All about Luxology Environments

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What is an Environment?

An environment is simply your surroundings; if you look around the space where you are sitting, everything that you see is your current environment. Getting up and moving to a different position would result in your environment changing. In MicroStation, the environment you specify can provide indirect light, reflections and refractions to your scene. As this document will illustrate, these extra touches are key to creating believable images.

However, there's one important caveat before we get started with Luxology environments. If you're rendering an interior scene, it's only worthwhile to use an environment if there is at least one opening that allows in light from the outside (this can include geometry with transparency or translucency). If no light from outside the scene is able to enter the room, there won't be any illumination, reflections or refractions visible from the environment and the Luxology engine may perform unnecessary calculations, potentially lengthening the time needed to complete rendering. Rather than use an environment, instead try to populate the scene as realistically as possible with furniture, paintings and other objects. These will provide the reflections and refractions that an environment would otherwise.

Side note: if you're in need of models for these incidental objects, an excellent resource is the Entourage community here on the Be Communities. It features models from both Bentley Systems and Bentley software users, with more added each day. It costs nothing to join, so anyone with even a passing interest in visualization using Bentley products should definitely be a member.

Getting Started with Environments

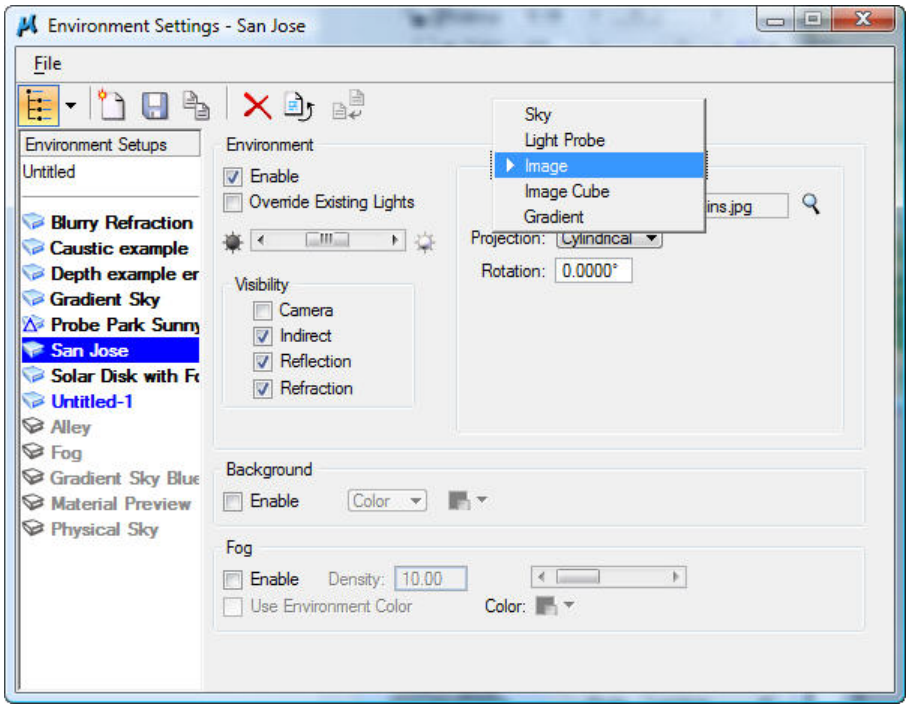
By default, each design file opened with MicroStation will have the following named environments available: **Alley**, **Fog**, **Gradient Sky Blue**, **Material Preview**, **Physical Sky** and **Probe Park Sunny**. If you've read this far in the document, these environments can be effectively used without understanding any other environment settings. Each of these default environments will provide light, reflections, refractions and a visible background to your scene.

Alley and **Probe Park Sunny** will provide, as you might expect, environments that resemble an alley and a park. **Gradient Sky Blue** uses a blue gradient to give the effect of a clear sky, while **Physical Sky** provides a realistic sky (including the sun) based on your solar position and time of day settings. **Material Preview** is the environment used by the Material Editor when generating previews – you can use this environment to quickly generate images that give you an idea of how realistic light would interact with your scene.

While the default environments can all be used to great effect, the key to unlocking the true power of Luxology environments is to understand the settings that make each environment what it is. After that, you can begin to customize and create your own environments.

If you'd like to add more environments to the list of those available by default, you can create a DGN Library file and use the Environment Settings dialog to save environments to that file. Once this is done, place the .dgnlib you've created in a path where MicroStation looks for DGN libraries. Do not modify the delivered .dgnlib – otherwise, you may find that your custom environments are lost with your next MicroStation update.

