

UNDERSTANDING V-RAY OPTIONS

ARCH2710/6710

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UNDERSTANDING GLOBAL SWITCHES

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Contains overriding properties. Using global switches is both important to ensuring a consistent base rendering, but it is also useful to make quick, large scale changes for testing or other purposes.

Key settings:

Make sure **LIGHTS, SHADOWS, MAPS, FILTERMAPS, GLOSSY EFFECTS** are always checked.

OVERRIDE MATERIALS:

Good to use if you want clay, or all-white, renders. The override material allows you to assign a color to all objects in the scene, without having to un-apply existing materials.

You can choose to uncheck Filter Maps, as this will skip the image filtering process, speeding up the render.

Global switches

Section	Setting	Value / State
Geometry	Displacement	<input checked="" type="checkbox"/>
	Force back face culling	<input type="checkbox"/>
	Lighting	
	Lights	<input checked="" type="checkbox"/>
	Hidden lights	<input type="checkbox"/>
	Default lights	<input type="checkbox"/>
	Shadows	<input checked="" type="checkbox"/>
	Show GI only	<input type="checkbox"/>
Indirect Illumination		
	Don't render final image	<input type="checkbox"/>
Misc.		
	Low thread priority	<input checked="" type="checkbox"/>
	Batch render	<input type="checkbox"/>
	Progress window	<input checked="" type="checkbox"/>
Raytracing		
	Secondary ray bias	0.001
Materials		
	Reflection/refraction	<input checked="" type="checkbox"/>
	Max depth	<input type="checkbox"/> 5
	Max transp levels	50
	Transp cutoff	0.001
	Maps	<input checked="" type="checkbox"/>
	Filter maps	<input checked="" type="checkbox"/>
	Filter maps for GI	<input type="checkbox"/>
	Glossy effects	<input checked="" type="checkbox"/>
	Override materials	<input type="checkbox"/>
	Override color	X
Asset transfer		
	Transfer assets	<input checked="" type="checkbox"/>
	Use cached assets	<input checked="" type="checkbox"/>
	Abort on missing asset	<input checked="" type="checkbox"/>

UNDERSTANDING SYSTEM

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Contains settings pertinent to rendering quality, speed, and distributed rendering.

Key settings:

Max Tree Depth; if not enough memory is available while rendering, the max tree depth can be reduced to prevent this, at a loss of performance.

Render region division; controls your "bucket size." For single computer rendering, default of 32 is fine. For distributed rendering, the bucket size can be decreased to a critical point, depending on number of processors that are rendering the image. This will achieve optimal performance.

System	
Raycaster params	
Max tree depth	80
Min leaf size	0.0
Face/level coef	1.0
Dynamic memory limit	0
Default geometry	Auto
Render region division	
X	32
Y	32
Means	Region W/H
Region sequence	Triangulation
Reverse sequence	<input type="checkbox"/>
Distributed rendering	
On	<input checked="" type="checkbox"/>
Hosts	...
Don't use local machine	<input type="checkbox"/>

Distributed rendering; use the School of Architecture's render farm to greatly decrease your rendering time by sending parts of your image to be rendered by a non-local host.

Check "Don't use local machine" if you want maximum performance during your render.

Check "Hosts" and add the School Architecture's servers:

128.143.138.81

128.143.138.82

...

through

128.143.138.88

Select added servers, then click "Resolve Servers." Exit window.

UNDERSTANDING CAMERA

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Set camera properties identical to a physical, real-world camera.

Key settings:

Shutter speed, F-number, Film speed (ISO), Depth of Field.

Following real camera "rules," the shutter speed changes the amount of light allowed into the camera between shutter clicks; the F-number determines aperture width; and the film speed determines the sensitivity of film to light.

Shutter speed: faster/slower = darker/brighter = sharp/ blurry (with motion)

F-Number: higher/lower = darker/brighter

ISO: higher/lower = brighter/darker

Starting place, daylight exterior: Shutter speed 400, F-Number 6.8, ISO 200

Vignetting and Depth of Field, while available, can be done the same, if not better, in Photoshop and unnecessarily compromise rendering performance. If post processing is desired for DOF, make sure to render a Z-Depth layer from your VFB.

The image shows a software interface for camera settings, divided into two main sections: "Camera type" and "Physical camera".

