AWE Shading Kit 1.0

Welcome! This is a collection of shaders and presets to be used with DAZ Studio and the built-in 3delight renderer. You should be able to find them within your DAZ3D library folder. The shader presets have been categorized and placed in the 'Shader Presets' folders, while the light presets will be placed in the 'Light Preset' folder of your library.

General Notes

No textures are included in these shader/material presets. This is intentional so you'll have the freedom of using pre-made maps.

These presets were made with gamma correction enabled and gamma set to 2.2, commonly referred to as linear workflow (LWF). They will likely will look very different otherwise.

It is recommended to limit total diffuse color to no more than 95% sRGB. Recommended minimum values is 3% or 8,8,8 in sRGB values. These are inline with GretagMacbeth RGB color values and conforms to typical albedo values used with physically based rendering workflow. Unity Reference Material Chart - https://docs.unity3d.com/Manual/StandardShaderMaterialCharts.html - notes that dielectric materials should be between 50 to 243 (between 19% to 95% of 255).

Applying AWE Surface to a surface with existing shaders will retain maps such as color/diffuse, opacity, bump, displacement, etc. Specular maps will be retained as long as they are inserted into the specular strength slot. If you have materials with specular maps inserted into the specular color slots, you have to move them to their respective specular strength slot beforehand. For convenience, you can use the 'Transfer Specular Maps' script included with this product.

AWE Surface will retain most settings found in dsDefault material or any of omnifreaker's shaders such as Human Surface Shader, UberSurface and UberSurface2.

Overview

Light Sets

The light includes an environment sphere, two light emitter figures and light presets with the emitter figures. AWE Surface handles global illumination on its own, so you do not need any other ambient or image based illumination (IBL) light. Ambient occlusion effects effectively comes for 'free' with global illumination.

Direct lighting will come from either point,spot, distant light or area light in your scene. If you use the AWE Environment light, direct lighting will come from the environment sphere. Indirect light or light bounces will come automatically from areas lit by direct lighting. AWE Environment does not come with any HDRI textures, so you will need to plug a HDRI texture into the surface of the environment sphere.

Material Presets

The included presets are categorized into three main categories – Dielectric, Glass and Metal. There are also extra presets for quickly modifying the roughness of the material – Reflective, Glossy, Dull and Rough. Usage is quite simple. Simply apply any of the base preset depending on the material you want to achieve, then apply the extra presets to change surface roughness properties.

Please note that most of these presets are set not to enable opacity by default. If you want to enable opacity, you will need to manually enable opacity by toggling 'Opacity' and 'Multiply Specular and Reflection with Opacity'.

Dielectric - Holds presets for general dielectric.

Base presets for dielectrics to be used for anything that is not metal or glass. These come in various index of refraction, plus two optimized fabric presets. One with and one without translucency.

IOR values for dielectric materials generally fall between 1.3 and 1.7. For specific materials, you can look up actual IOR values on websites such as https://refractiveindex.info and https://pixelandpoly.com/ior.html

Glass - Holds presets for glass and glass like surfaces.

Base presets for glass comes in three flavors. Glass 1 is used for refracting glass, while Glass 2 should be used for non-refracting glass. Glass 2 simply enables 'Thin Glass' feature found in AWE Surface. Glass 3 is a fallback preset, setting opacity to 0 (zero) and disabling Multiply with Opacity for specular and reflections.

There are also presets to change IOR values, especially made with glass in mind.

Metal - Holds presets for various metal surfaces.

Here you'll find various presets for commonly found metals from aluminium to zinc. These presets simply change the specular/reflection color and edge tint values for the two base specular/reflection lobes.

Base Character MATs and Character Surfaces

This is where you'll find character MATs for various DAZ figures from Generation 4, Genesis, Genesis 2, Genesis 3 and Genesis 8. These presets can be considered a general base to be used with all shapes. When applied, these MAT files will retain maps, bump/displacement settings. For characters other than the above figures, there's also individual surface shader presets for various parts of the characters.

Hair

Use the included presets in this folder for hair either with both translucency and subsurface scattering, basic translucency or without both. Unlike other presets, these will enable Opacity and Multiply Specular & Reflection with Opacity. These presets do not enable 'Use Face Forward' by default. If you need the feature, you will have to manually enable it.

Subsurface scattering (SSS)

This folder contains various presets with subsurface scattering/absorption profiles.

Utility Presets & Scripts

Last but certainly not least, in this folder you'll find various presets for turning on/off specular, reflections, bump, displacement, global illumination or the coat layer. There's also the 'Transfer Specular Maps' script. If you want to use the same specular map with the second specular/reflection and the coat layer, run the additional 'Transfer Specular Maps 2' script.

Just to be clear, if you have a specular map inserted in the color slot, first run the 'Transfer Specular Maps' before conversion. After the conversion, you can use the 'Transfer Specular Maps 2' script to copy the specular map from the 1^{st} specular/reflection lobe to the 2^{nd} lobe and the coat lobe. You can run this script with multiple surface zones selected, but this will only work on a single object/figure.

A quick start scene have been included to illustrate how you can put the kit to render a scene.

Workflow Notes - Materials

To apply these presets,you need to select the actual surface you want to convert first. The quickest way is to use the 'Surface Selection' tool and pick the surface of the object in DAZ Studio's viewport. After selecting all the surface you want to convert, simply double click on the preset to apply AWE Surface.

As noted in the AWE Surface readme, the rendered material will largely depend on what mode you choose (PBR mode or Classic mode). By default, AWE Surface is set to Classic mode.

To reset materials, you can reset changed values using the 'Currently Used' shortcut in the Surfaces pane.

Subsurface Scattering

In general, you should start with a low diffuse strength when subsurface scattering (SSS) is enabled. This is because AWE Surface simply adds SSS on top of existing diffuse. Start with a 50% diffuse strength with subsurface strength set to 75%. If you want to increase the effect, increase the subsurface phase value. In general, this should be set to around 0.8 for human skin. Higher values still below 1 will produce even more intensity.

Subsurface will render differently with IPR (progressive rendering) and bucket rendering. The effects will be more subdued so keep this in mind when you're doing material tweaks in IPR.

Most of the rendered subsurface color will generally come from absorption color. When tweaking materials, use one of the SSS profiles as a base. You can then fine tune absorption color to adjust the effect. If you need to slightly tint the final effect, use 'Subsurface Color' to apply an overall tint.

Due to a bug in DAZ Studio, subsurface will not render on instances of models with subdivision applied.

Working with Specular Maps

Depending on the look you want to achieve, you will likely be using specular maps to control reflectivity of your material. It may be difficul to determine the value you should use for specular/reflection strength. Some specular maps may use really low pixel values, while others depends on shaders to remap the values to a range of dielectric reflectivity per PBR conventions.

For example, a texture artist may choose to paint the absolute value of 0.04, which is the dielectric reflectivity for a material with an IOR of 1.5. Another may use PBR convention style of reflectivity, where the value is normalized so that the same material will be painted with a value of 50%.

For example, Unreal Engine uses this convention of remapping dielectric reflectivity with an IOR of 1.79 as 100% reflective.

Material	Specular
Glass	0.5
Plastic	0.5
Water	0.255

From https://docs.unrealengine.com/en-US/Engine/Rendering/Materials/PhysicallyBased#hable

On the other hand, Unity reference sites values between 40 to 75 in sRGB for specular value (0.15 to 0.29) https://docs.unity3d.com/Manual/StandardShaderMaterialCharts.html

Material	IOR	Reflectivity
Glass	1.5	0.04
Plastic	1.5	0.04
Water	1.33	0.02
Glass, Flint, Lanthanum	1.78	0.08

Measured values from https://refractiveindex.info and https://pixelandpoly.com/ior.html

Obviously, maps using these scheme will look very different. AWE Surface allows you to multiply the specular map to correct for these differences. However, there are two important factors to note. First, you have to figure out the value to use. Second, to use these maps, you will have to set specular/reflection strength set to 100%. Otherwise, materials will look very different once you remove the maps.

AWE Surface comes with a feature that dynamically normalizes specular maps to the IOR used for each layer. What this means is that you can simply dial in the actual reflectivity value (based off the IOR value) as specular strength rather than use the baked in value. Materials will have the same reflectivity with or without the specular maps.

For example, let's say we're going to use a specular map with a painted value of 0.04 for plastic. First, we set the base layer to the appropriate IOR (1.5). Setting the 'Normalize Specular Map' slider to a value of 100% will remap values in the map (from 0 and 0.04) to values between 0 and 1. Now we can set specular/reflection level either with the specular/reflection strength or the IOR value.

What if we're using a UE style specular map? You can either just use the map as is or use the 'Normalize Specular Map' and set Specular Map Strength appropriately.

For those who prefer using this feature, here's a rule for setting specular/reflection strength. Since a material with an IOR of 1.8 has 100% specular strength, you can simply calculate the appropriate specular strength of lower IOR materials by taking the lower IOR value's decimal value and divide it by 8. This is illustrated below, with a few examples of commonly used IOR values.

IOR	Specular Strength (assuming IOR 1.8 is 100%)
1.3	3/8 = 0.375
1.33	3.3/8 = 0.4125
1.5	5/8 = 0.625
1.6	6/8 = 0.75
1.8	8/8 = 1

This feature is disabled by default, letting you choose which reference or scheme you would like to use.

Light Presets – Environment Light and IBL Sphere

This prop included with AWE Environment Light is an environment sphere enveloping the scene. The difference with the one included with UberEnvironment2 is the normals now face inward. This means any texture you use will now be correctly orientated when viewed from inside the sphere.

