than others and it seems as if a new one is being released everyday... Most of our VR presentations to clients have been given using Gear VR. The default oculus 360 photo viewer that can be installed from the oculus store for free, has been a great tool. Autodesk A360 now has the option to download your renders specifically for use with the Gear VR. Before they added this option, we had to use a custom script that rearranged the squares before placing on the Samsung's.

If you are GoProVR running on a desktop that meets minimum requirements is also another option to vie

IrisVR Scope... <https://www.kubity.com/>... <https://modelo.io/>... Holodeck??
<http://devalvr.videopanoramas.com/paginas/productos/index.html> (InSiteVR as a note that some services will allow a guided tour) Samsung can cast to a Google Chrome cast for guided tours as well.

Hardware

The cloud renders can be viewed in various hardware using an appropriate app. You can use Google carboards for viewing or some higher end VR products such as ____ . Some apps will allow you to pair a Bluetooth game controller... For the Gear VR, there is the oculus 360 photo app which is free. The same app can be used with the oculus rift. For Apple we've also used GoProVR.

<http://www.pocket-lint.com/news/141202-gear-vr-now-supports-chromecast-here-s-how-to-stream-vr-to-your-tv>

Resources

<http://pano.autodesk.com/>

Panorama Information: <http://pano.autodesk.com>

Forum / Community Help: <http://forums.autodesk.com/t5/a360-rendering-general/stereo-panorama-rendering-now-available/td-p/5503731>

Blog posts: <http://autodesk360rendering.typepad.com/blog/>

Twitter Feed: <https://twitter.com/search?src=typd&q=autodesk%20cardboard>

Main Rendering Portal: <https://rendering.360.autodesk.com>

Revit online help made it easier to understand what each material parameter can do.

2018 Improvements?

<https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/CloudHelp/cloudhelp/2018/ENU/Revit-DocumentsPresent/files/GUID-12C2D6B0-71ED-490E-9CC6-AD3C635F092B-hm.html>

<https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/CloudHelp/cloudhelp/2018/ENU/Revit-DocumentsPresent/files/GUID-4046977A-9323-4535-9AC0-4EF9A138A5A6-hm.html>

Q & A