VRAYforC4D PHYSICAL CAMERA  
A rough guide for architectural rendering

Architectural rendering and photography is traditionally best displayed with little or no depth of field and motion blur. They’re effects (like lens flare, lens correction etc) that are different to how the human eye perceives such events. They must be used sparingly and correctly.

Of course, there is no right or wrong in how you opt to use them. Like camera exposure settings, people have their own preferences and favourites.

These short tutorials are just a simple set of standards and guide lines to start from. They can be fully adopted and adapted to suit your own personal style and tastes of rendering.

As Vray has an ON/OFF facility for physical camera sampling (ie, depth of field (DOF) and motion blur (MB)) we’ve split this tutorial into 2 sections to accommodate both states - On and OFF.

The first part concentrates on the physical camera with sampling set to OFF. Because of this, any or all of the 3 physical camera exposure settings can be used to increase or decrease the level of light entering the lens.

The ISO, F-Stop (FS) and Shutter Speed (SS) options each have the same effect, both visually and speed-wise when sampling is off. For this reason you might want to pick a ‘standard’ you’re happy with that best suits the lighting conditions in hand, say - ISO:200 , FS:5.6 , SS:125

then just use the ISO value to increase or decrease light into the camera, (as mentioned, any of the other values, on their own or in conjunction, can also be used to control lighting levels, as each has the same effect if blurring is switched off).

Even though Vray lets you tweak these levels to any value you might choose, it’s not a bad idea to keep your levels or ‘steps’ of exposure to real world standards.

This makes it slightly easier to understand when picking and choosing figures from established exposure tables. (A simple Google search will bring up standard camera lens exposure tables and charts).

Part 1 - Sampling OFF Internals

* Environmental GI (or physical sky if using a physical sun) - start at 1.0 (or 100%). Remember, environmental GI emanates from outside, so it’ll only illuminate the exterior. If you have a lot of glazing or intend the GI to help illuminate the interior this value will need to be increased significantly. This means the exterior will be un-proportionately lit to the interior, so care will be needed to get the lighting correct before rendering.

  * Colour mapping - suggested Reinhard, clamped to 1-1.5, burn value quite low, maybe 0.2 - 0.4
  * Secondary GI bounces - 0.9 to 0.99. We recommend anything less than a value of 1.0. This just takes off any possible ‘edge’ of glare. Saturation and Contrast levels can also be kept more in line with the default of 1.0 (non physical cameras means a lot more playing around with these parameters).
  * Sun light - physiccam multiplier can be left at 1.0. Personally, I also like to disable the phys sky GI (tick Override GI env. box) in favour of the Environmental GI spinner. I like the alternative feel and control I get compared to GI the sky intensity option.

  * Background/reflection images - whether in environmental slots or on planes, these values need to be increased to at-least the 25-30 mark.
  * Environmental lights (sun, in-fills etc) - turn OFF Affect Specular.
  * Direct lights (ceiling lamps, wall spots, IES lights etc) - turn ON Affect Specular.

Compared to using non-physical cameras lighting values in general will be significantly higher to suit real world values. Correct wattage values can also be used for direct lighting.

Your scene can also be light adjusted via the lighting and GI rig if you prefer - camera exposure isn’t the only ‘correct’ method to use. To this effect, in-fill lighting can still be used (ie, lights or portals in window gaps, omnis in darker areas) if still deemed necessary. This isn’t physically correct, but again, it isn’t wrong either. Sometimes these ‘extras’ are needed to get the render completed. It’s a common practise for us at Buzzbox to regularly employ, and you’ll see their effects in nearly all the imagery we produce.

Externals

* Environmental GI - advisable to raise level considerably to fill in or lighten shadow areas. If the GI is left at default 1 (or 100%) with shadows in your scene, the shadow areas will be extremely dark. Too dark. Higher Environmental GI brings these levels up to a more natural state. Try 15-20. LWF rendering also helps.

  * Remember, because of the GI and camera differences between interior and exterior you’ll have a sizeable lighting and exposure difference to overcome. This can be advantageous for both internal and external still photography, giving that ‘bleached’ exterior look and darkened interior feel, but might prove tricky if animating between the two. This is easily overcome using various lighting and camera techniques. To keep matters simple, you might want to use a non physical camera and lighting rig; this can be set up just as realistically as physical rendering and takes the hassle out of these dramatic lighting changes.