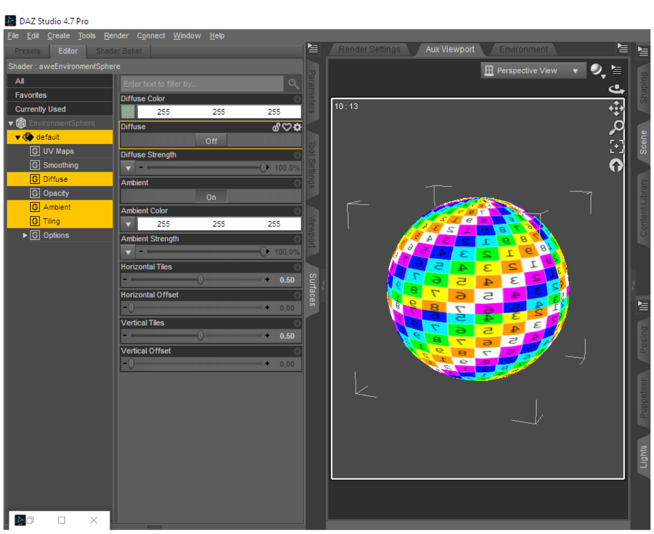

Illustration 1: AWE Environment viewed from the outside

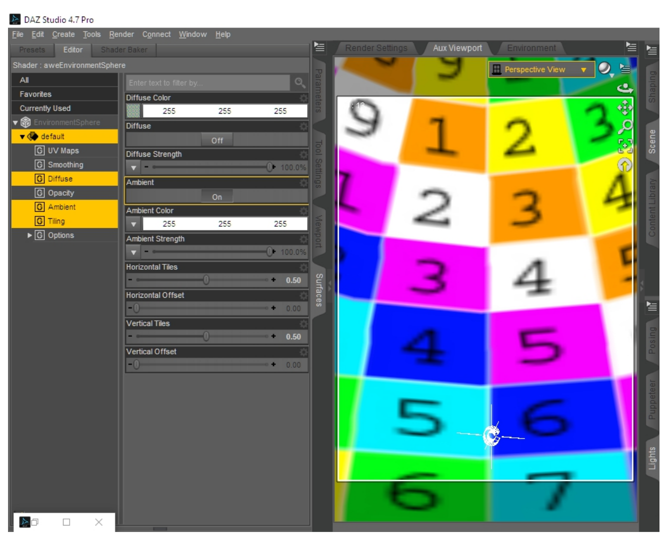

Illustration 2: From the inside. Correctly orientated

AWE Environment Light

This light shader is used to 'feed' certain values to all surfaces with AWE Surface in your scene, making scene wide changes to exposure, temperature, saturation, and pixel values to be tone mapped.

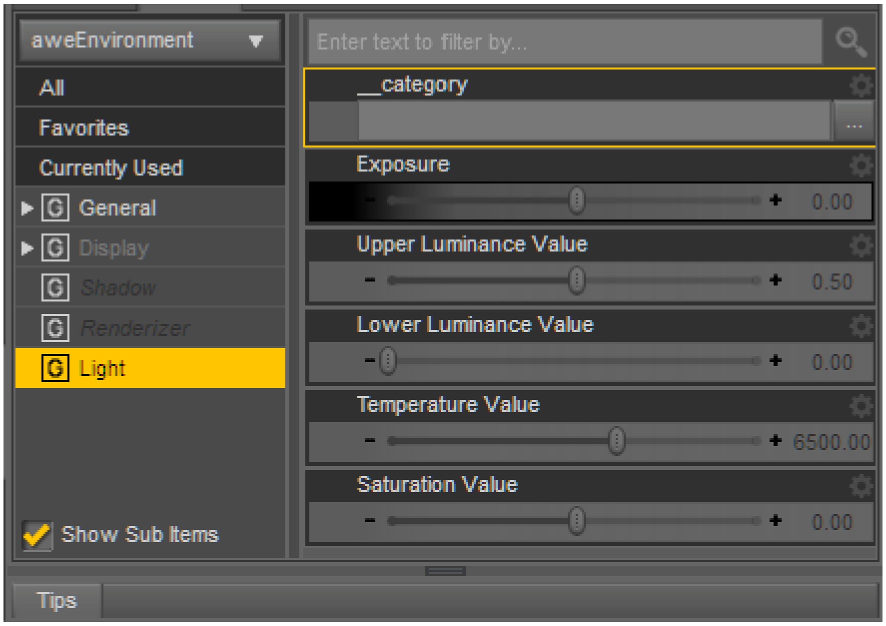

Illustration 3: The AWE Environment light control panel.

When you set the __category flag, you can even do custom light linking to allow changes to a select subset of your scene. For example, you may want to use one control light to manage exposure levels, but use different tone mapping values, temperature and/or saturation values to certain materials. This is possible by light linking the appropriate control light to your selected materials (which will be discussed later on).

AWE Environment Sphere Shader

The environment sphere comes with the new AWE Environment Sphere shader with extra options to manage textures and visibility.

This surface shader is a simple yet robust shader to be used with the environment sphere. It can be used to apply a pure Oren Nayar based iffuse environment or an image based lighting (IBL) sphere around your scene. To use it as a diffuse environment, simply enable diffuse and disable ambient. Vice versa, to use it as an IBL shader, disable diffuse and enable ambient with your chosen HDRI texture as input.

For added flexibility, you can use either the ambient input or the diffuse. Using the diffuse provides two advantages. First is that the diffuse texture is viewable in the viewport. Second, you do not need to separate enter the same HDRI twice in the diffuse and ambient channels. By default, this option is set to default. To disable it, simply toggle the 'Use Diffuse Input as Ambient' switch.

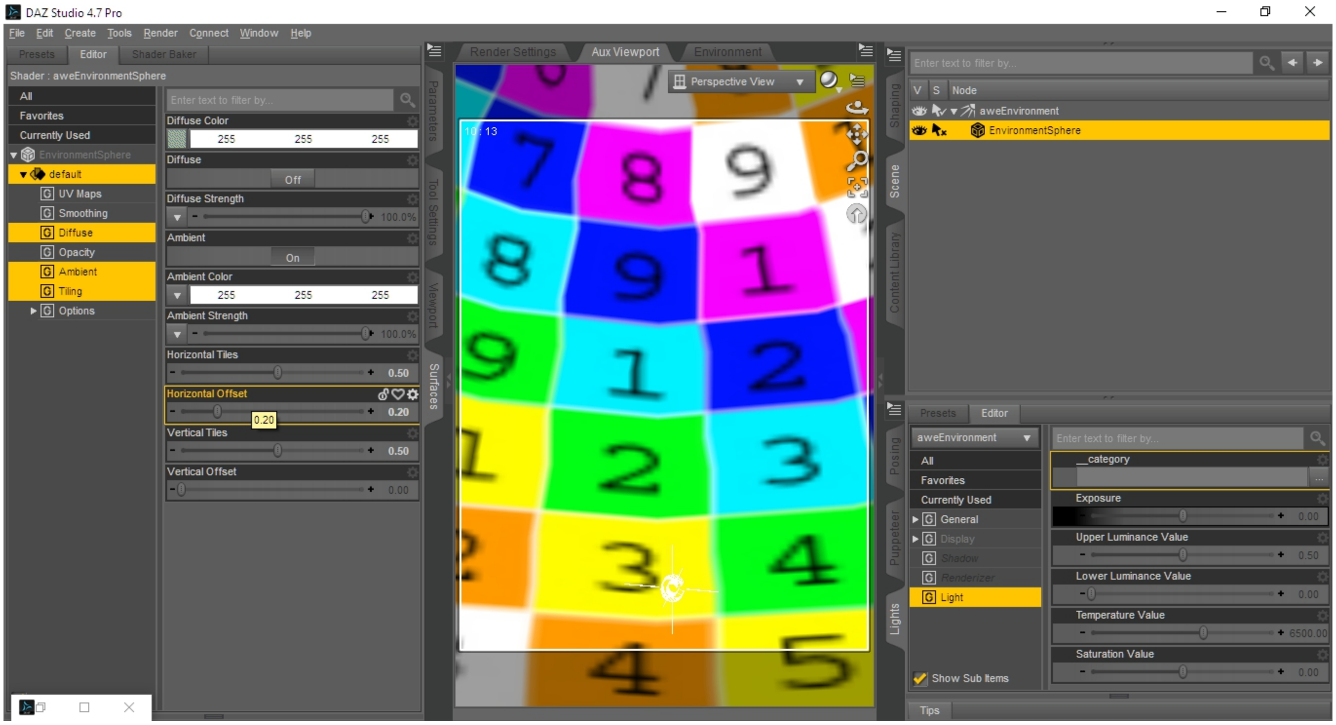

Illustration 4: To rotate the texture across the sphere, change the value of the horizontal offset.

AWE Environment Sphere shader provides tiling/offset controls,. Changing the horizontal offset value effectively rotates the texture around the sphere. The changes are instantly viewable in the viewport and in renders. You can even change offset values during live, progressive rendering (IPR).

Illustration 5: HDRI rendered with chosen color value. The environment sphere on the background looks exactly the same in the viewport and in the render

For even more robustness, you can manipulate the HDRI texture by changing saturation, exposure levels, gain and gamma. The adjustment values can be tweaked in IPR, making it easy to get the look you want without repeating renders for each adjustment. In addition to these options, various visibility switches are available.

- Visibility – Camera
- Visibility – Occlusion and Indirect Diffuse
- Visibility - Reflection and Refraction
- Visibility – Shadows

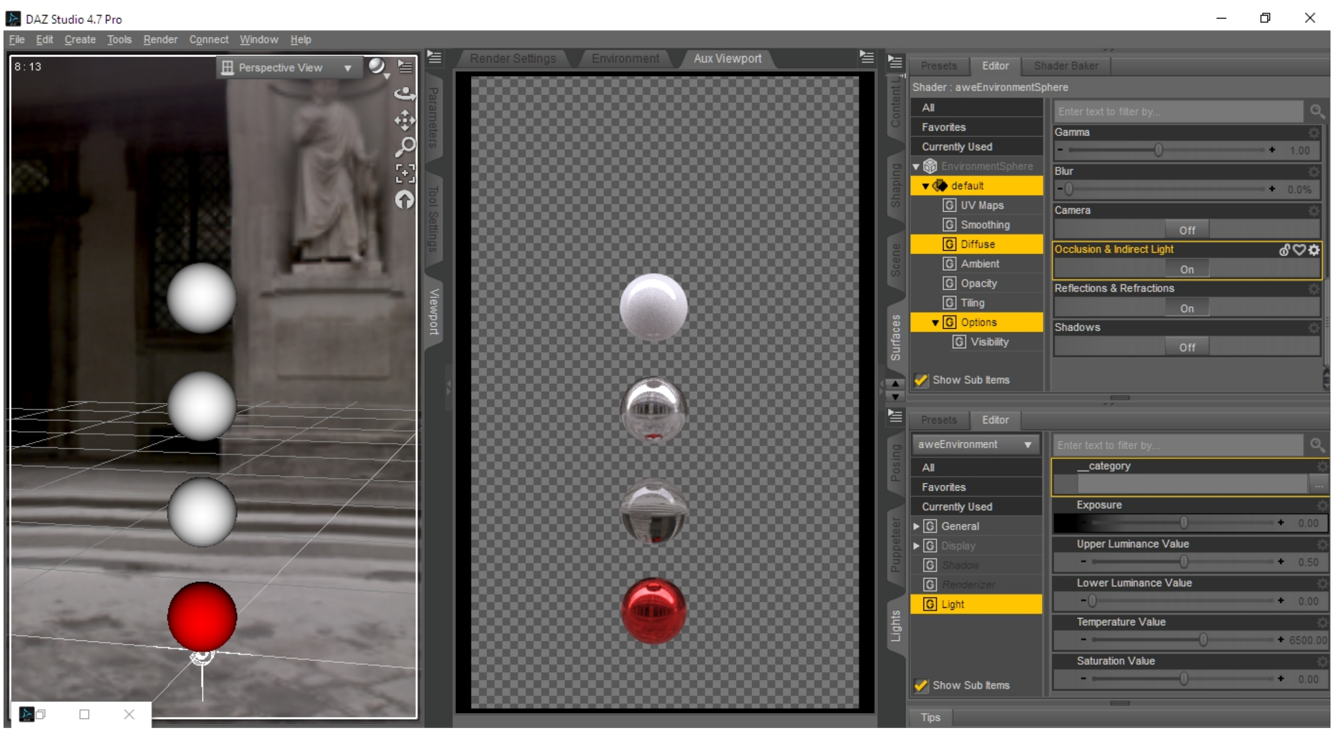

Illustration 6: Turning off Visibility - Camera hides the environment sphere from the camera

These options lets you change the behavior of the shader so they affect the render differently. When Visibility – Camera is turned off, the environment sphere will not be visible to the camera, but will still show be visible in reflections/refractions and contribute to global illumination. To make the environment sphere invisible to global illumination, simply turn off Visibility – Occlusion and Indirect Diffuse.

