

# 1. Rendering

---

## 1.1. Introduction

ARCHLine.XP provides an integrated powerful, easy-to-use rendering and visualization technology based on the latest release of LightWorks product.

This photorealistic-rendering engine includes a physically based lighting model supported by advanced sky, analytical anti-aliasing, ray-trace algorithms, and a range of global illumination techniques. This release contains High Dynamic Range Images, or HDRIs, which makes easy Image Lighting and scene creation.

### 1.1.1. 64 bit rendering support

ARCHLine.XP 2013 or later version comes with extended 64 bit rendering engine. ARCHLine.XP rendering engine runs on Windows 7 32-bit and 64-bit, and Windows XP 32-bit operating system. The 64-bit version is able to access larger amounts of memory than 32-bit, providing customers increased efficiency, which is particularly useful for those working with very large and complex 3D models and lot of lights.

### 1.1.2. More about rendering

Techniques and quality of rendering can differ. We would like to introduce the background of this technology in the followings.

#### **Ray tracing**

Ray tracing is a technique for generating an image by tracing the path of light through pixels in an image plane. The technique is capable of producing a very high degree of photorealism.

See more: [http://en.wikipedia.org/wiki/Ray\\_tracing\\_\(graphics\)](http://en.wikipedia.org/wiki/Ray_tracing_(graphics))

#### **Global illumination**

Global illumination is a general name for a group of algorithms used in 3D computer graphics that are meant to add more realistic lighting to 3D scenes. Such algorithms take into account not only the light which comes directly from a light source (direct illumination), but also subsequent cases in which light rays from the same source are reflected by other surfaces in the scene, whether reflective or none (indirect illumination).

Theoretically reflections, refractions, and shadows are all examples of global illumination, because when simulating them, one object affects the rendering of another object.

See more: [http://en.wikipedia.org/wiki/Global\\_illumination](http://en.wikipedia.org/wiki/Global_illumination)

#### **Global illumination – Colour bleeding**

The transfer of colour between nearby objects is caused by the colour reflection of indirect light. This is a visible effect that appears when a scene is rendered with Radiosity.

See more: [http://en.wikipedia.org/wiki/Colour\\_bleeding\\_\(computer\\_graphics\)](http://en.wikipedia.org/wiki/Colour_bleeding_(computer_graphics))



*Ray tracing*



*Global illumination*

#### **Radiosity**

Radiosity is a global illumination algorithm, an application of the finite element method to solving the rendering equation for scenes with surfaces that reflect light diffusely. In the renderer there are lower level and higher level radiosity settings. Lower level radiosity is a fast method while higher level radiosity takes longer to calculate.


In practice Radiosity helps better representing the shading and lights in dark areas especially when these are barely lit or not even lit by direct light only diffuse light. A good example is a dark room which has a window to an

open brightly lit area, but the light source or that area doesn't cast any light directly into this space. In this case Radiosity solution provides a better and very likely brighter representation of the walls, ceiling and other surfaces.

### 1.1.3. Usage of rendering

You can make photorealistic pictures with 'rendering' icon.



 Icon is active if you work in the 3D window  
If you click on the icon you will see the 'rendering' control panel.



## 1.1.4. Rendering Settings

### 1.1.4.1. Image size

320x240 (0.08 MPixel)
400x300 (0.1 MPixel)
640x480 (0.3 MPixel)
768x576 (0.4 MPixel)
800x600 (0.5 MPixel)
1024x768 (0.8 MPixel)
1280x960 (1.3 MPixel)
1400x1050 (1.5 MPixel)
1600x1200 (1.9 MPixel)
854x480 (Widescreen 16:9 - 0.4 MPixel)
1280x720 (Widescreen 16:9 - 0.9 MPixel)
1366x768 (Widescreen 16:9 - 1.0 MPixel)
1920x1080 (Widescreen 16:9 - 2.0 MPixel)
Custom
Window size

#### **Standard size**

You can use from the standard sizes in the list. The Window size option will make the software use the 3D window content size for rendering. This option is very useful when you would like to see the same part of the scene in the 3D view and on the rendered image.

#### **Width**

The width of the final image in pixels. You can use custom values as well .

#### **Height**

The height of the final image in pixels. You can use custom values as well .