Camera type section:

- Type: Pinhole (highlighted in a red box)
- Height: 400.0
- Override FOV: 0.6194
- Dist: 2.0
- Auto-fit:
- Curve: 1.0

Physical camera section:

- On:
- Override focal length: 56.181
- F-number: 6.8 (highlighted in a red box)
- Specify film width: 36.0
- Film speed(ISO): 200.0 (highlighted in a red box)
- Type: Still Camera
- Distortion: 0.0
- Shutter speed: 400.0 (highlighted in a red box)
- Zoom factor: 1.0
- Shutter angle: 180.0
- Lens shift: 0.0
- Shutter offset: 0.0
- Vignetting: 0.0
- Latency: 0.0
- Exposure: (highlighted in a red box)
- White balance:

UNDERSTANDING ENVIRONMENT

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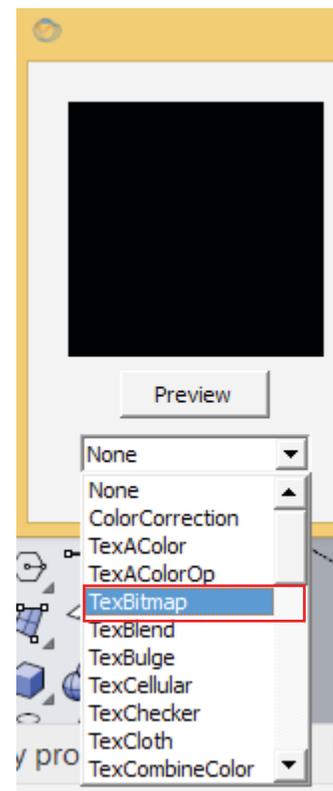
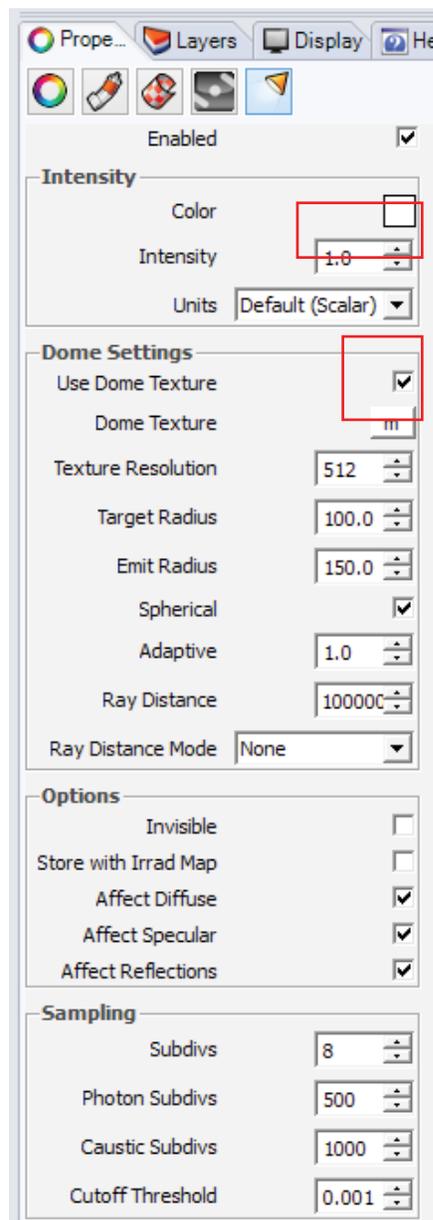
Contains basic global settings for lighting, reflection, refraction. Used to set backgrounds as well.

ALTERNATIVE:

DOME LIGHT WITH HDRI TEXTURE APPLIED (POSSIBLY PAIRED WITH A PROPERLY ALIGNED SUN)

STEPS:

This is the same process as applying an HDRI map through the environment slot. Add a V-Ray Dome light. Select Properties and enter the V-Ray light sightings. Check "Use Dome Texture." Add image through "TexBitmap" option. Depending on the image, you may have to lower/raise the gamma value (for a good, high quality HDRI, drop gamma to .75 for a bigger punch). Exit Window. Control the image's light through its intensity and the camera settings.



UNDERSTANDING ANTI-ALIASING

ARCH2710/6710

Control the way sampling for smoothing and edges occurs, in particular regarding color and intensity.

IMAGE SAMPLER:

Fixed Rate: takes the same number of samples per pixel.

Adaptive DMC: adaptively determines the sample number per pixel, based on intensity.

Adaptive Subdivision: adaptively determines the sample number per pixel, based on intensity, using a grid-like subdivision (mix of fixed and adaptive).

