PBR Materials for Revit: What These Materials Mean and How You Can Use Them

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About the speaker

Josh Radle

Product Manager in visualization programs and BIMBOX computers at ATG USA. Josh is responsible for all levels of assistance, training, and consultation to Architectural, Engineering and Contractor firms across the world.

Agenda

- What is Physically Based Rendering
- What are the different materials that make up a PBR material for Revit
- Where to find them in Revit 2019 and 2020
- How to create our own PBR materials
- Render in the Cloud with Autodesk Raytracer (ART)
- How these materials will enhance our Real-Time Rendering experience.
- Questions

What is Physically Based Rendering (PBR)

Physically Based Rendering is a way of creating materials that will accurately respond to light just as if they were in the real world. It is a theory based on measured surface values.

What are the benefits?

• Physically Based rendering removes the guess work of wondering what my materials are going to look like in a certain lighting condition.

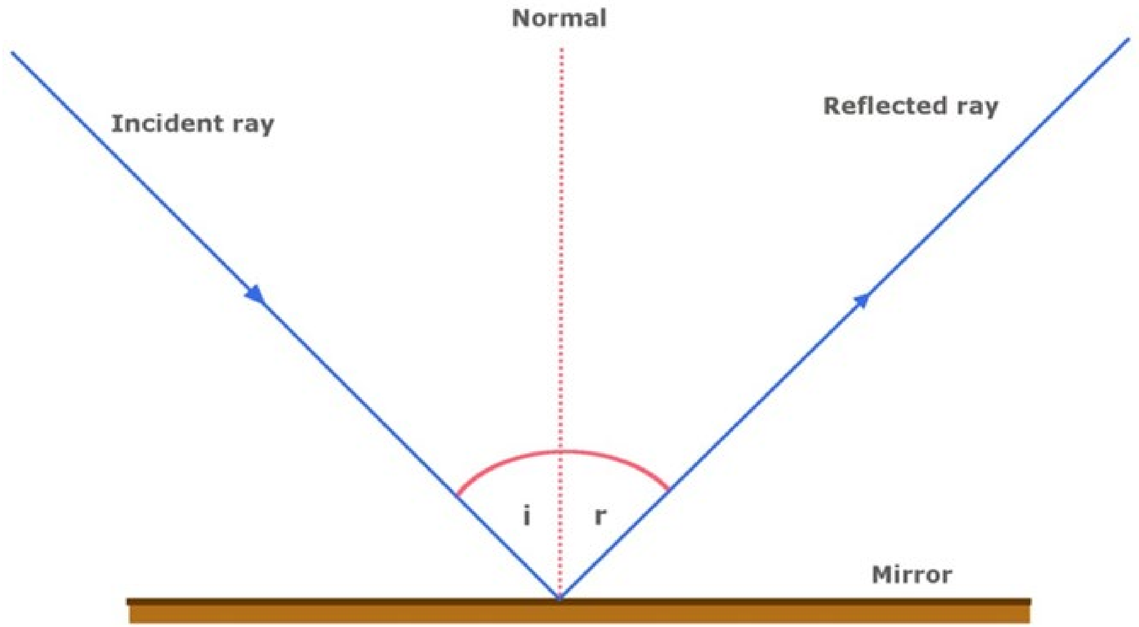
• It will help develop a texturing standard for your company knowing every material that is created will have all the texture maps that make up a Physically Accurate material.

• It will help provide a more photorealistic render or real-time rendering experience.

Physics behind PBR

HOW DOES LIGHT WORK?

When a light wave encounters an object, it is either transmitted, reflected, absorbed, refracted, diffracted, or scattered depending on the composition of the object and the wavelength of the light.

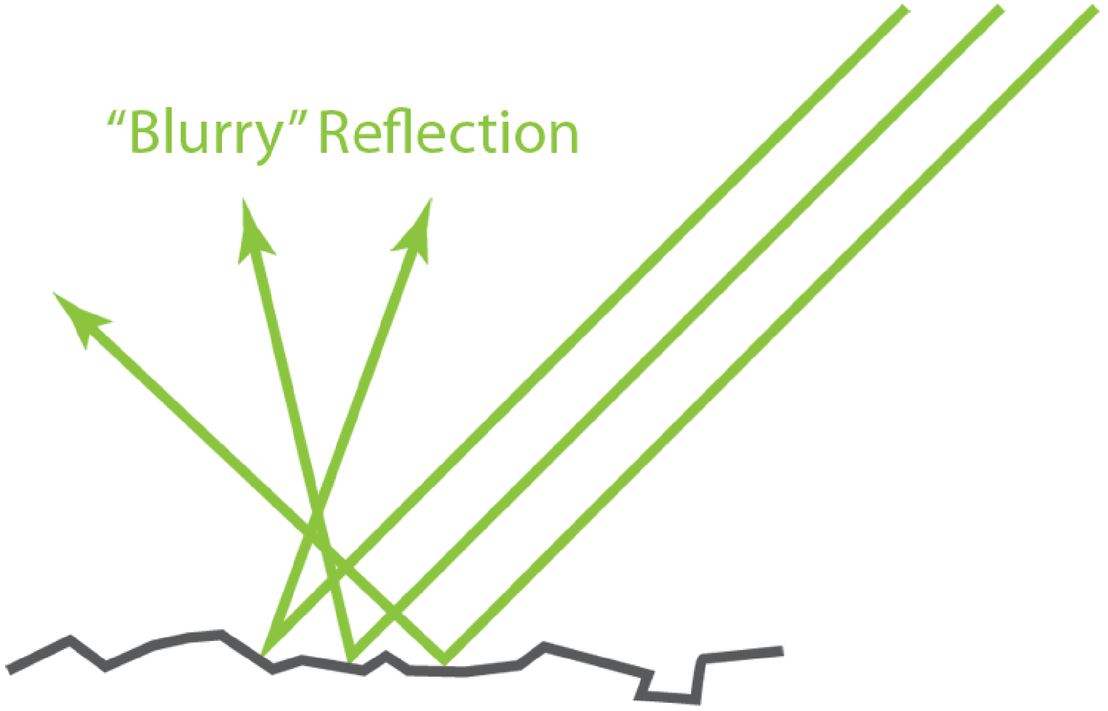


https://www.scienceabc.com/pure-sciences/what-is-the-law-of-reflection-definition-and-a-simple-explanation.html

