Autodesk® Revit® Rendering Tips You Can Use
Daniel John Stine – LHB

**AB4025**  This class will cover a multitude of topics related to creating renderings in Revit. Class highlights include using Design Options to manage “props” for rendering, using a future phase to quickly create a “chip board” type rendering, and employing transfer project standards to load different color schemes for materials. We will also cover exporting a rendering and a wireframe view to create a compelling composite view in Photoshop, how to use an omni-light family to help brighten interior renderings, how to set the location and true north to get accurate daylighting, and how to troubleshoot problems with light sources from linked in Revit MEP models. You will also learn about using ArchVision™ RPC content (All Access subscription) and adding custom materials and colors. The class also covers how to use Remote Desktop to utilize idle computers when producing multiple still images, how to use Illuminating Engineering Society (IES) photometric files to get more realistic results, and how to use the Section Box feature in camera views to get interesting results and reduce render time.

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

- Use Design Options to manage the visibility of “props”
- Rendering a “chip board” model
- Create a wireframe overlay
- Manage material design options
- Set the project location and true north for accurate daylight
- Work with artificial lighting

**About the Speaker**
Daniel John Stine, CSI, CDT is an author, instructor, BIM manager, and architect with nearly 20 years of experience. Working full-time at LHB, a 160-person multidiscipline firm in Minnesota, Daniel provides training and support for all versions of Autodesk® Revit®, AutoCAD® Civil 3D®, and AutoCAD. Dan is a member of the Autodesk Developer Network and an Autodesk Revit Architecture 2011 Certified Professional. He teaches AutoCAD and Revit classes at Lake Superior College. Leveraging his professional experience, Daniel has also written the following textbooks: Design Integration using Revit 2012 (Architecture, Structure and MEP), Commercial Design using Revit Architecture 2012, Residential Design using Revit Architecture 2012, Residential Design using AutoCAD 2012 and Commercial Design using AutoCAD 2012. Finally, Daniel (and the electrical department at LHB) was involved with the development of the “Electrical Productivity Pack for Revit MEP” offered by Cad Technology Center (CTC).
Basic Tips

- **Lock 3D/Camera View**
The ability to lock a 3D view is nice when you get your view setup the way you want it. Simply click the Lock 3D View icon on the View Control Bar while in the specific view.

  **Warning:** there are still a few ways this view can be changed (unfortunately). A number of the Navigation Wheel tools can change a locked view. For example, Walk, Up/Down, Pan, Etc. Also, using the *Show Camera* (mentioned later) option in a plan view lets you change the camera graphics but does not affect the view (it remains locked).

- **Show Camera option**
The camera graphics you see in plan view, when initially creating a camera view, can easily be made visible at a later time. While in a plan view: simply right-click on the camera view name in the *Project Browser*, as select *Show Camera*. See image below.

  Sometimes it is easier to reposition the camera in a plan view rather than using the *Navigation Wheel* (while in the camera view).

  **TIP:** A similar process works to view a *Section Box* applied to 3D view.
- **Use Navigation Wheel to Adjust View**
  The Navigation Wheel is a great way to make quick adjustments to a camera view. Once the view is setup and you want to adjust the view to look a little to the left, the Navigation Wheel will let you do this and without “moving your feet” in the building. Moving forward or backwards a little can sometimes be tricky as it may move too much and place you behind a wall (behind you for example).

- **Far Clip Active Setting**
  Each camera view has a **Far Clip Active** setting in its *Properties Palette*. The initial **Far Clip Offset** is based on your second pick (i.e. direction the camera is looking) when creating the camera. This can sometimes inadvertently crop portions of the model. You can either turn this off all together or adjust the offset value.
• **Crop Region Size**

Crop Region Size is an often overlooked function of the final rendering product. In a camera view, when the Crop Region is selected, you can select the Size Crop button on the Ribbon. You are now in the Crop Region Size dialog (see image below). When changes are made here, the default is to adjust how much is seen in the 3D view (i.e. more or less of a given space). This can also be done in the view using the grips on the Crop Region.

However, the other option is called **Scale (locked proportions)**. This feature changes the overall size of the image rather than how much is seen within the same sized “window”. Revit can actually render billboard sized images!

The dimensions shown in the dialog below would not be good for a presentation board. The when the image is enlarged to fit on the board it becomes pixelated.