What to use?

Fixed: just don't use this.

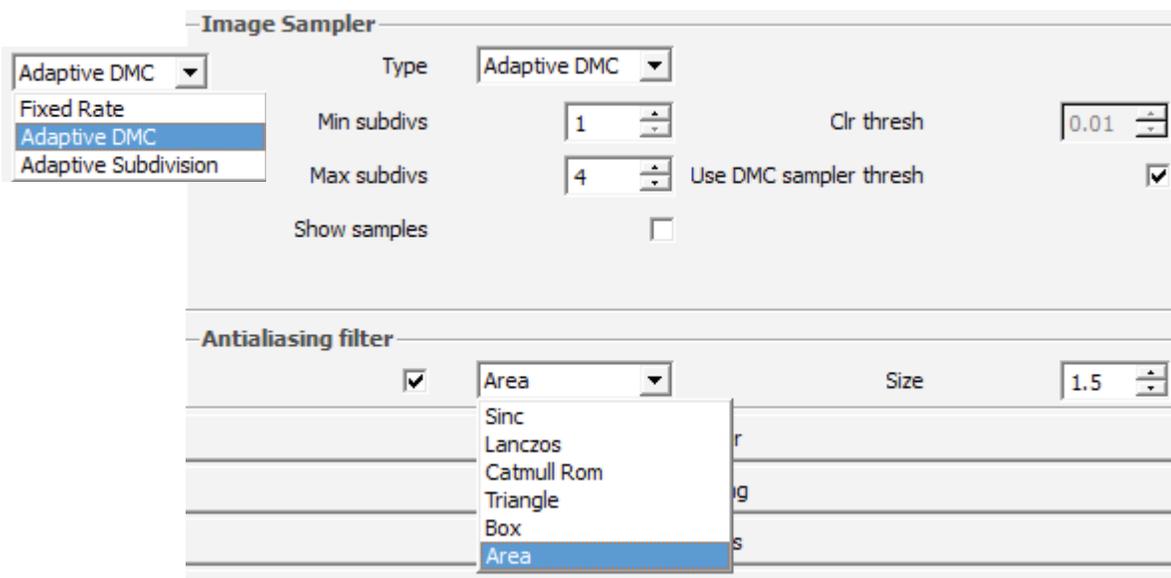
Adaptive DMC: Use all times except when your image has a LOT of bump maps, displacement, lights etc.

The cost of adaptively calculating each pixel for an extremely complicated scene is high.

Adaptive Subdivision: Use as a replacement for Adaptive DMC.

Always use sampler threshold.

Min/Max: affects quality. Increasing/decreasing values exponentially increases/decreases render time, so use with caution. For testing, use 1/4. For final rendering, consider bumping to 2/4, 2/8, or 4/16 (although expect performance costs).



FILTERS:

AREA: slightly blurs the image. Larger size, more blurry. Can be used to achieve a "foggy lens"

SINC: crisp edges, but doesn't "sharpen" like Catmull Rom.

CATMULL ROM: edge-enhancing. Can produce "moire" effects. Used for arch viz.

SIZE determines subdivision/quality level.

You can't go wrong with the Sinc filter. The Area filter is slightly generic, and the Catmull Rom will produce sharper edges. But, if you use a Sinc filter, sharper edges can be applied during post production.

UNDERSTANDING COLOR MAPPING

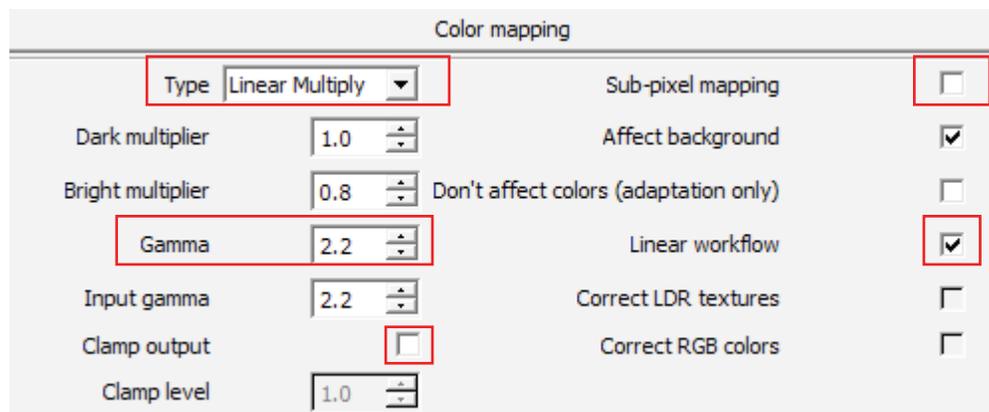
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Effects global light and color properties within the render. This applies “mapping” to all values, according to the properties selected.