Vice versa, to exclude the environment sphere from being visible in reflection and refraction, turn off Visibility – Reflection and Refractions. If you don't want the environment sphere to cast shadows when using distant light, simply turn off Visibility – Shadows. This is set by default. Changing any of these settings does require you to restart the render to view the changes.

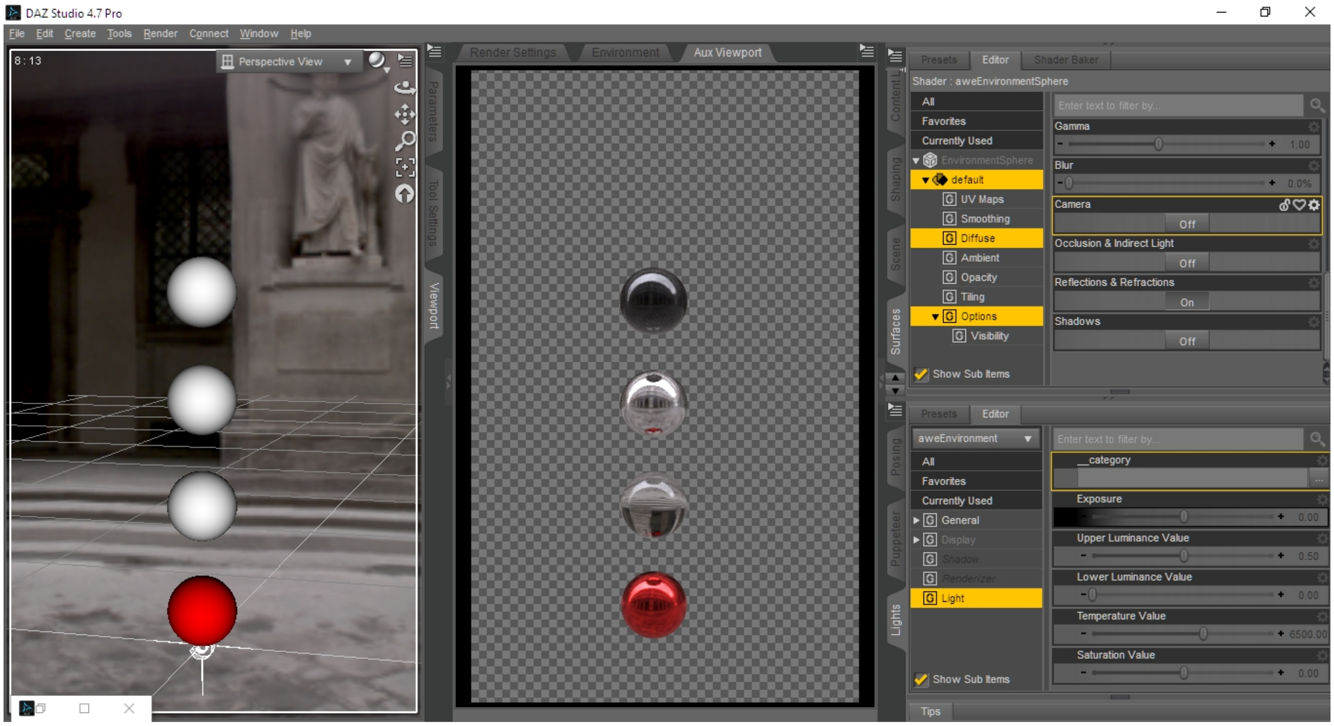

Illustration 7: Turning off Visibility - Occlusion and Indirect Light turns off global illumination contribution of the environment sphere. It still shows up in reflections and refractions.

These switches allows interesting ways to further customize the environment sphere. You can have multiple environment sphere, each only visible to certain rays. Enhance this even further by setting Trace Group Memberships so only certain surfaces will include the environment sphere you've chosen. This will be discussed later on.

Extra Notes

- The horizontal tiling can also be used to 'flip' the map direction so you do not need to manually adjust normals or scale the sphere. Simply use a negative tiling value to flip the texture direction.
- To use multiple HDRIs. create a geoshell of the environment sphere and apply the shader to the geoshell. Once done, essentially you have two environment spheres. Load either the same HDRI or different ones on each. Make one sphere visible to reflections & refractions but not to occlusion and indirect light. The other sphere should be set the other way around.
- The AWE Environment Sphere shader will work with AWE Surface with reflection/GI enabled or any other shader that has raytraced reflection or indirect diffuse enabled.
- It is recommend to load the AWE Environment light/environment sphere first before applying the AWE AreaLightPT shader to emitters. This avoids DAZ Studio adding head light blockers.

Workflow Notes – Using a HDRI environment

Simply load the AWE Environment set into your scene. This will load the AWE Environment Light node and an environment sphere with AWE Environment Sphere shader already applied. Select the environment sphere and go to the 'Surfaces' tab. Insert your HDRI texture and make sure relevant visibility options are enabled.

Once loaded, you can use the various saturation, exposure, gain, gamma and blur controls to manipulate the HDRI. Of all these controls, you will likely use exposure, gain and gamma the most. All of them multiply the image but have very different output.

Exposure uses the pow (2, EV) formula, so changes will be exponential. In other words, the effects will increase even higher with higher values, for both negative and positive values. Since HDRI by nature have quite a bit of range in exposure, changing exposure values too dramatically can quickly under or overexpose the image. To avoid this, the limits for this dial have been set to -4 and 4. If you do need higher values, simply turn off these limits.

Gain simply multiply the pixel values with the given value. By default, this is set to 1 so it will apply zero changes. You can use this to apply an correction to fine tune the exposure.

Gamma simply multiplies the image with a gamma ramp using pow (color value, gamma value). Manipulating gamma will either decrease (lower values) or increase (higher values) the contrast.

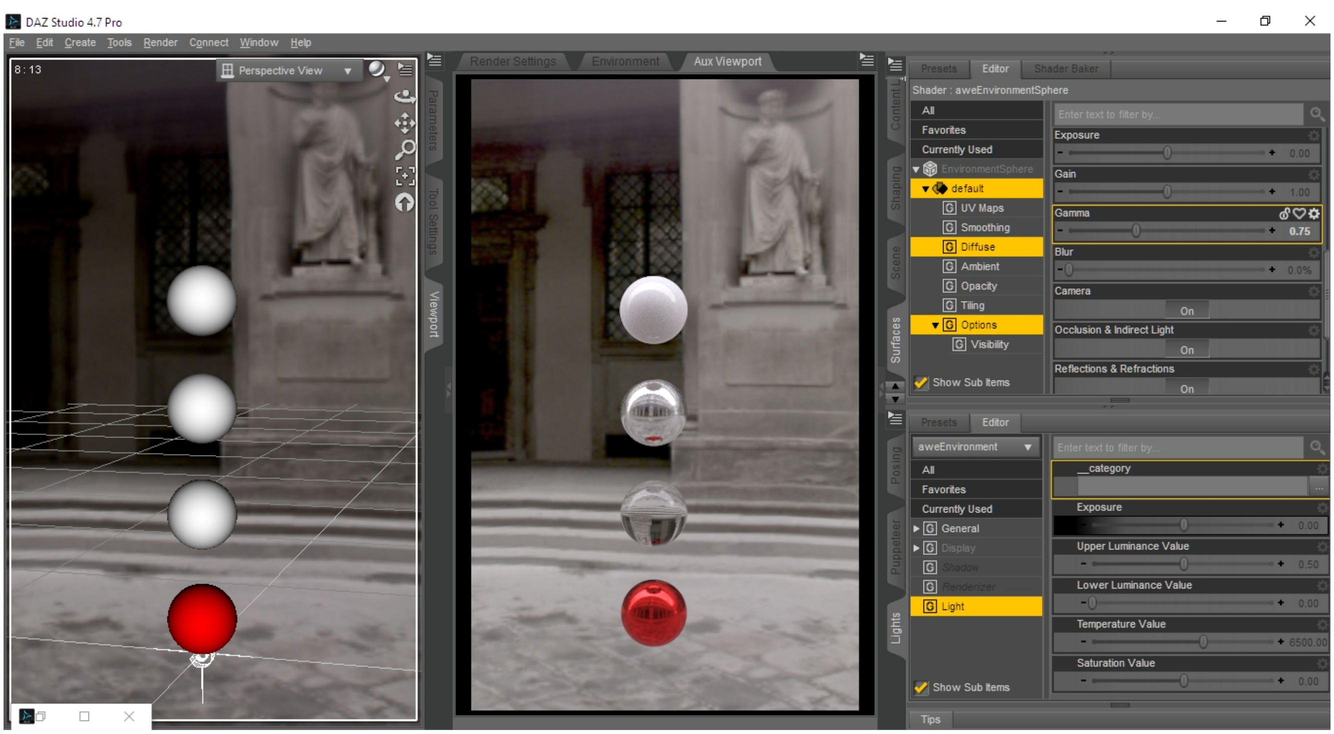

Illustration 8: Negative gamma values brightens the midtones of the HDRI texture.