### 1.1.4.2. Quality settings

Quality settings	
Templates	Custom
Ray Tracing	Medium
Global Illumination	Interior
Radiosity	Disabled
Shading accuracy	4000 mm (Fine shading quality)
Antialiasing	<input checked="" type="checkbox"/>
Shadow type	Hard shadows

#### **Ray Tracing**

Ray Tracing displays the model with tracing the path of direct light through pixels in an image plane. Higher quality will improve accuracy at the expense of performance."

#### **Radiosity**

Radiosity represents real-world lighting situation. It calculates the amount of lights distributed from each surface to every other surface. This method is also capable to calculate colour bleeding on surfaces. 'High' template will improve accuracy at the expense of performance."

See more: [http://en.wikipedia.org/wiki/Radiosity\\_\(3D\\_computer\\_graphics\)](http://en.wikipedia.org/wiki/Radiosity_(3D_computer_graphics))

#### **Visible model size**

You should set up this value to approximately the main, visible part of the model. Reducing this value will improve accuracy at the expense of performance.



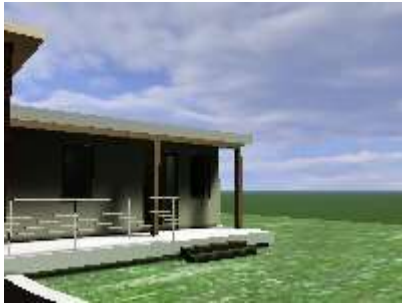
Large visible model size



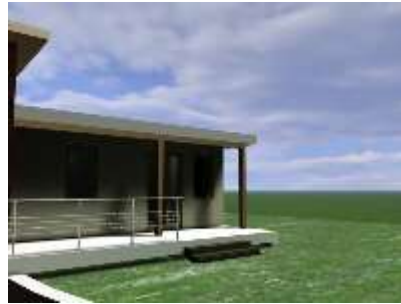
Small visible model size

#### **Anti-aliasing**

With the help of Anti-aliasing, the edges of a rendered scene will be more realistic, smoother.



Without anti-aliasing

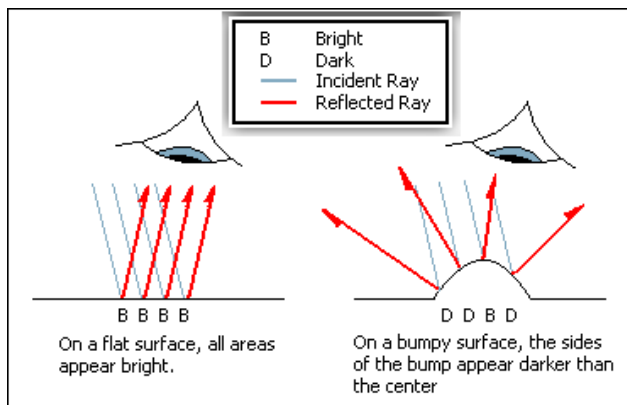
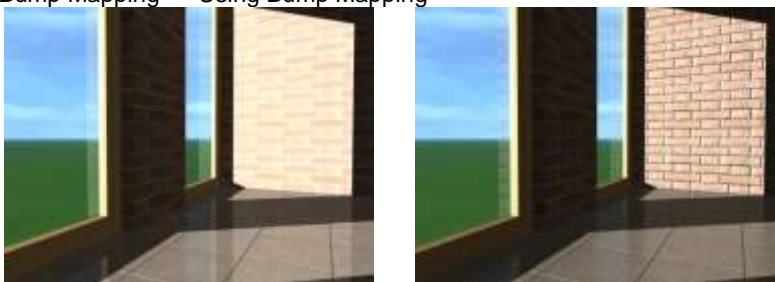