LINEAR WORKFLOW: the only way to obtain natural light falloff particularly for interiors. LWF ensures that exterior lights fills all corners of the interior, without unrealistically cranking the lights up.

Color map: Linear Multiply, Gamma 2.2, turn off sRGB in VFB (avoids burning in the gamma correction). De-activate sub-pixel mapping and try not to clamp the renders. This ensures that the raw rendering has the largest possible dynamic range.

You could also use Reinhard color mapping to give an overall more pleasing image than Linear Multiply, although this also restricts the dynamic range available for post production.



UNDERSTANDING VFB

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This is the best way to perform post-production renderings.

Select each layer that you wish to save as a separate image file along with the raw render. Each layer is isolated, and only contains the elements from that layer.

Load the layers into Photoshop simultaneously using Adobe Bridge.

Select all the images you wish to load within Adobe Bridge > Tools > Photoshop > Load Files Into Photoshop Layers...

Layers that are the most useful:

ALPHA: allows easy selection of voids, backgrounds.

BACKGROUND: allows editing of background.

DIFFUSE: alter material colors.

GI: alter global lighting

MATERIAL ID: select individual elements

MATTE SHADOW

REFLECTION

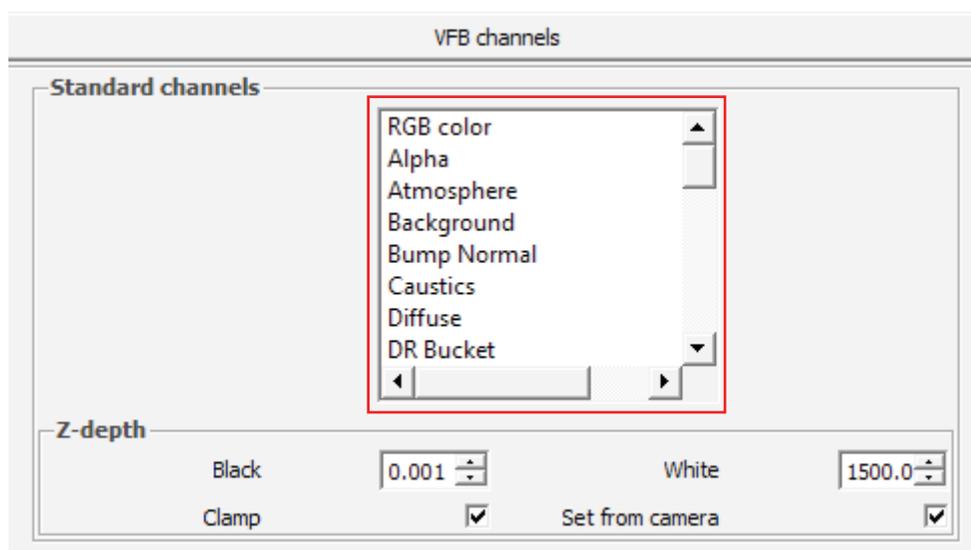
REFRACTION

RAW LIGHT

SHADOW

VRAY MTL REFLECT

ZDEPTH: used to fake DOF in post-production.



UNDERSTANDING OUTPUT

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For test renderings, use a output size around 800x600 pixels. For final production renderings, use a size larger than 1920x1080 but not larger than 4k in width or height (this is unnecessarily large for our applications).

Select location to save output file.