Basic Environment Settings



Environment Settings Dialog

Each environment has four Visibility options: **Camera**, **Indirect**, **Reflection** and **Refraction**. **Camera** controls whether the environment is used as the background for your scene. With **Indirect** turned on, an environment will produce indirect light and can be used to illuminate a scene. If **Reflection** is visible, the environment will be shown in materials that are reflective. If **Refraction** is visible, the environment will be able to be seen through transparent materials. Many users find that even if they don't want to have a particular environment visible in their scene, the reflections and refractions offered by an environment are very valuable. To see a setup like this, try turning off **Camera** visibility and leaving the other settings enabled.

It is important to note that all environments can produce indirect light. The amount of light produced can be adjusted using the brightness slider in the Environment Settings dialog. To use only the indirect light produced by the environment, enable **Override Existing Lights**.

Environment Types

MicroStation supports five different environment types: **Sky**, **Light Probe**, **Image**, **Image Cube** and **Gradient**.

Sky – The scene will be illuminated by the physical sky color, which is determined by settings in the active Light Setup (including time of day and geo-location). If solar lighting is not enabled in the active Light Setup, this environment will have no effect. Additionally, if the time of day is set such that the sun is below the horizon, the amount of indirect light generated will be minimal and the sky will be black.

This environment also provides the option to set a size for the sun. Larger values for this field increase the sun's size and can provide dramatic telephoto lens effects.

Rendered using Sky with Bloom.

Light Probe – Light probes are a special kind of image environment. They are made by photographing mirror balls with multiple bracketed exposures to produce an image with high dynamic range. Because of this, light probes can provide higher quality reflections and indirect lighting.

While they can be any image format, the most common type is the High Dynamic Range format (.hdr). Many light probes are available for downloading on the internet; in particular, we recommend Unparent Light Probes.

No Environment | Light Probe Override | Light Probe

The above images are an example of how important an environment can be in producing realistic renderings from real world models. In the first image, no environment is used and there is nothing to reflect but the background color. This produces an almost monochromatic image, making the stainless steel material look nothing at all like stainless steel.

In the center image, a light probe is used with **Override Existing Lights** enabled. Once the stainless steel material has an environment to reflect, it changes dramatically and looks like the stainless steel we've seen in the real world. It's almost hard to believe this is the same material that was used in the first image!

In the right-most image, the same light probe is used with **Override Existing Lights** disabled. With multiple light sources active (in this case: solar light, ambient and the light probe), the image takes on a softer quality but the stainless steel continues to look accurate.

While light probes are very useful and memory-efficient for providing quality indirect lighting, reflections and refractions, they tend to be lower resolution and thus often inappropriate for use as a high quality background. To work around this limitation, you can turn **Camera** visibility off for a light probe and specify a background image in either the Environment Settings dialog or, once your image is rendered, in the main Luxology dialog.

Side Note: MicroStation's light probes do not produce direct light. Although the Luxology engine supports this feature, Luxology recommends against making use of it. Direct light from light probes tends to dramatically increase time spent rendering without any visible gain in quality. As such, we will not be implementing this feature in the future.

Image – These environments allow you to select any kind of image and a method for projecting that image as your environment. The possible projections are **Planar**, **Cylindrical**, **Spherical**, **Cubic** and **Front**.

With a **Planar** projection, the image is laid out in a plane. Currently, this projection would only be useful if you're rendering in a top view. The ability to offset, scale and rotate environment projections dynamically will be added in the future, making this mode much more useful.

A **Cylindrical** projection wraps the image around the scene as a cylinder. In addition to the dynamic projection adjustments mentioned above, the option to mirror or repeat the image along its seams will also be added in the future.

When a **Spherical** projection is used, the image is projected as a sphere encompassing the scene.

With a **Cubic** projection, the image is applied to the six faces of a cube encompassing the scene. This method works similar to the way environments were applied in previous versions of MicroStation; these older

environments were often referred to as “Sky Boxes”. However, this mode does not allow a different image to be specified for each face (an **Image Cube** environment can be used to mimic the old behavior).

A **Front** projection applies the image to the front plane of the scene, always aligned with the camera. If the image is visible, its orientation should be identical to that of a background image. There is little to gain from using this mode because turning on **Camera** visibility negates being able to change the background image once the rendering is complete, and the reflections visible from this mode do not look as convincing as cylindrical or spherical mapping.

Because **Image** environments can be higher resolution, they are viable choices for sources of background, indirect lighting, reflections and refractions. Using an **Image** environment can be more memory intensive than using a **Light Probe** environment, so this may not be an option in all scenes.

Image using Cylindrical projection visible to all but Camera. Background image used for visible background.

Image Cube – This environment type assigns an image to six sides of a cube that surrounds your scene. This method is identical to the method MicroStation used for its legacy rendering modes (Ray Trace, Particle Trace and Radiosity). When using an **Image Cube**, you can rotate the environment about the global z-axis.