![Crop Region Size dialog](image)

When the size of the image is increased, the render time is also increased. Notice the change in pixels when the original dimensions (image on left, below) are doubled (image on right). The images below are from the Render dialog, before and after adjusting the Crop Region.

![Initial image size](image)

![Crop region adjusted](image)
- **Section Box Tips**
  The *Section Box* feature is great for a couple reasons when it comes to rendering. The first, and more obvious reason, is for rendering cutaway views of your project as shown in the example below.

  ![Camera view rendering using the Section Box feature](image)

  There is a trick to getting the view above setup. Here are the steps:

  1. In the camera view, turn on **Section Box** via the *Properties Palette*.
  2. Make sure no other projects or families are open (otherwise the next steps may not work).
  3. **Select the Section Box** while in the camera view.
  4. **Switch to one of you plan views** (if you use the Ctrl+Tab shortcut to toggle between view, the *Section Box* will become unselected if you switch to another project or family file).
  5. Adjust the position of the four sides of the section box relative to your building.

  ![Section Box visible in plan view](image)
The second use for a Section Box and rendering is **enhancing performance of interior renderings**. How’s that, you might ask! When you do an interior rendering, Revit is thinking about all the elements in the entire building, even if they don’t show up in the current view. This is because one of those elements might have some sort of indirect impact on the view; an adjacent wall blocks the sun that would otherwise make an interior door look like an exterior door. Or several light fixtures may actually cast light through some interior glass.

If you turn on the section box in an interior rendering, anything outside the box is not considered in the rendering. This can save a ton of render time. When the Section Box is turned on Revit does a pretty good job of cropping the model based on the current perspective view. However, using the steps outlined above, you can make adjustments to the Section Box in plan-view to make sure it is set the way you want it.

One way to verify the overall 3D impact of the section on your model is to look at it in a 3D view. To do this, follow these steps:

1. Switch to your default 3D view (make a copy if you wish)
2. Right-click on the View Cube (see image below)
   a. Select **Orient to View** from the pop-up menu
   b. Expand 3D Views
   c. Select the named camera view (i.e. the view you are rendering)
3. Drag on the View Cube to adjust the view.

**FYI**: the Section Box in this view is not in any way tied to the Section Box in your camera view. They will not update together.
**Rendering Dialog**

- **Quality Settings (custom options)**
  The quality setting relates to how “hard” Revit has to think about the rendering while it is being created. For example, how many times should light bound around the room? The more times, the more realistic, which takes more time.

  *Draft* and *Low* should be used for early stages so you are not wasting time. Maybe letting one render overnight at *Medium*. Artificial lighting really needs to be at least at a *Medium* setting for the final rendering to look decent. The *High* and *Best* settings are only needed for the very last rendering,
once you know everything is setup right. And even then, most of the time you can get by with Medium quality.

Clicking the Edit option opens the Render Quality Settings dialog (see image below). You don’t typically need to change things here, but it is interesting/good to know what can be tweaked here. Revit provides one custom setting which allows these controls to be adjusted. Adjusting the sliders to the right makes for a better rendering, but the time it takes to calculate the rendering is increased seemingly exponentially.

- **Artificial Lights (group)**

In the Artificial Lights dialog (shown at right) the Dimming value can be changed for individual fixtures or for the entire group. To change the dimming value for the entire group, simply change the value to the right of the group name. The three images shown in the next page show how adjusting the dimming value changes the rendering; notice the hotspots on the back wall.
**TIP:** Turn on **Light Source** sub-category (under **Lighting Fixtures**) to see the mesh representing the artificial light source in the view.

The light source cannot be behind a solid object, unless that object is transparent. This can be a problem when the light fixtures are coming from a link. Linked light fixtures do not cut a hole in the ceiling. Thus the ceiling obstructs the light. The light source in the fixture can be moved down just below the ceiling via the family editor.
It is important to select render materials from the appropriate category. This will help to ensure they have the proper reflectance values, which contribute to the overall lighting of a space. The images above were rendered with Interior: Artificial lighting only. So the only light source is from the fixtures placed in the model.

Results: changing the dimmer value in artificial lights dialog

Changing wall render material

Concrete settings
• **Adjust Exposure**

The following is a quote from Autodesk’s Wiki Help document: “When rendering an image, exposure control (or tone mapping) is just as important as the lighting and materials used. Exposure control helps to convert real-world luminance values into a realistic image. It mimics the human eye response to luminance values with regard to color, saturation, contrast, and glare. Use the following settings to adjust the exposure of a rendered image.”