UNDERSTANDING GI

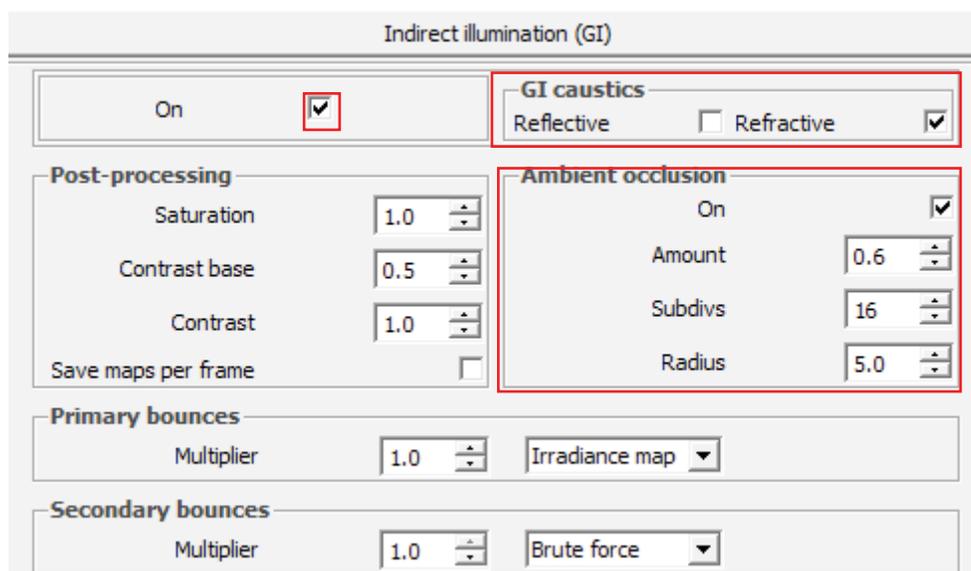
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Don't mess with this stuff. Changing the post-processing values is unnecessary, as you should just alter saturation/contrast through either your camera settings, or post in Photoshop. Changing your bounce multipliers from anything other than 1 creates a non-physically accurate result.

CAUSTICS: Caustics are only necessary in some situations, primarily whenever light is traveling through glass onto another surface, and then that surface that is affected is visible. If you are rendering a completely concrete room with no reflections coming from light off a glossy surface, turn off caustics.

Caustics is a very costly calculation. Turning on reflective and refractive caustics will greatly slow your rendering. Be conscious of your decisions to use caustics. When used, the results produced are highly realistic, but they come at a time cost.

AMBIENT OCCLUSION: This is great for clay renderings and increasing shadows. Use sparingly though. Turn on ambient occlusion, slightly lowers the amount, boost the subdivisions and do tests to determine the appropriate radius. You want the ambient occlusion to highlight dark corners and shadows on edges.



UNDERSTANDING IRRADIANCE MAP+BRUTE FORCE

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The irradiance map and brute force options are tricky, confusing, and somewhat over-complicated.

There are two things that should be noted:

Basic Parameters: Min/Max Rate

Controls the number of prepasses, and the number of final passes. Setting the Min value at -4 means that the resolution of the first pass will be $\frac{1}{4}$ the resolution of the final image. If you set it to 0, you will be calculating your image in one or two single goes - do this if you are confident of your settings!

The Max controls the resolution of the final GI pass.

Brute Force GI:

Determines the number of samples used for GI calculations. Any increase in subdivisions results in an exponential increase of rays, so increase sparingly. The number of bounces determines the number of bounces per ray before the calculation is complete - a higher number of bounces results in more accurate lighting, but at a much greater cost.

PRO TIP: Use the presets at the top of the option editor to set a starting point for IR, GI and BF. Then, go in and check that the settings are suitable/not excessive.

The image shows a software interface for rendering settings, divided into two main sections: "Irradiance map" and "Brute force GI".

Irradiance map settings:

- Basic parameters:**
 - Min rate: -4 (highlighted with a red box)
 - Max rate: -1 (highlighted with a red box)
 - HSph. subdivs: 50
 - Interp. samples: 20
 - Clr thresh: 0.4
 - Nrm Thresh: 0.3
 - Dist thresh: 0.1
 - Interp. frames: 2
- Detail enhancement:**
 - On:
 - Scale: Screen
 - Radius: 60.0
 - Subdivs mult: 0.3
- Options:**
 - Show calc phase:
 - Show direct light:
 - Show samples:
 - Use camera path:
- Advanced options:**
 - Interpolation type: Least squares fi
 - Sample lookup: Density-based (
 - Calc pass interp samples: 15
 - Multipass:
 - Randomize samples:
 - Check sample visibility:
- Mode:**
 - Mode: Single frame
 - File: [] ...
- On render end:**
 - Don't delete:
 - Auto save:
 - Auto save file: [] ...