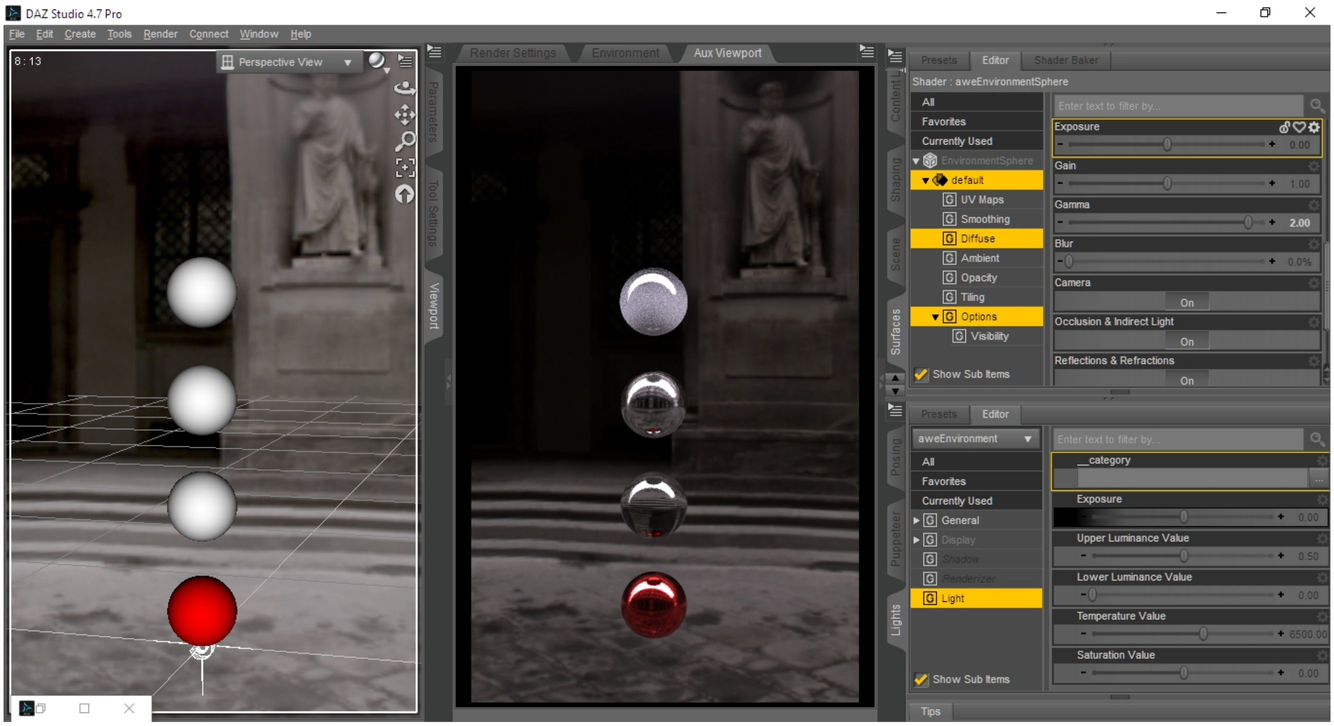

Illustration 9: Positive values for gamma shifts the midtones, giving us a darker image..

Illustration 10: Blur settings can be dialed in with even higher values for even more blur.

Blur simply applies a blur to the input texture. Interesting enough, this can be used to mimic a depth-of-field effect since it blurs out the environment sphere in the background (when visible). By default, it is limited to 100%, but higher values will still work.

Light Presets – Scene Lights

Included are two simple, yet robust, poly-count optimized light emitter props. These props are built as figures, with extra bones controlling parts of the emitter. This arrangement allows you to move and scale the bones, effectively reshaping the emitter into different shapes. Both also come with an additional morphs to skew the shape of the emitter.

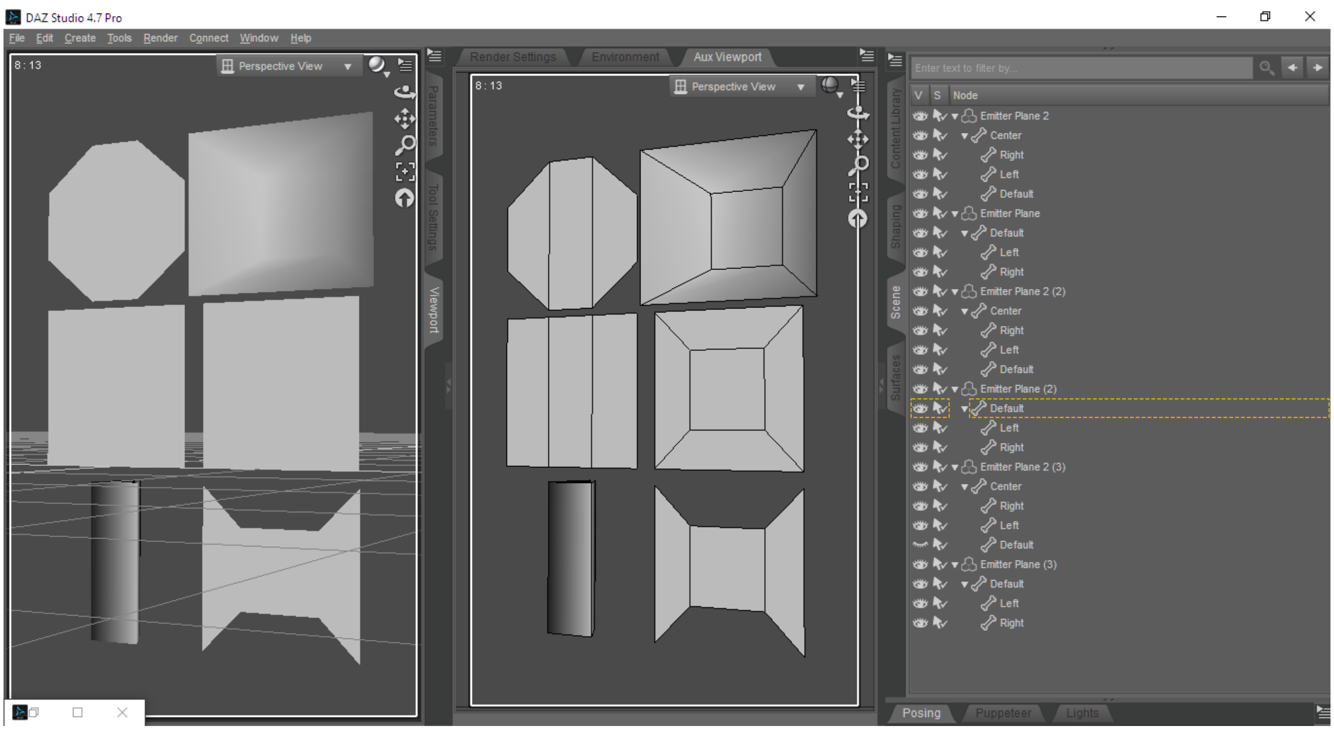

Illustration 11: Simple yet robust emitters figures. These shapes are made with only joint manipulations (rotate, scale, hide).

Two light presets have been included, one for each emitter prop. Essentially, the emitters are parented to a null node acting as a light target node. This makes it very convenient to place or parent the target node to an object you want to light.

To control the lighting with area lights, you can just simply move the emitter away or scale the size. You can still change the amount of light, direction and certain features of the light shader via the surface pane.

Since area light are geometry based, you can create instances of the prop. The instances will share the same light settings, but you can still manipulate individual instances by moving or scaling them.

AWE AreaPT Light Shader

This is basically an area light shader using 3delight's trace based sampling. Compared to traditional analytic lights (point/spot lights) and area lights with illuminance based sampling, this new area light shader can be up to 2x faster. When used with shaders such as AWE Surface, direct lighting can come essentially for 'free' with trace based area lights.

This light shader comes with various extra options in addition to light color, intensity/intensity scale (exposure) and black body temperature.

Barn Door – Alter the ray direction being cast onto the scene. Front and back side can be controlled simultaneously or separately. The barn doors settings are in degrees, with 90 degrees have no effect, -40 degrees have roughly 45 degrees coverage and 80 degrees will essentially be full coverage.

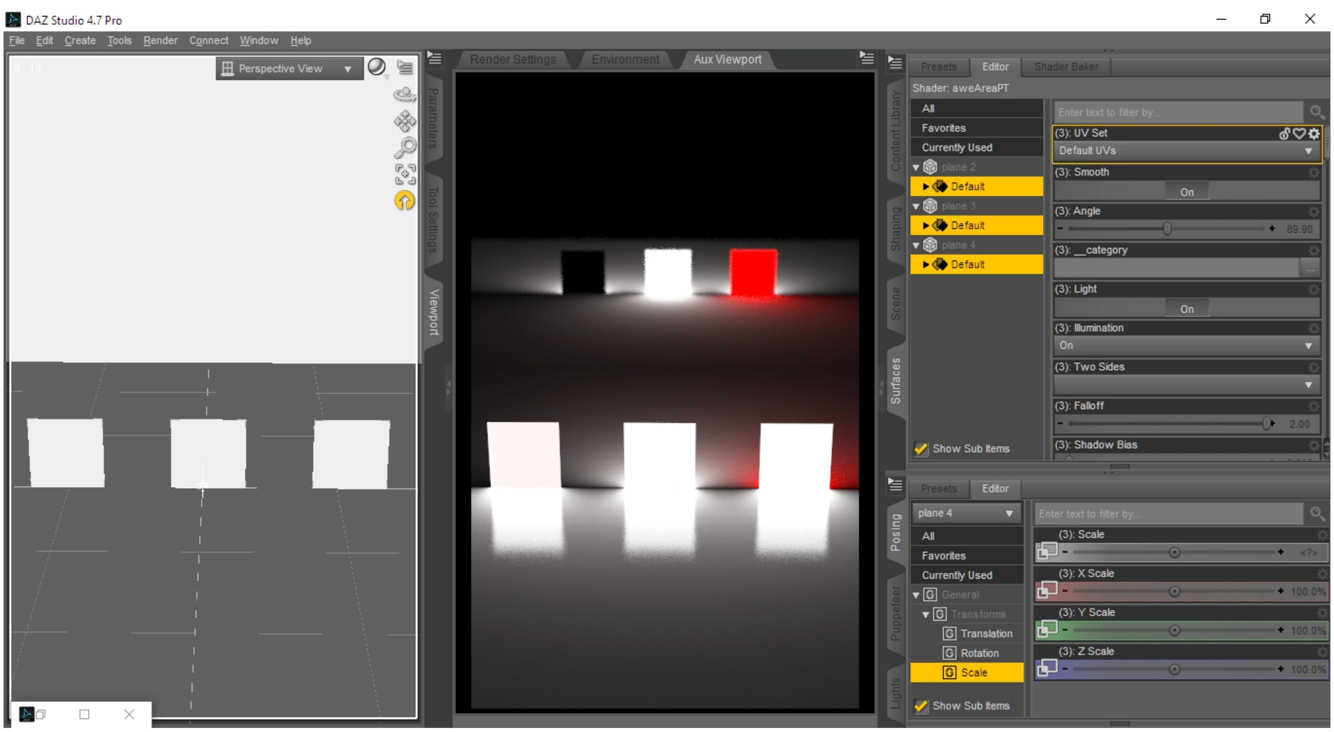

Illustration 12: From left to right - Front side only, front and back side unified, front and back side separate

Front, FrontBack, FrontBackSeparate - Choose between single side emission or use both sides. Different light settings for the back facing side can also be used with FrontBackSeparate.