If the environment is made visible to the **Camera**, specialized images should be used that are intended for a sky box. These images are warped to appear correct when seen from inside of the box so that they display without visible corners or seams.

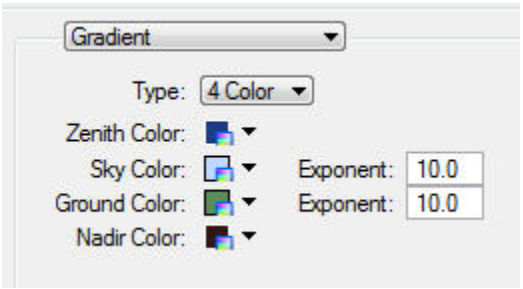
Proper **Image Cube** imagery can be time consuming to create. The first step is to create a seamless 360 panorama image. After that, map the image to a cylinder using MicroStation. Render the **Front**, **Right**, **Left** and **Back** images by rotating a 90 degree camera located in the center of the cylinder. For the **Top** and **Bottom** images, the camera looks straight up and down. Each of these images must then be edited in an image editor, and the holes in each section must be artistically filled or painted with a convincing sky or ground image.

Rendered with Image Cube visible to Camera, Reflections, Refractions and Indirect Light.

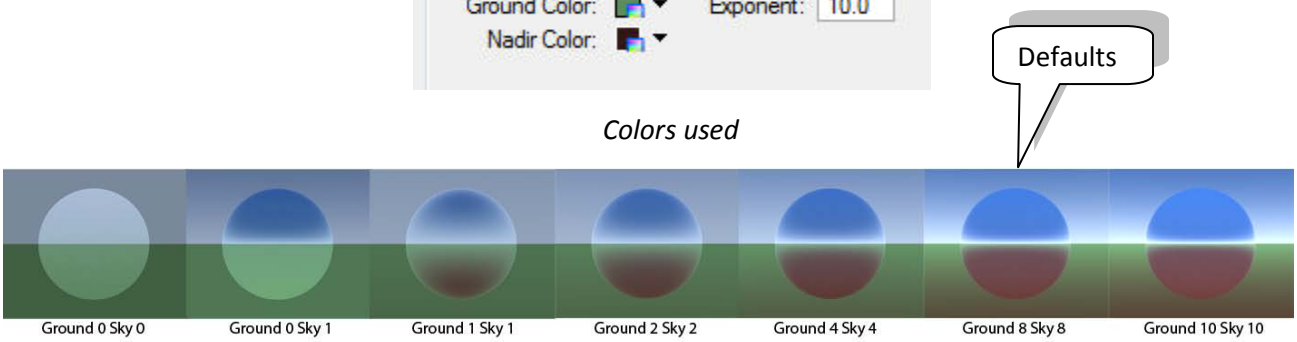
Gradient – The environment is made up of a gradient between either 2 or 4 colors. A **2 Color** gradient is a straightforward interpolation between the selected **Zenith Color** for the high end and the selected **Nadir Color** for the low end.

With a **4 Color** gradient, the selected **Sky Color** and **Ground Color** are also used. Each has an associated **Exponent** value that controls the percentage of **Sky** or **Ground Color** used in the gradient. Using a low value (such as 0) for both **Exponent** values would result in only **Ground Color** and **Sky Color** being used in the gradient with no mixing of **Zenith** or **Nadir Colors**. Using an **Exponent** value of 4 for **Sky Color** and 0 for **Ground Color** would result in some mixing of **Sky Color** but no mixing of **Ground Color** with **Nadir Color**.

The diagram below illustrates these concepts. In it, a reflective sphere was rendered with the environment visible to the **Camera**. Note that the camera used is a front view with some perspective added.



Colors used



You can see that as the **Exponent** values are increased, more of the **Zenith** and **Nadir Colors** appear in both the reflections and the visible sky. The default **Exponent** values for **Sky** and **Ground Color** are 8.0, which, as the diagram illustrates, provide a fairly even distribution of the gradients in the visible sky.

Other Environment Settings

With the Luxology dialog, it is possible to replace the alpha pixels in a rendered image with either a solid color or image background. The **Background** options in an environment allow you to store your background settings for use in other rendering dialogs like Save Multiple Images or Record Script. Because both an environment and a **Background** will replace the alpha pixels in your image, these options cannot be used at the same time.

Enabling **Fog** produces an exponential fog effect that increases intensity as it moves farther from the camera. If the fog's **Density** is increased, it becomes uniformly thicker. A color can be either manually specified, or if **Use Environment Color** is enabled, the environment color will dynamically adjust the fog's color. The latter option often produces spectacular results.

4 Color Gradient Sky with Fog Density of 0.25 and Environment Color used for Fog Color.