Using anti-aliasing

### Bump Mapping

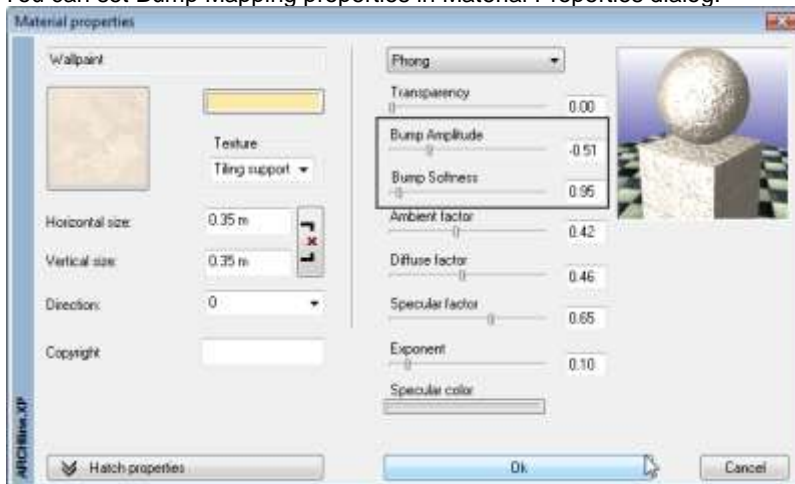
Bump mapping is a technique used to add more realism to images without adding a lot of geometry. Texture mapping adds realism by mapping images to geometric surfaces. Bump mapping adds per-pixel surface relief shading, increasing the apparent complexity of the surface. This uses lighting properties and indicates which parts are dark and which are light on a texture, making it look more geometrically complex because of light refraction.

Without Bump Mapping      Using Bump Mapping



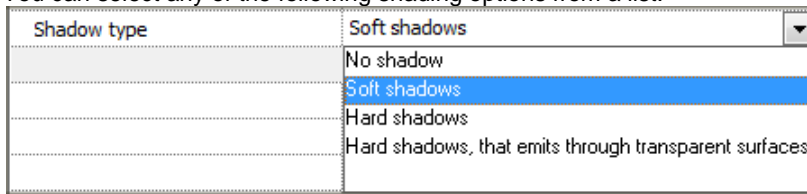
See more > <http://www.tweak3d.net/articles/bumpmapping/>

You can set Bump Mapping properties in Material Properties dialog:

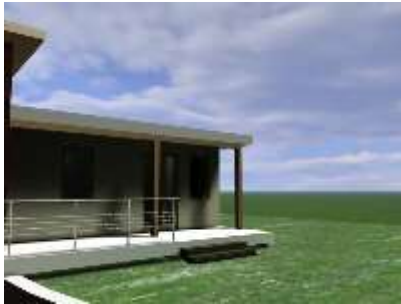


### Shadows type

You can select any of the following shading options from a list:



Calculating shadows may slow down the rendering process, but provides more realistic images.



Soft shadows



Hard shadows

### 1.1.4.3. Light effects

Light effects	
Realistic Sun	User defined - Azimuth: 235.00 Zenith: 60.00
Sky	Day - Clear Sky
Ambient light	50 lx (Dawn, sunset)
Brightness	0%
Contrast	0%
Use light solids	<input checked="" type="checkbox"/>
Use Lights	<input checked="" type="checkbox"/>

### Lights

You can change the values of the artificial light sources, represented in your model before rendering or you can switch off all the lamps or groups of the lamps.

Lumen based estimation of lights

Unlike the definition of previous versions the source of light is defined by lumen flux units.

The below chart shows the utilization of different light sources which gives us practical help in defining flux (lumen) according to different lamp types. In ARCHLine.XP source of light's type is based only on incandescent lamp.

**Luminous efficacy** = Ratio of luminous flux emitted from a light source to the electric power consumed by the source lumen per watt lm/W

Light source type	Luminous efficacy (lm/W)	Light source emission (Lumen)
Incandescent 100 W (220 V)	14,4	1440
Halogen 100 W (220 V)	17	1700
Compact fluorescent 9–26 W	57–72	513-1872
Metal halide lamp	90	
High pressure sodium lamp	85–150	
Low pressure sodium lamp	100–200	

See more: <http://hu.wikipedia.org/wiki/F%C3%A9nyforr%C3%A1s>

### Sun

You can set sun by defining the geographical location, the north direction, the date and the time, or you can set the sun to an optional position.

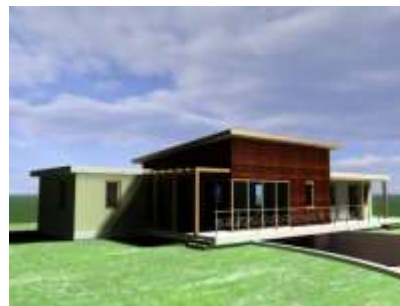
### **Sky**

You can choose the aspect of the sky that influences the light from outside in HDRI panoramic images background.