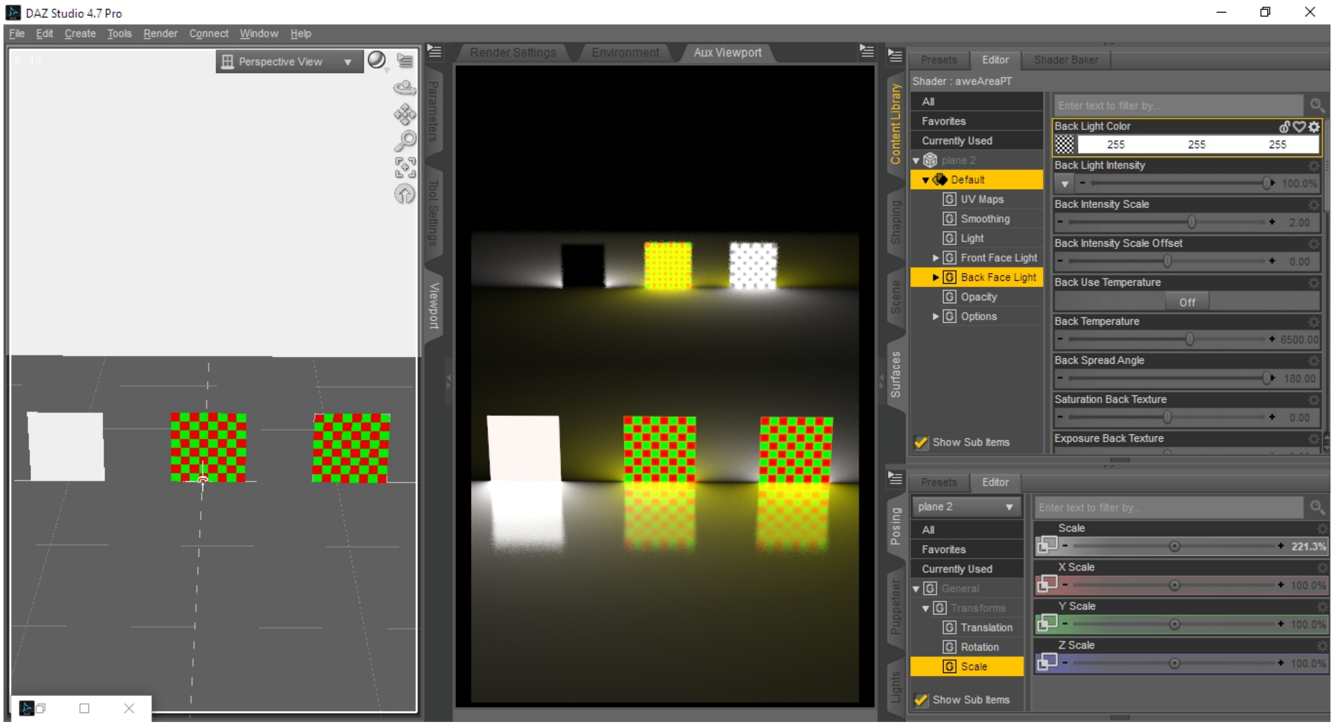

Illustration 13: Gel lights also works with the front back scheme.

Gel Light – Use maps either as light color or intensity masks. Tiling scale and offsets are provided, with the option to use separate tiling scales/offsets for the intensity mask.

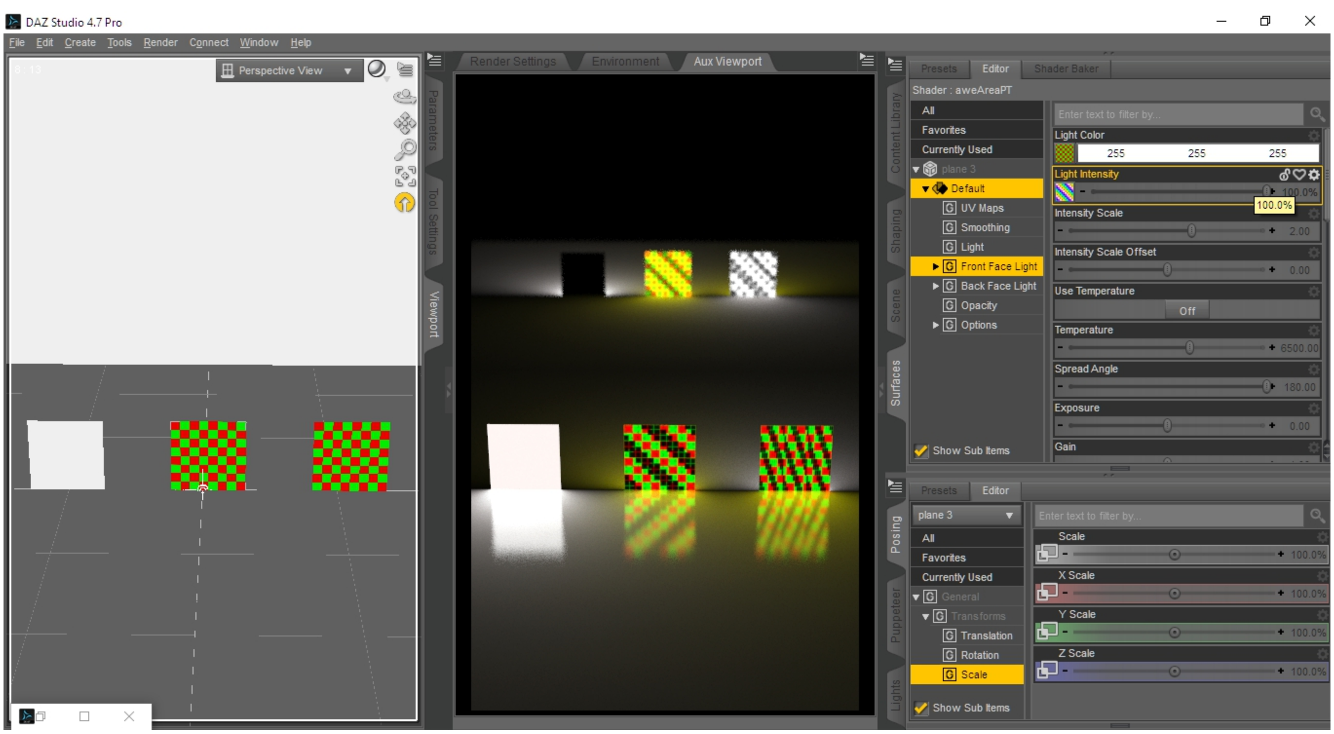

Illustration 14: Separate tiling for the intensity mask

Extra Notes

- When you toggle Visibility – Camera, the light/emitter surface will be rendered.
- Changes to the light shader settings does require restarting renders for changes to take effect. This is strictly something that will only affect live, progressive rendering.
- This shader will only emit light when applied to non-SubD objects.
- Intensity scale higher than 3 may produce slightly darker area near the light source. Simply add more distance from the light to nearby objects to compensate.

Optimization, Sampling and Noise

By default, AWE Surface uses 128 irradiance samples for both direct and indirect diffuse lighting. This is generally enough for direct lighting and preview of global illumination. Depending on your needs, this may even be enough for final renders, especially if your scene is very well lit using direct lighting.

On scenes where there is more indirect lighting, you will likely see noise in dark, shadowy areas. For these scenes, raise the sample value up to either 512 or 2048 samples to get rid of the noise. Obviously, higher samples leads to longer render times. For 2048 samples, render times can be up to 4x slower.

What you can do to minimize render time is only enable diffuse and global illumination for non-refracting (non-transmissive) dielectrics. Metal and glass do not generally contribute much diffuse lighting, both directly or indirectly. Disabling diffuse and/or global illumination for generally results in a 10% speed up when they are visible in the camera.

Rendering with high pixel samples, such as 8x8 or 16x16, might also help make some of the global illumination noise be less noticeable. In such cases, you may be able to use slightly lower irradiance samples (between 512 to 1024 samples). Using 8x8 pixel samples and 1024 irradiance samples can be 20% faster compared to 4x4 pixel samples and 2048 irradiance samples. You will also have the benefit of higher anti-aliasing for objects, depth-of-field and/or motion blur. Obviously, you can also fine tune your scene so that only areas that exhibit noise uses higher irradiance samples.

Here's a rule of thumb for troubleshooting diffuse noise.

- If you're seeing noise from global illumination, try to use 512 samples first.
- If you're still seeing noise, raise the samples to 2048 samples.
- If there's still visible noise, it's likely you need to raise pixel samples from 4x4 to at least 8x8 pixel samples. This is especially true for scenes with depth-of-field or materials with high reflection roughness.
- 8X8 pixel samples is just slightly slower than 4x4 and provides very good anti aliasing. For more challenging scenes, 16x16 will likely provide the best result. Going above 16x16 is generally not necessary and render will be much slower.
- The render script bundled with AWE Surface comes in two flavors: Draft Quality which defaults to 4x4 pixel samples and Final Quality, which uses 8x8 instead.

Working with Trace Group, Light Categories and Tone Mapping Control Lights

First, let's talk about trace group or trace sets. The AWE Surface readme already discussed this briefly, but here's a more practical explanation on working with this Renderman Specification feature. As a refresher, here's a look at the usage syntax.

Usage Syntax (enter these values in the Trace Group field without quotes)
"" (empty field, default) - Objects which don't belong to any group.
"group1" – Only objects which belong to group1.
"group1,group2" - Only objects which belong to group1 or group2.
"+group1" - Objects which belong to group1 or which don't belong to any group.
"-group1" - Objects which don't belong to group1.

By default, all material will trace everything in the scene that does not belong to any group. As soon as you enter a group name in an object's or material's Trace Group Membership, then that object or material will not be visible in any other object or material. This means you will have to enter the 'missing' object group name into other material's 'Trace Group' field. Once entered, it is just a matter of including or excluding the object, by way of using '-groupname', which excludes it, or '+groupname', which will include it.