![Exposure Control Settings](image)

**Render Material Tips**

• **Chipboard Rendering (using Phases)**

Creating a chipboard (or paper/cardboard) rendering is easy and great for massing studies. The process can be done in the actual project without messing anything up. The trick is to create a “future” phase, set the 3D view to that future phase and assign a chipboard type material to the “existing” phase override in the Phasing dialog.

Here are the steps:

  o Create a future phase; call is something like **Paper Model** (see image below)

![Chipboard model](image)
Creating a future phase

- Set the Graphic Overrides for Existing to a Material (see image below)
  - This will be a material which represents the chipboard
  - If your project has existing conditions, don’t change the line and pattern overrides as they do not affect the rendering and will mess up the main project.

Setting the material override for existing elements
In your 3D view you wish to render, adjust the view settings:

- **Phase** = Paper Model
- **Phase Filter** = Show All

Now, when you render, the elements will be overridden to use the “existing” material specified in the Phasing dialog. The key here is that the Phase Filter has the existing elements overridden. So, by setting the view to a fake future phase, everything in the view is considered existing. Thus a universal material is applies for rendering!

In the 3D view you can tweak a few things to adjust the results. You can turn off the sub-categories for glass, under Doors and under Windows. You can also turn off the Curtain Panels category. This will make the glass hidden and allow the interior to be visible (otherwise the glass would be the chipboard material, not transparent).

Another option would be to move certain elements (e.g. curtain wall or site) into the “future” phase so you can control their materials separately. This will cause problems with the project in terms of documentation, so you might want to make a copy of the model for this final adjustment just before rendering.

The sample rendering shown at the top of the next page is the result. The renderings seem to process faster given the singular material and lack of reflectance and transparency. Thus it is possible to increases the quality and print resolution higher than would otherwise normally be needed. This is nice in that the shadows are softer. The sample image also employs a Section Box which nicely crops the site.
Another variation on this process, or any exterior rendering, is to set the time to something before sunrise. The initial result is the block blob seen to the right. Your initial thought when seeing this is – what a waste of time! But wait, there is actually a ton of hidden data here. BEFORE closing the file or doing another rendering, use the Exposure Control dialog to adjust the settings as shown in the image on the next page. The results are a nice lightly shadows, realistic looking cardboard model. Other than adjusting the lightings, NOTHING else was changed.
Making minor adjustments to exposure has a major impact on the image. So start out by making small adjustments and then click Apply to see the image change without closing the dialog. If things get too messed up, simply click the Reset to Default button and start over. Another option is to click OK, an then Export a good looking image and then try more changes.

**TIP:** hoover your cursor over the sliders to see a tooltip describing each setting.
- **New Materials**
  When creating a new texture, be sure to change the **Bump** map. This is a file used to give the final rendered material more depth in a scene. Notice the example to the right. The lighter areas define areas which will appear raised. You should either set the bump to none or create one which matches your new texture (via a scan or downloaded).

  Be sure to check the scale of your image once a new texture is applied. One the **Render Appearance** tab (in the **Materials** dialog) click directly on the Image swatch, in the **Generic** section and you will see the dialog shown below.

  The example shown here is a simple illustration of what you need to check. This is of a 2'-0” x 2'-0” suspended ceiling system. Eight 2'-0” ceiling tiles equal 16'-0”. Thus the scale is correct. If not, scroll down and change the Scale section below the preview. Here you can also reposition the image and define if the image should repeat or not.
• **Material Options (using Transfer Project Standards)**

  Often, during the design phase, there is a need to experiment with various color palettes. Revit does not have a way to do this. Design Options is certainly not something appropriate for this task. The easiest workflow, given the available options in Revit, is to use the **Transfer Project Standards** tool.

  The steps are simple:

  1. Create a dummy file as a “container” for the materials you want to use – the first file will be **Option A**.

  2. Delete all the materials in the dummy project except the ones needed (see example to the right).

  3. [Optional Step] Create an element for each material and add **Model Text** next to it as a reference (see images below).

  4. Copy the **Option A** file to create additional options. Adjust the materials as needed in each file/model. Name the files; **Option B**, **Option C**, etc.