Sky	Day - Partly Cloudy
User defined ambient light	Dawn
Ambient light	Day - Clear Sky
⚡ <b>Background properties</b>	Day - Partly Cloudy
	Day - Heavy Cloudy
User defined background	Sunset
Sky	Night - Partly Cloudy
Sky-type influences the environment at	Night - Heavy Cloudy

Panoramic background affects the light coming from the surroundings. HDRI panoramic background not only shows the realistic appearance of any models, but even more. With its help very near to reality it shows different light distributions. For example if we display a certain picture with morning light we will get totally different light conditions such as we try it with sunset lights where the rays will give slightly red colour light.

### **Prospective in different panoramic backgrounds.**



### **User defined ambient light**

Using this option you can set unique ambient lights. Basically the HDRI panoramic background's ambient light is shown in the picture which can be chosen at the „sky” option. The unit of lighting is in Lux. (lighting is 1 Lux if 1 Lumen flux is perpendicular to 1 m2. 1 Lux is equal to the light of full moon and lights at noon is roughly equal to 30,000 Lux)

Ambient light in bigger volume is increasing lighting in the picture. The disadvantage is that it is decreasing the contrast of tones.



*Low ambient light*



*High ambient light*

### **Camera light**

With the camera light you can switch on and control the camera's high light. A light source is emitting light from the view position. No shadows are ever cast from a camera light. It can be well used for lighting dark or under lighted places. The light unit is defined in lux.

In use of radiosity the camera light is going to switch off automatically.

#### Light solids

The source of the light is usually not visible on renders, as they have no visible bodies in 3D space. By enabling the Use light solids option, the software will generate tiny fake-light source-bodies where the light sources are present.

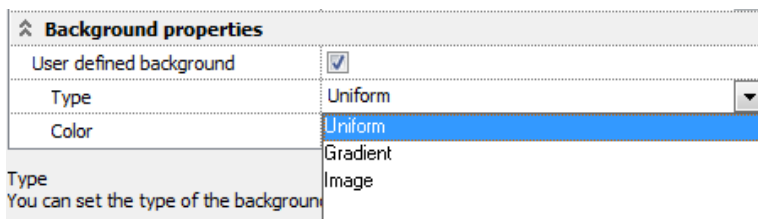


Light solids OFF



Light solids ON

### 1.1.4.4. Background type



#### **User defined background**

The image background can be monochrome, uncoloured or an imported picture. If you switch off the user defined background option, you will see the HDRI panoramic background that has been chosen for 'sky' option. In case of switching it on you can set properties of the image background behind the model.

#### **Plain**

Use this scroll down menu or the colour dialog box to set background colour.

Set background colour with the colour table.

#### **Graduated**

Define a top and a bottom colour to set the background colour of the image. The colour of the background will change gradually from the top colour to the bottom colour.

Set the top and the bottom colour of the background in the colour table.

#### **Image**

You can load an image into the background of rendering.

In the **Open image** dialog box select the appropriate background image.



Plain



Graduated



Image

## 2. Rendering with post-processes

The simple interface of the ARCHLine.XP Render is offering ready-made templates to quickly set up the quality of the final image. The image is rendered with a progressive rendering method which gives you the ability to have an idea of the full image and make decisions based on that even at the initial phase of the rendering. You can also zoom and pane the image while it is still not finished to check the smallest details.



If that is necessary, you stop the rendering at any time; you can make fundamental changes and start another render without closing the renderer.

The post-processes are extremely useful as they allow you to make changes on the image even during rendering, so you can fine-tune features like brightness, contrast or many more without having to save the image and open it in an image manipulator tool.

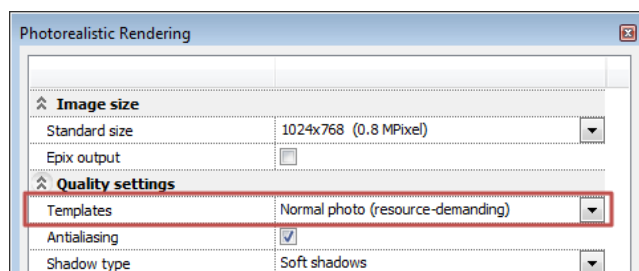
## 2.1. Progressive rendering

The image is rendered with a progressive method. This means that the initial phase of image rendering the Renderer shows a very coarse approximation of the final result. This result is becoming better by time approaching the final image. The progressive gives you a great opportunity to make decisions of the image even when there is plenty to calculate and you do not have to wait until the full image is rendered totally. In contrast to scan line rendering when the image is processed in one step from top to down this can save plenty of time for you when doing the test renders.