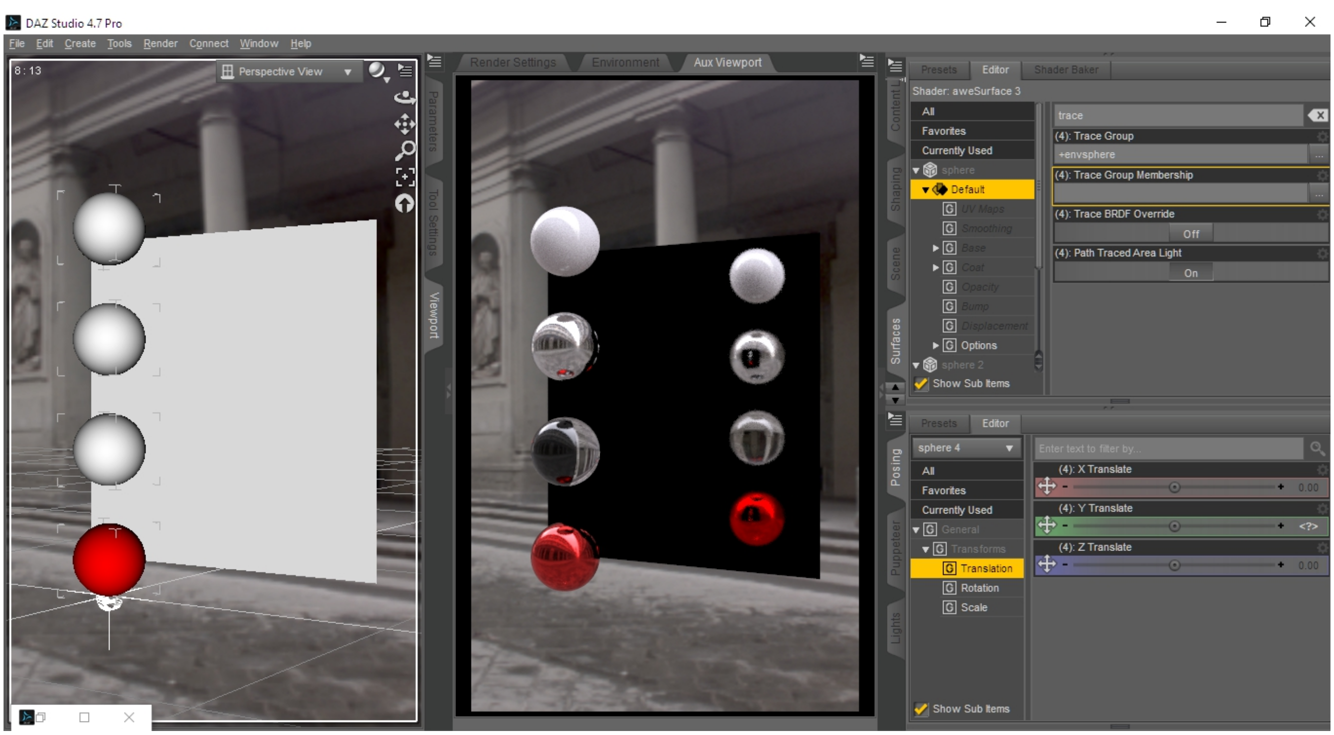

Illustration 15: The ball probes are set to trace the environment sphere, while the plane excludes it.

There's also an undocumented shortcut to force materials with '-groupname' to basically 'see' the excluded object again. Just append '*' to the field, for example '*,-groupname' will restore everything as it was before we assign trace group memberships. Using just '*' in the Trace Group field won't work though, since it has to be used with other groups. This is not in the 3delight documentation for trace groups, but it is written for light categories.

One final note on trace sets. Although adding or removing trace sets works in an IPR session, you need to restart the render to see any changes after changing or entering Trace Group Memberships.

Light categories works similarly, except you don't have to assign memberships. After assigning a name to your lights or groups of lights, simply include or exclude the light in your material's 'Light Category' field.

This is also applicable to the tone mapping, temperature and saturation control lights. Remember that you should enter the light group name in their respective 'Tone Mapping Control', 'Temperature Control' and/or 'Saturation Control' fields. For extra flexibility, you can actually override the options you use for 'Tone Mapping Control' when you explicitly enter a light group name in 'Temperature Control' and 'Saturation Control'. So, you can use the tone mapping values from one control light, but have temperature and/or saturation from another or Even separate ones for each.

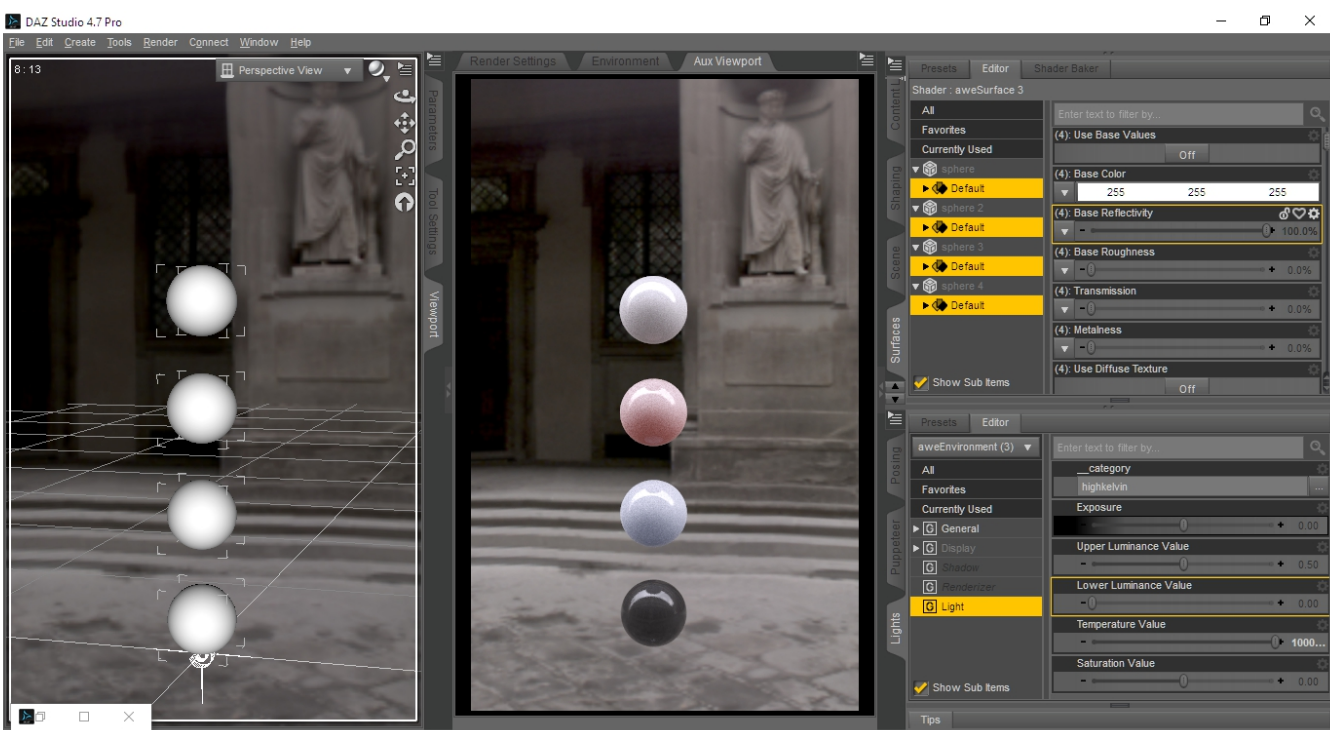

Illustration 16: Different control lights used to control each ball

Like trace sets, you should see instantaneous result during IPR when assigning light group names to the lights and materials. Please note that path traced area light uses trace groups rather than light categories.

Tone Mapping Notes

The tone mapping in AWE Surface is a simple luminance based, Reinhard tone mapping. However, it is implemented so you can explicitly choose the luminance values (level of brightness) you want to include/exclude in tone mapping. By default, the shader and control lights defaults to 0.5 luminance. Essentially, this will darken parts of the rendered image that meets the criteria. If you raise the value, you will restore the pixel values to their initial values before tone mapping.

Please note that it is not equal or more than the chosen value.

In practice, this is an additional, but more limited exposure control. Increasing the upper luminance value rather than exposure value will brighten areas which are already well lit. The lower luminance control is essentially a way to darken areas which are already quite dark so it does work in contrast to exposure.

Tutorial – Lighting Workflow with HDRIs

We have an example scene already setup with a clothed Genesis 2 figure with hair, some metal/dielectric probes and a ground plane. No lights except the AWE Environment Light and the environment sphere. We're going to use only the HDRI as an IBL.

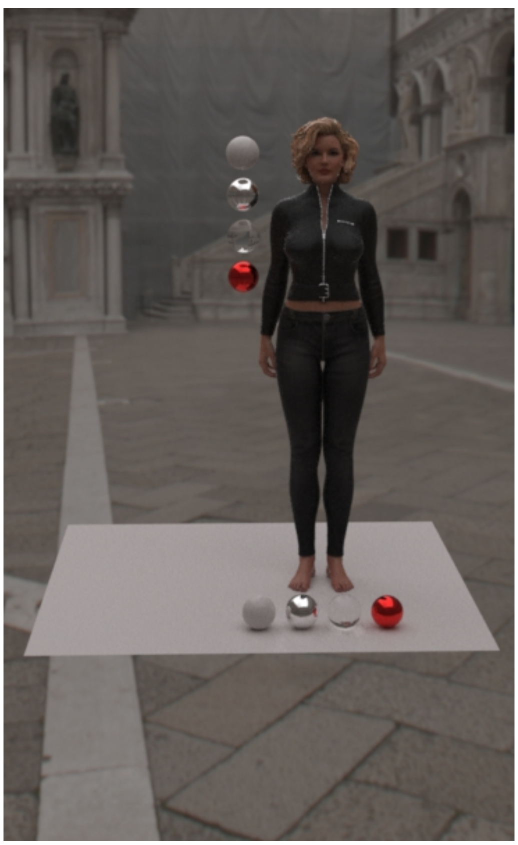

Illustration 17: Initial render with the Doge Palace HDRI.

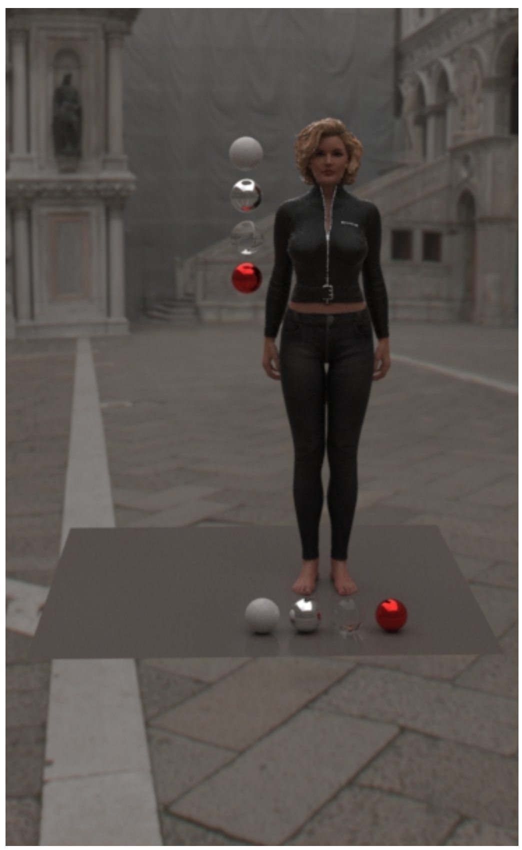

Illustration 18: With sRGB values for concrete applied to the ground plane.