  * Colour mapping - as internal but burn values might need to be raised a few units.

  * In externals (and not so much in internals) sun values can be lowered a couple of notches to suit, again, upping GI to compensate. Changing GI contrasts, colour mapping or camera settings can sometimes loose an image’s ‘zing’ or vibrancy, so material saturations and speculars can be adjusted more effectively in these situations.
Part 2 - Sampling ON

This section of the tutorial touches on Depth Of Field (DOF) and Motion Blur (MB).
As previously mentioned, if you have to use it then go easy on it. Too many architectural renderings are ruined by strong or over use of these camera effects. Less (if any) is most definitely more.

DOF and MB are real camera attributes which, unlike the Vray Physical camera, can’t be just switched on or off. This is where the correct combinations and ratios of ISO, F-Stop and Shutter Speeds all come into play. Each influences the other (especially the relationship between F-Stop and Shutter Speed). Standard camera lens exposure tables and charts (that are freely downloadable from Google) will show you the standard stops and intervals between the exposure settings to allow you to achieve the various lens effects you’re after.

Basically:

More DOF = lower or wider F-Stop (and faster Shutter Speed)
More MB = lower or slower Shutter Speed (and higher F-Stop)

Rendered examples

Example 01 - ISO:400, FS:5.6, SS:125
Normal 'noon' sunny daylight conditions, with nominal GI and sunlight strength. Low light emitting internal IES lights added.

Example 02 - ISO:400, FS:5.6, SS:80
Evening/night internal. Background and sunlight have been disabled. The environmental GI has been upped to compensate for lack of direct sun light, luminance value dependant on atmospheric lighting required. This example uses a medium blue tint set at a value of 8.0. The IES lamps have been slightly brightened and the Shutter Speed lowered (or slowed) a bit to enhance the internal/external lighting differences. Alternatively, increasing (opening) the F-Stop or upping the ISO would also have produced the same results.

Example 03 - ISO:100, FS:8, SS:125

Standard bright sunny day. Nominal sunlight, GI set at 15.
Dawn/dusk. Sunlight lowered and shadow softened to suit. Turbidity changed to between 5-7, GI set to a medium blue, strength 12. Colour Mapping burn value upped to 6.5 to achieve correct contrast. ISO upped a notch to let in more light. White balance also used pushed off white towards a yellowish hue, giving a blue evening atmosphere to the scene.

Lower light or ‘in-shadow’ conditions. Settings as Example 03 (external sunny), except camera ISO upped to 150.

In this example the F-Stop has been lowered to dramatically enhance near DOF whilst maintaining the same scene lighting conditions. For less DOF the following camera setting could be used:

ISO:100, FS:16, SS:30

In this case it would be much wiser (and faster) not to use any DOF in the first place.

The next trick is controlling and fine tuning the DOF. What if you want a certain point in your scene in ultra sharp focus whilst the foreground and background are heavily out of focus?
This example uses a medium/strong physical camera DOF. The focal point is the middle pepper pot. It's distance from the camera position (290cm in this case) is entered into the camera's Depth Target Distance box. When rendered we get our expected DOF.

To pin-point your desired focal point (ie, to get our middle pepper pot into sharp focus) we need to significantly increase the camera's Aperture View value whilst maintaining the initial Field Of View value (copy’n'paste will help you out here) and the further the camera is away from the focal point the higher this value will need to be. The focal length will now automatically change to suit.

Example 07 - ISO:200 , FS:2.8 , SS:1000

Example 08 - ISO:200 , FS:2.8 , SS:1000

Example 09 - ISO:100 , FS:16 , SS:30

Motion Blur is achieved by using a slower Shutter Speed with a higher F-Stop value. In an animation, the distance (speed) the camera or objects travel along a path or given time period is also a major factor in determining what strength of Motion Blur you require. And remember your parallax - the closer objects to camera will appear to be faster and blurrier, whereas distant objects might appear to have no blur at all.

and remember, DOF and MB significantly slow down render speeds!