## 2.2. Render Templates

Render templates are ready-made pre-sets of Ray tracing, Global illumination, Radiosity and Shading accuracy values for your convenience. Professional users still have the option to tweak all the setting by selecting the Custom template. Render templates can be found in the Quality settings paragraph of the Photorealistic Rendering dialog.



You can choose the following templates:

- ❖ Simple ray trace
- ❖ Fast photo
- ❖ Normal photo (resource-demanding)
- ❖ Detailed(resource-demanding)
- ❖ Custom

As the names suggest there are simpler and rather detailed templates, very likely giving better results for longer render time. The largest difference between these templates is that the shading and lighting calculations become more accurate towards higher quality settings. In the name of Normal photo and detailed template it is highlighted that these demand more resources than the others, meaning that using

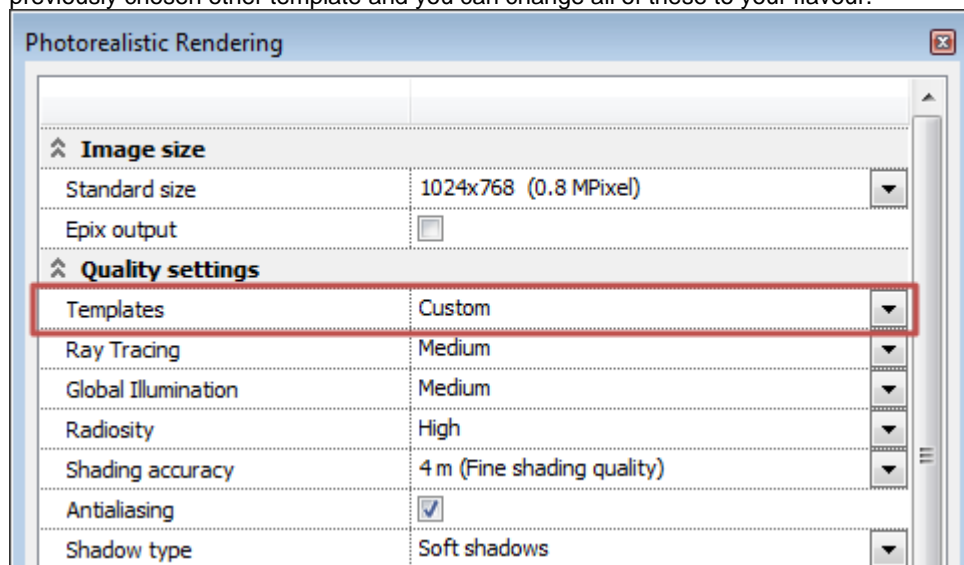
these the render time will very likely be longer. In case of using the Detailed template the render time is very likely be the longest - based on real life experiences this means double or longer time compared to Normal. Comparing the results of these two templates you will see better and more accurate shading and contact shadows between surfaces in favour to the Detailed render template.



Fast photo template  
Simpler shading and diffuse lighting representation  
❖ Rendering takes relatively short time

Detailed template  
More accurate shading and diffuse lighting representation  
❖ Rendering takes longer