The ground plane is set to 100% diffuse, so not really realistic for concrete. After changing it to an sRGB color of 128,123,119 – reference value for concrete as noted by Unity Reference albedo values – we have a much closer match to the ground in the HDRI.

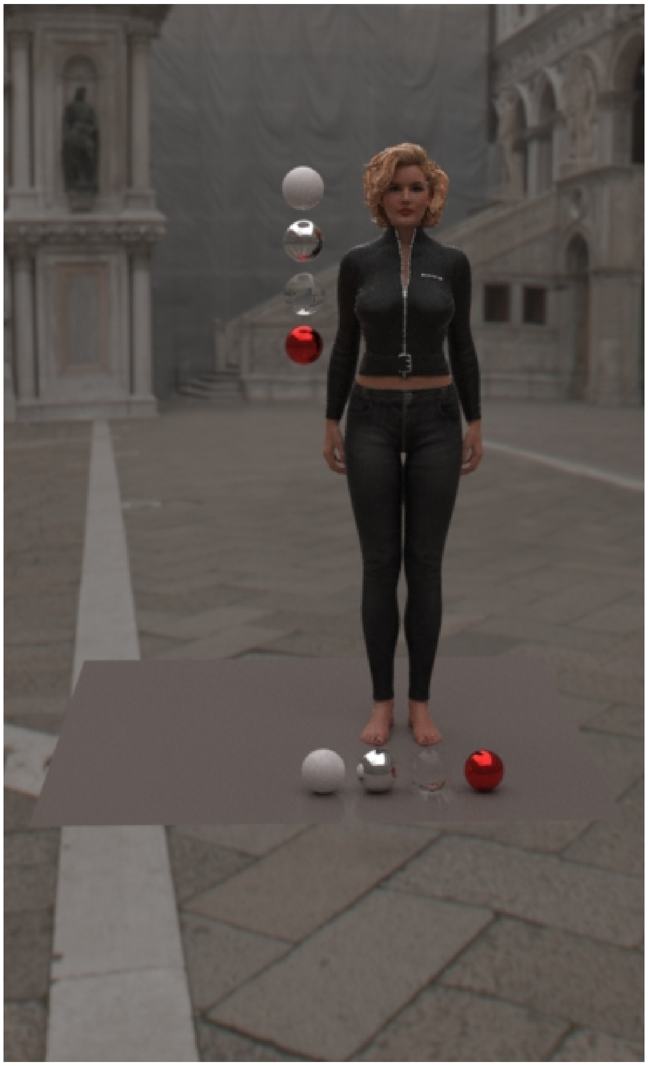

Illustration 19: Adjusted ground plane with the HDRI exposure set to 0.

Illustration 20: With the HDRI exposure set to 2.

Next, we raise the exposure by 0.5 on the AWE Environment Light and the exposure on the HDRI to 2. We now have a very nice match between the ground plane and the HDRI and a more brightly lit scene.

The probe balls are a nice way to judge exposure levels and allows you to properly tune scene lighting appropriately. Rather than over compensating for lighting by boosting diffuse strength or albedo on the materials, we should be adjusting exposures of the lights.

The HDRI used is the Doge's Palace HDRI from http://gl.ict.usc.edu/Data/HighResProbes/

Lets test if the materials hold up with different HDRIs and lighting conditions. This one is Lac d'Annecy from https://community.renderman.pixar.com/article/705/hdri-lac-dannecy.html?l=r

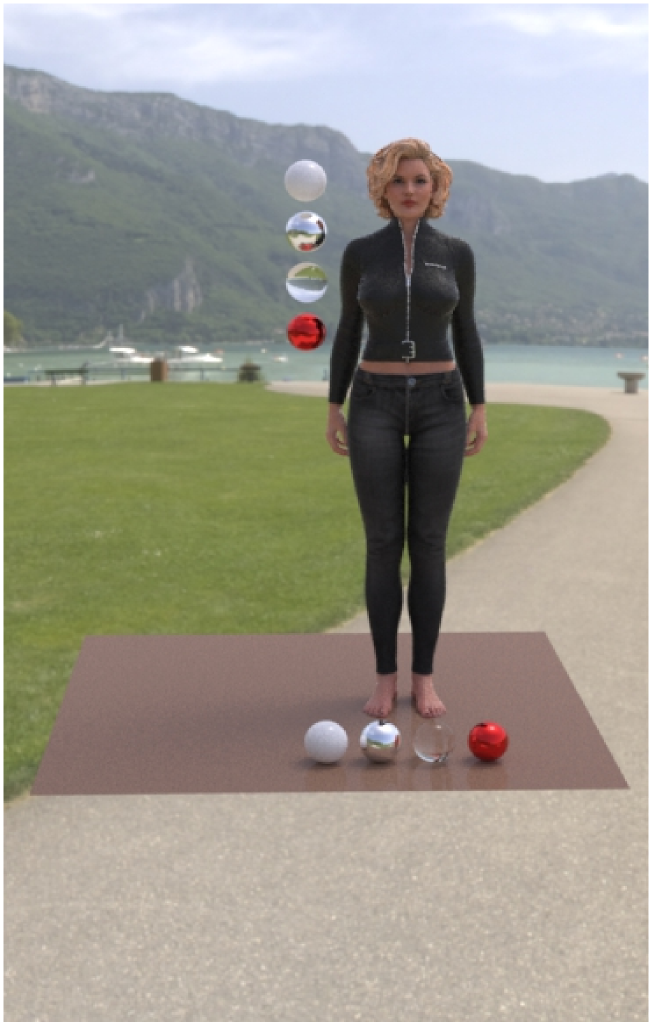

Illustration 21: Initial render with the Lac 'd'Annecy HDRI.

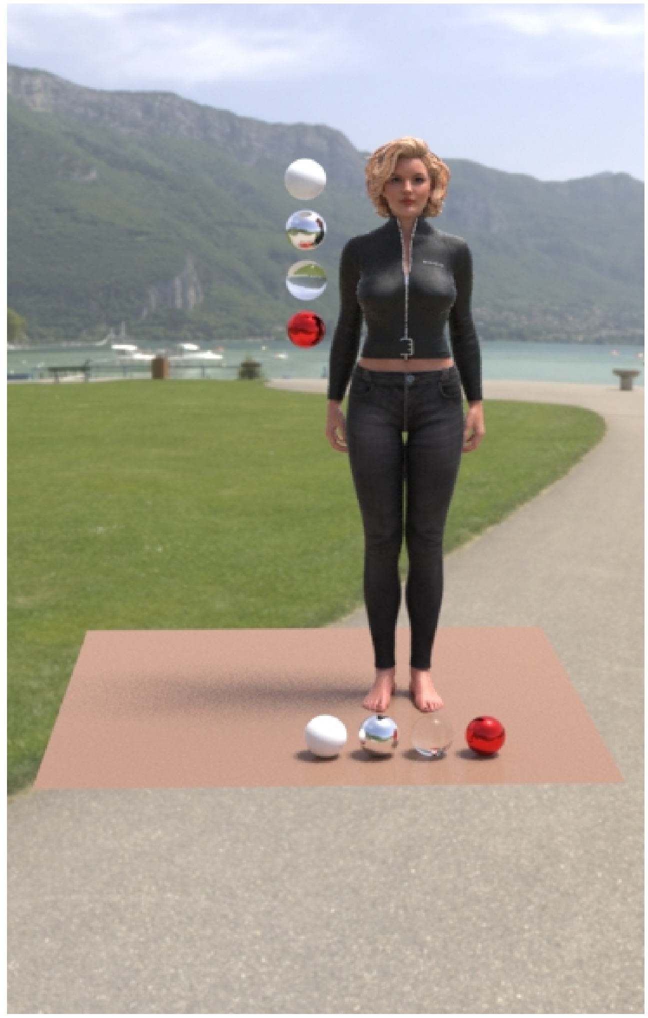

Illustration 22: With added distant light.

This is what we have after we switch the HDRI and reset its exposure to 0. The ground plane is using an sRGB color of 140,112,93, the value for mud from the same Unity reference. In the first render, it looks like we need a little more light. So we added a distant light to compensate. We still have to make a few additional adjustments though.