  5. Open the project file; make sure you have the same material names setup in this file.

  6. In the project file, use Transfer Project Standards to import the material options.

     a. Make sure one of the “Option” files is open; select it from the drop-down list at the top.
b. Click the Check None button; **Warning:** the project file can get really messed up if you miss this step.

c. Check only **Material**

d. Click **OK**

e. Click **Overwrite** when prompted.

The materials are now updated for the selected option. You can now render the model or print shaded 3D views. Once done, repeat these steps using another “Option” file to import those material settings. If the “drafting” settings (i.e. Materials → Graphics tab) are kept the same in all files, this method can be done in the main model – even during construction documents without causing problems.

- **Painting Material Parameter in Family**

- **Duct and Pipe Materials**
Duct and Pipe materials can be set in two ways. First is via **Object Styles**. This is a one-stop-shop if you want all ducts to have the same render material. Anytime you see a material set to **<By Category>** it is using what is set in the **Object Styles** dialog; exception: when phase filters / overrides are used, that material takes precedence. See my AECbytes articles called **Controlling the Graphical Representation of Elements in Revit** for more on this topic; [http://www.aecbytes.com/tipsandtricks/2010/issue54-revit2.html](http://www.aecbytes.com/tipsandtricks/2010/issue54-revit2.html).
Notice in the image below, the *Material* is set to <By Category> for the selected Duct System. This means it will be using the material set in *Object Styles* (if one is specified – it is not by default). Change this Material to control individual systems (i.e. supply, return, exhaust, etc.).

**Note:** the same rules and options apply to pipe.
Lighting Tips

- **True North**
  The video for this presentation covers this. The key to setting true north, is to set the view property **Orientation**, for a plan view, to **True North**. When this is set, you can use **Manage → Position → Rotate True North** to rotate the plan and see the results on-screen. All other plans with **Orientation** still set to **Project North** are unaffected. It is best to duplicate a site plan, rename to “Site Plan – True North”.

  When other disciplines are linking the architectural model and using shared coordinates, the architectural model will rotate on them when they update the model. They will have to also adjust true north, and do it from the same rotation point. It is best to set true north as early as possible to avoid problems with hosting and such.
• Omni Light
This is also covered in the video. This family allows you to light an area that is too dark, but you don’t want to just increase the ambient lighting and make the entire image brighter. Here are the steps to create one:

1. New → Family → Light Fixture template
2. Select the light source, click the Light Source Definition button on the Ribbon
3. Set as show in image to right
4. Open Family Types
5. Click Initial Intensity
6. Set the Wattage (think light bulb)
7. Save Family with name Omni Light
8. Load into project

Go into VV and turn on Light Fixture → Light Source so you can see the omni light family in the project. See an example of visible light source in the next section (IES files). Adjust the Offset value to set the vertical position.

Be careful not to place the omni light too close to a wall, as you will get a hot spot. Note, the light source itself is not visible.

• IES files (photometric data)
An IES file is a definition of photometric data for a specific light fixture. This information is used by Revit to create more realistic artificial lighting. The IES file is available from most lighting manufactures. A new Add-In for Revit called ElumTools (from the AGI32 folks) uses this photometric data to do point-by-point lighting analysis right in Revit! This means “professional grade” lighting design and analysis right in Revit!

Take a look at this short article on IES files: http://www.cgarena.com/freestuff/tutorials/max/ieslights/. Note the discussion on the IES viewer.
The image below shows a camera view in Revit with the Light Source sub-category turned on. The fixtures have IES files attached to them. Therefore they will render more realistic and can be used by ElumTools to do accurate lighting analysis.
Rendering Props Tips

- **Managing “props” Visibility (using design options)**
  This is a simple, yet powerful tip. Create a Design Option Set, make the Primary option called “Empty” and a second (or more) option called “Entourage” (see image to right). Only make the “Entourage” Design Option visible in your rendering views. All other views will automatically be set to the “Empty” view so your people, trees, cars, etc. will not appear in construction document views.

- **Rendering Entourage**
  - *Realistic*
    
    If you want realistic people, cars and trees you should take a look at ARCHVISION’s RPC content. They offer a subscription plan called All Access. For a yearly fee of a few hundred dollars you get access to 3,500+ items to use in your model. The license can be setup on a network and used by multiple people (one at a time of course, unless you have multiple licenses).