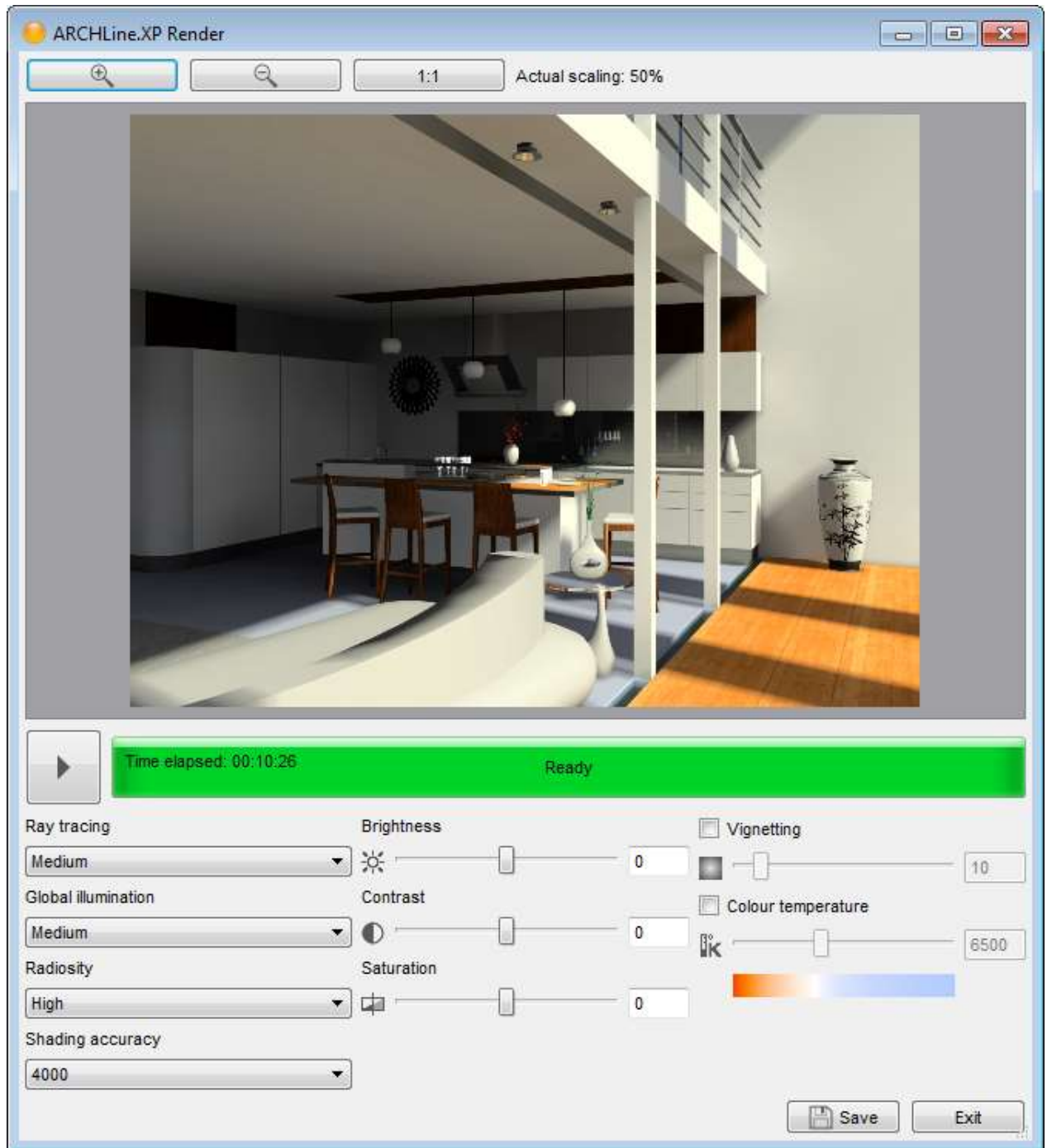
For professionals there is the Custom template. If you choose this template you will see the details of a previously chosen other template and you can change all of these to your flavour.



The Custom template lets you tailor these settings to perfectly match you current scene. This way you can save render time and you may also have better details in some cases if the ready-made templates are not ideal for special scenery.

An example: In some cases, if the Shading accuracy is too high for the actual scene, the image might not be rendered at all. If this happens the renderer will give you a warning message, you can select the Custom template and select or type a smaller value in the Shading accuracy field to be able to create a rendered image.

## 2.3. The ARCHLine.XP Render Interface



### 2.3.1. Image area

The largest part of the ARCHLine.XP Render interface is occupied by the Image area and Zoom tools. At the initial phase of rendering the Image area represents a snapshot of the scene to be rendered. The final image starts to be processed over the top of this snapshot once the calculations reach a certain level.

#### **Zoom image**

The image represented in the Image area can be zoomed and panned even during the rendering process. To zoom in or out use the Zoom buttons at the top of the Image area. You can also zoom the image by simply hovering your mouse over the image area and using the mouse scroll-wheel. Scroll up to zoom in and scroll down to zoom out. The current zoom ratio is represented next to the zoom buttons on the right hand side. To see the image in real size, just click on the 1:1 button.