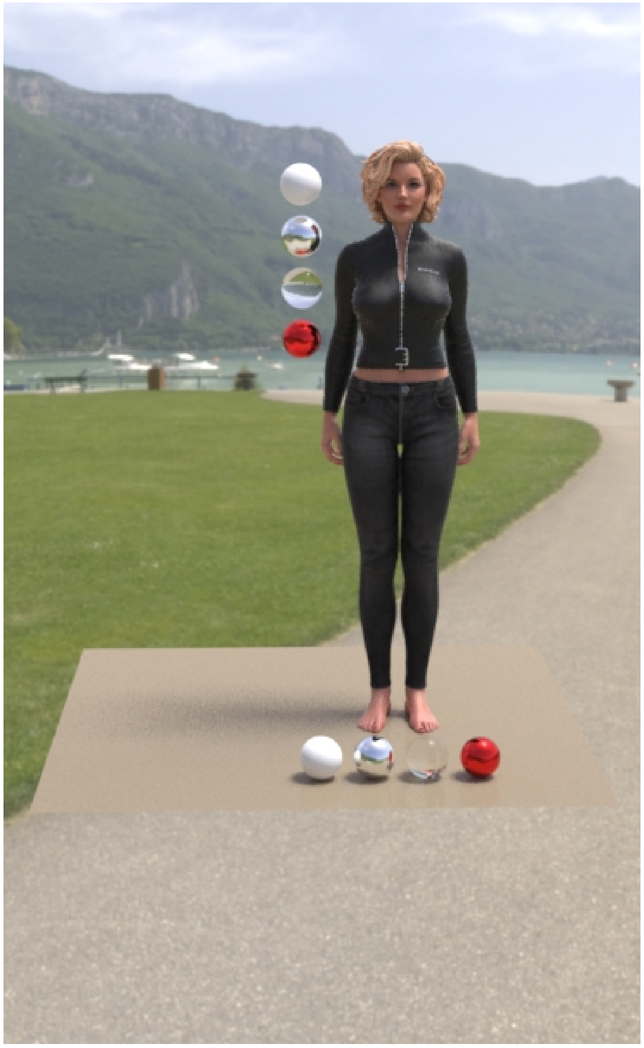

Illustration 24: Dialed down saturation of the ground plane's color

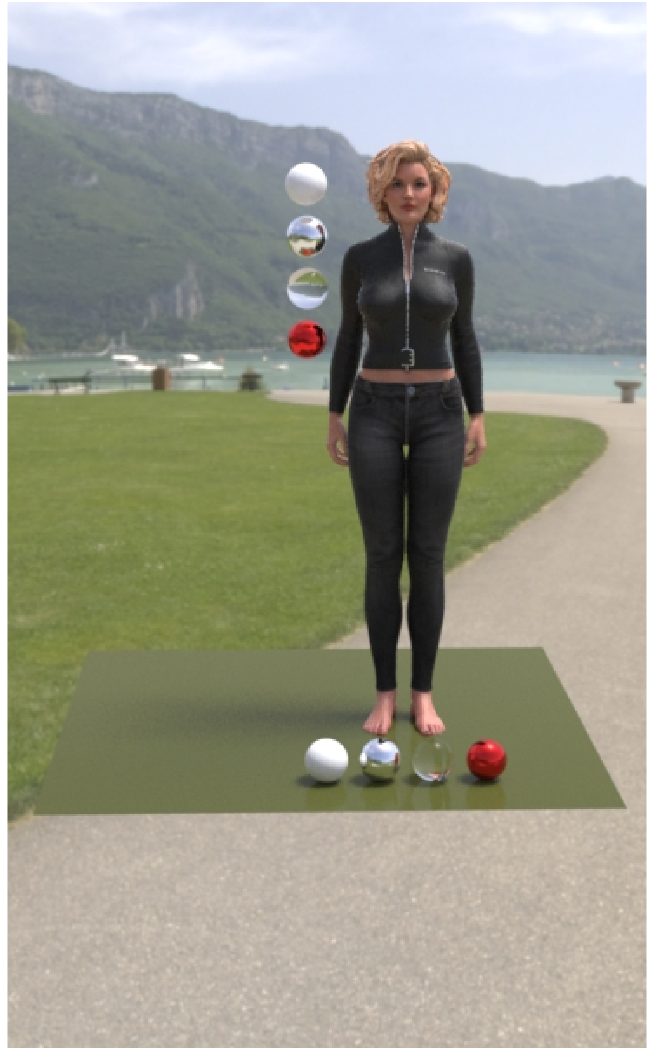

Illustration 23: Grass color used instead.

We've dialed down the saturation for the ground and adjusted the intensity of the distant light. As you can see, we now have a much closer match. To test if we're using proper values, let's see what it will look like when we substitute the ground plane color values with ones for the grass. When we switch the ground color to 85,89,45 which is grass color as per Unity's Reference, it still looks very close.

Next we have an indoor HDRI. This one is a set from https://zbyg.deviantart.com/art/HDRi-Pack-2-103458406. We removed our distant light and reset the ground plane color to concrete.

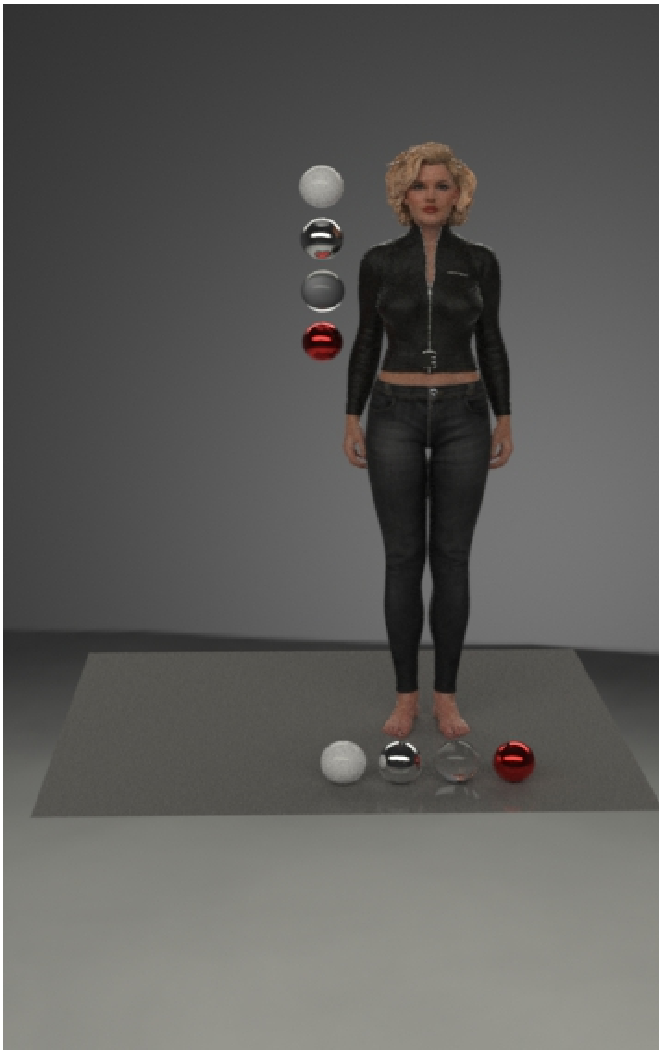

Illustration 26: Initial render with Fluorescent Lights HDRI

Illustration 25: After adding a second environment sphere, plus slight adjustments to ground plane color and scene white balance value (7000 K).

For this one, we had to raise the exposure a bit more on the AWE Environment light and a geoshell as an additional environment sphere to light the scene.

The main point of this exercise is to showing you how to calibrate lighting to your materials. Since we're using physical values and reference albedos, we only need to correct or adjust our lighting values.

Tutorial – Indoor Scene with Outdoor Lighting

Scenes such as this always present a real challenge to light properly. We are using the Lac d'Annecy HDRI on the environment sphere placed outside.

This is our first test render of the scene. We've applied 'Glass 3' preset with zero opacity to allow indirect diffuse light to go through the window. As you can clearly see, we have tons of noise.

This is what we have after using 2048 irradiance samples and 16x16 pixel samples. Better but the noise is still very noticeable and the scene lighting level is still very low. Render time was 11 min 45 secs.

We've loaded an area light, placed slightly inside with dimensions matching that of the window. We've inserted the HDRI used on the area light (in the light color/texture slot). After some manual adjustment to tiling scales and offsets, we've managed to get the HDRI on the area light as close as possible to what's outside the window. This is essentially, our 'portal' light. Obviously, if we didn't use a HDRI for the environment sphere, we could just use the area light as is.

This render is actually just using 8x8 pixel samples rather than 16x16. Render time is slightly longer at 12 min and 53 secs, but this render have very little noise. We also have more light in the room now. Adding a second area light for the open door on the right of the image will likely help us manage noise in that area too.

We could probably optimize this further by creating a HDRI of the room, which is done by rendering the scene with a spherical projection camera. But for the purpose of this tutorial, this is enough.

Tutorial – Hair Workflow

The three hair presets were made to be used without diffuse hair textures, but they can still be used with them. Without textures, most of the color will come from the diffuse color, subsurface scattering and/or translucency. To add additional variation, you can use the opacity mask in the diffuse strength slot.

For very light hair colors, the 'Hair 1' preset with subsurface scattering and translucency is probably the best. It also is the most taxing on rendering time, particularly since you will need 512 subsurface samples to avoid noise artifacts. Thankfully it will not that much different from the default value of 256 samples.

More saturated hair color can probably make do with the 'Hair 2' preset, with just basic translucency. This preset will render a lot faster since it disables subsurface scattering. To compensate, the diffuse strength have been raised to 100% in this preset.

Finally, the 'Hair 3' preset is a more optimized version that disables both subsurface scattering and translucency. This is more suitable to darker colors and probably will look the best with hair textures with baked in highlights.

As noted in the AWE Surface readme, the hair presets will have 'Opacity' and 'Multiply by Opacity' enabled. This is done since most hair props for DAZ figures come as hair 'cards' with opacity masks. AWE Surface comes with some optimizations for opacity by filtering out values below a certain threshold. It also remaps the remaining values close to fully opaque whenever possible. Since the opacity values will vary between hair props and masks, you will likely have to fine tune the values from the default ones.

Illustration 28: Unoptimized original values for Portia hair mask

Illustration 29: Shader default values

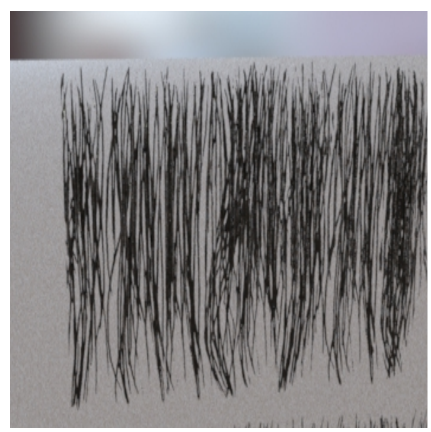

Illustration 27: Opacity Filter 2 set to 67.5 %

This is especially important when using the 'Hair 1' preset because subsurface scattering is rather sensitive to opacity values. Artifacts such as slightly dark areas along the edges of the mask will appear with improper values, as noted in the AWE Surface readme.

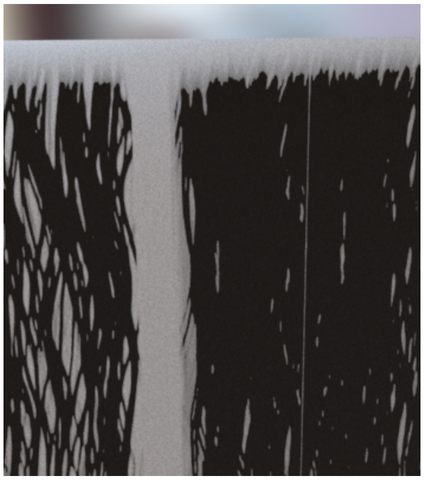

Illustration 32: Unoptimized, original value for Yu hair mask

Illustration 30: Shader default values

Illustration 31: Opacity Filter 1 set to 50%

What value works for one hair prop will likely be different on a different hair prop/mask.

AWE Surface does an interpolation between the original values in the mask and the optimized version. The interpolation level will be based on the optimization level set for the material. As such, it might be best to use slightly less than 100% to retain some of the original values, but keep most of the optimizations and culling thresholds.

Illustration 33: Unoptimized original values - render time 7 min 28 secs

Illustration 34: Optimization at 100% - render time 2 min 1 secs

As you can see, 100% optimization leads to a very solid look, which in most cases is not what we wanted. For comparison sake, rendering the hair without opacity enabled actually takes longer (3 min 28 secs) because there's more area visible.

Illustration 35: Unoptimized original values - render time 7 min 28 sec

Illustration 36: 90% Optimization - render time 2 min 50 sec

A 90% optimization keeps most of the savings in render time while at the same time allowsing us to retain most of the soft look of the original. Using 50% optimization will produce the same look as the original, but renders slightly longer (4 min 25 secs).

Full 100% optimization is likely best be limited to out of focus or far away characters.

If you're using fibermesh or strand based hair, you probably can turn off opacity completely.