Current map:

- Save
- Reset
- 0 samples
- 0.0 MB

Brute force GI settings:

- Subdivs: 8 (highlighted with a red box)
- Bounces: 3 (highlighted with a red box)

UNDERSTANDING CAUSTICS

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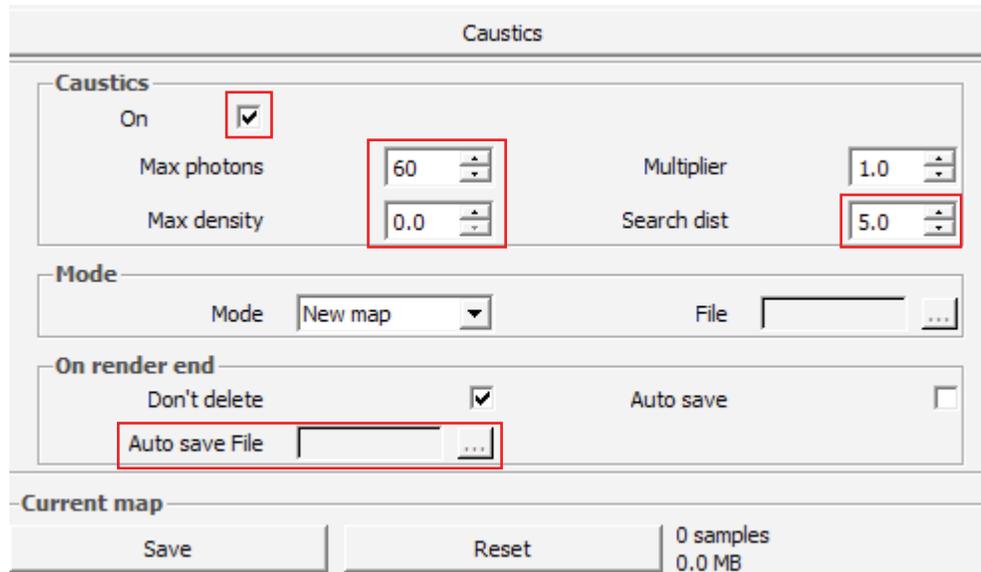
As mentioned above, caustics should only be used when it is critical to the scene (i.e. rendering a set of glassware on table top next to a reading light).

Max photons determines the quality of the caustics.

Max density limits the extent of the photon map while maintaining quality. Increase to decrease caustic rendering time.

Search dist controls the radius of the search map. Smaller = sharper/noisier. Larger = smoother/blurry.

If you do one rendering with caustics on, you can save the photon map somewhere that you can access later. If you want to re-render your scene with different settings applied, you can load the photon map back into V-Ray, and V-Ray will only calculate photons that have been changed - saving lots of time.



UNDERSTANDING DISPLACEMENT

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Edge length: determines overall quality of displacements applied (global setting). **More sub-triangles means more RAM usage, more displacement detail, and slower rendering times. Less sub-triangles means lower displacement quality but less RAM usage and faster rendering times.**

Max subdivisions: use with caution! This number should not get much higher than this. This value determines the number of subdivisions performed on the original mesh. If you require a high number of subdivisions, it is better to lower this value and subdivide the base mesh before rendering.

Amount: 1 is the equivalent to the displacement settings on each material with displacement. Values less than one reduce the amount of displacement (globally), and values greater than 1 increase the amount of displacement.

Default displacement			
Override on	<input type="checkbox"/>		
Edge length	<input type="text" value="4.0"/>	Amount	<input type="text" value="1.0"/>
View dependent	<input checked="" type="checkbox"/>	Relative to bbox	<input type="checkbox"/>
Max subdivs	<input type="text" value="256"/>	Tight bounds	<input checked="" type="checkbox"/>

FINAL TIPS

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Real renderings come from real properties.

MAKE THE WORLD REAL

Model to real-world scale, model with detail, model everything that will be noticed and seen.

MAKE THE LIGHTS REAL

Your home is not lit by a single light. It may only have one light on, but there is ambient light from the windows, other rooms and the exterior that are lighting the space. You cannot forget to include these.

MAKE YOUR CAMERA REAL

If your render is too dark, don't increase the lights. Set your lights to be realistic, real world values. Adjust the shutter speed and exposure of your camera in order to light correctly.

I always set up my renderings in the same process:

1. Model
2. Light until near-final results are achieved.
3. Materials
4. Check lights again.
5. Test renders for material qualities.
6. Adjust lights, camera settings and material properties (diffuse values, reflection, refraction).
7. Final render with many VFB layers.
8. Post-production in PS.

Lastly, use the V-RAY RT renderer to your advantage. This allows you to see instantaneous updates to lights, materials, and your model. It allows for a much faster workflow than clicking render and waiting every time.