    **FYI:** If you have multiple images in a project, you have to render them one at a time or, again, have multiple licenses.

    The RPC content can be viewed from multiple angles. Notice the lady sitting in the two images above. This is more realistic compared to the next option, which is similar to SketchUp.
- **Artistic**
  Custom content (people outlines); the image below shows how one can employ simple 2D shapes with model lines to refine an on-screen view. This method, similar to SketchUp, is nice when you do not want to do a full rendering. The previous section talked about RPC content used for full renderings. These RPC items really only look decent when rendered, not while viewing the model (see image to right).

These can easily be created as an inch thick outline. Scan an image from a magazine and trace it for various people roles and activities. The 2D outlines must be positioned towards the camera as Revit does not have a “follow me” feature as SketchUp does; this is highlighted in the image on the next page.
Custom 2D content must face the camera
Final Output Options

- **Required Options Dialog Settings**
  - *Hardware Acceleration*
    Go to Application Menu → Options → Graphics tab to make sure *Hardware Acceleration* is turned on. This usually makes navigating the model faster and allows *Realistic Display* and *Ambient Shadows* to work (see below).
  - *Antialiasing for 3D views*
    This setting makes angled lines look much smoother. The drawback is performance. Regens and navigation get noticeably slower. Check out the example images below.

- **3D/Camera view background options (gradient)**
  In a simple 3D or Camera view you can set the background color to a gradient blue. This is done via the Graphic Display Options dialog.

- **Ambient Shadows**
  This feature provides a nice sense of depth to a view, requires *Hardware Acceleration* to be turned on. This may be enabled per view in the *Graphics Display Options* dialog.

- **Realistic with Edges** - close to real-time rendering!

- **Wireframe Overlay (using Adobe Photoshop)**
  This is covered in the video presentation.

---

Basic shaded view for comparison
Ambient Shadows turned on

Ambient Shadows plus Anti-Aliasing for 3D views turned on
Miscellaneous Rendering Tips

- **Using Multiple Computers (using RDP)**
  Each still image rendering can take a few hours to render. If you have multiple stills you are developing for the same project you can use Remote Desktop (RDP) to help speed things along. This is the manual alternative to getting into 3DS Max and its ability to setup an internal render farm.

  This trick allows you to utilize an idle computer in your office. Maybe it is a spare computer, someone on vacation, or overnight use – there always seems to be one or two available in the office. You can log into the idle computer from your desk, get a rendering going and then log out. The rendering will continue to process in the background. If you have enough idle computers, you could have one computer per still image (or animation).

  RDP is built into Microsoft Windows and is basically free. Here are the basic steps to using it:

  1. Start → All Programs → Accessories → **Remote Desktop Connection**
  2. Enter the **name of the computer** you wish to connect to.
     - How to verify computer name: go to the computer, Start → Right-click on Computer → Properties.
  3. Enter your **user name and password**

  You may need to get your IT folks involved for various rights on the system and if you need to do this from outside the office (i.e. firewall). Once you are connected you have the computer’s desktop in a maximized window. Once you start the rendering you can tile the window or minimize it and continue to work on your computer (which is unaffected by the rendering in progress). If you Log Off you will end the rendering. But if you click the “X” at the top (for the RDP title bar) you will disconnect from the session, but the rendering will continue.

  **TIP:** open the model Detached From central on the remote computer just before starting the rendering. This will prevent multiple people showing up in the Worksharing Monitor (WM). In Revit 2011 and previous, you would show up in WM as the person whos computer you are using seeing as the Revit.ini file is shared (this is the file that
remembers the users initials). Also, if you are using ArchVision All Access content you would need multiple All Access licenses to render multiple images.

- **Autodesk Project Neon (cloud rendering)**
  Autodesk Labs has a technology preview called Project Neon, which is a cloud based render engine. This allows you to push the render job to the cloud (i.e. internet) and let Autodesk server farm do the heavy lifting. A rendering that takes six hours on your computer might only take 5-10 minutes using Neon!

  All of the Labs technology previews expire at a certain date. So this may not be an option by the time you read this. However, this may become part of a future version of Revit

  Check out this link: [http://labs.autodesk.com/technologies/neon/](http://labs.autodesk.com/technologies/neon/)

  **FYI:** This process has some limitations with some custom materials and does not work with the RPC All Access render content.