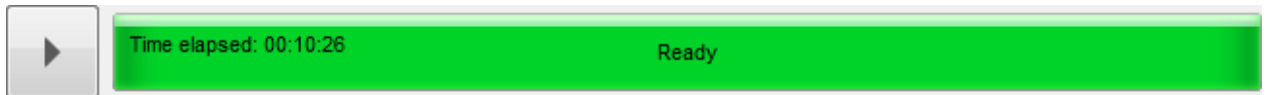
### Pan image

If the represented image is larger than the Image area you can pan it even during rendering. To pan the image hover your mouse over the Image area, press and hold the scroll-wheel and move your mouse.

### Stop / Re-render button

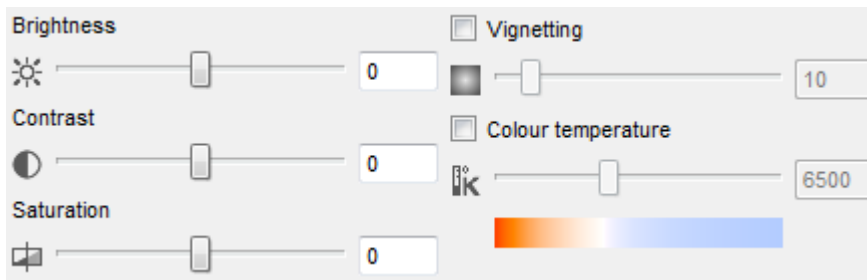
At the bottom of the Image area you can find the Stop / Re-render button on the left hand side. If you push it during rendering, the process will be stopped immediately. When rendering is finished normally or stopped by the user, all the quality settings become editable under the Stop / Re-render button. If you make changes you can push the Re-render button to render a new image with these changes.

### Progress bar



Right under the Image area you can see the Progress bar. The Progress bar is providing information about what actually happens. When the renderer appears model initialization starts. During this there is no rendering yet, only a snapshot of the model appears. When the calculations start you can see information about the time elapsed, the percentage of readiness of the whole rendering process and the estimated time left on the progress bar.

## 2.3.2. Post-processes



Once the image is ready some of its features are often need some fine tuning. The post-processes of the ARCHLine.XP Render are a great help in this job. Using the post-processes of the renderer you can change the brightness, contrast and many other features of the image, even on the fly when the renderer is still working.

### Brightness

Use the Brightness post-process to change the image brightness even while the image is still rendering. Use the slider or type a specific value between -100 and +100 to see a darker or brighter version of the rendered image.

Note: The Brightness post-process is not the same as the Brightness value of the Photorealistic Render settings dialog. The main purpose of the post-process is to give you an additional tool to change the brightness of an image that was already rendered with specific render settings. This setting has no effect on the quality of lighting – while the Brightness option in the Photorealistic Render Settings dialog actually has.



Brightness: -100



Brightness: 0



Brightness: 100

### Contrast

Use the Contrast post-process to change the image contrast even while the image is still rendering. Use the slider or type a specific value between -100 and +100 to see a different version of the rendered image. Note: The Contrast post-process is not the same as the Contrast value of the Photorealistic Render settings dialog. The main purpose of the post-process is to give you an additional tool to change the

contrast of an image that was already rendered with specific render settings. This setting has no effect on the quality of lighting – while the Contrast option in the Photorealistic Render Settings dialog actually has.



Contrast: -100



Contrast: 0



Contrast: 100

### **Saturation**

Use Saturation post-process to change the saturation of a rendered image. If you lower saturation, the image will tend to lose its colours. If you increase saturation you can boost the colour saturation of the image even over the normal level.



Saturation: -100



Saturation: 0



Saturation: 100

### **Vignetting**

Use the Vignetting post-process to make the corners and edges of the image a bit darker. This post-process also can be turned on or off.



Vignetting: OFF



Vignetting: 50



Vignetting: 100

### **Colour temperature**

Use the Colour temperature post-process to create a warm-tone or a cool-tone version of the same image. Colour temperature is measured in Kelvin. Lower values result in warmer colour tones (deep orange tones) and higher values result in cooler colour tones (sky-blue tones). Using this post-process you can create different colour tone versions of the same image without having to change the real light colours of the whole scene.



Colour temperature:  
3500 K



Colour temperature:  
6500 K



Colour temperature:  
9500 K