Physics behind PBR Continued

HOW DO REFLECTIONS WORK?

Reflection is when incoming light hits an object and bounces off. Very smooth surfaces such as mirrors reflect almost all incoming light.

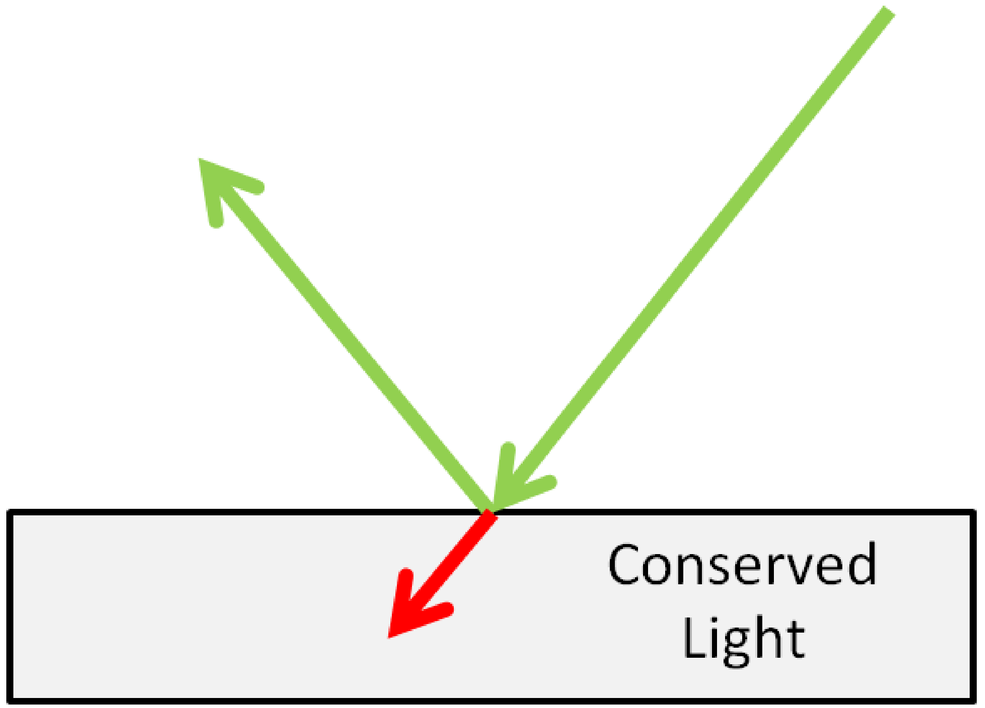


https://medium.com/@grahamte/physically-based-rendering-simplified-d01ec18667d1

Physics behind PBR Continued

WHAT IS ENERGY CONSERVATION?

When the light ray meets the surface, some of the light ray is absorbed by the object, then the light intensity will decrease as it changes into another form of energy, usually heat. The rest of the light ray being reflected off the object.

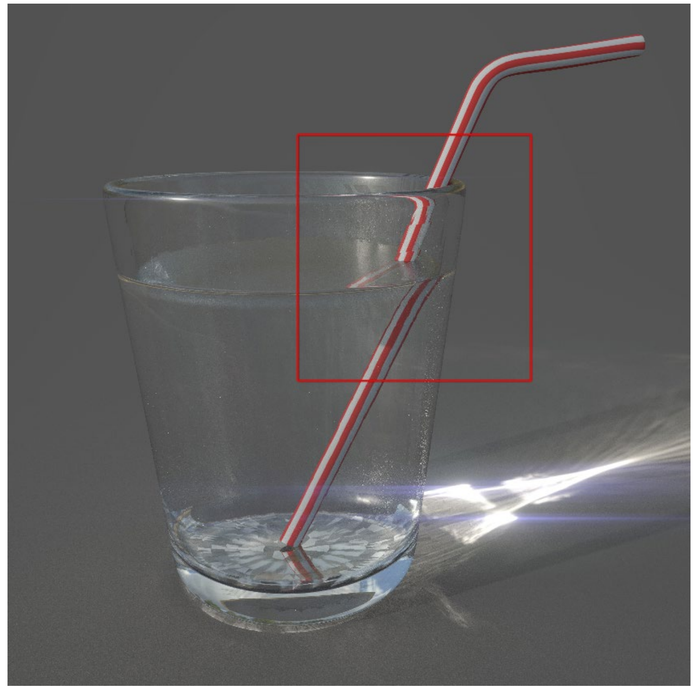


https://medium.com/@grahamte/physically-based-rendering-simplified-d01ec18667d1

Physics behind PBR Continued

HOW DOES REFRACTION WORK?

Refraction is when the light waves change direction as they pass from one medium to another. The *Index of Refraction (IOR)* is used to determine how much the light will be bent when it is traveling from one medium to the next.



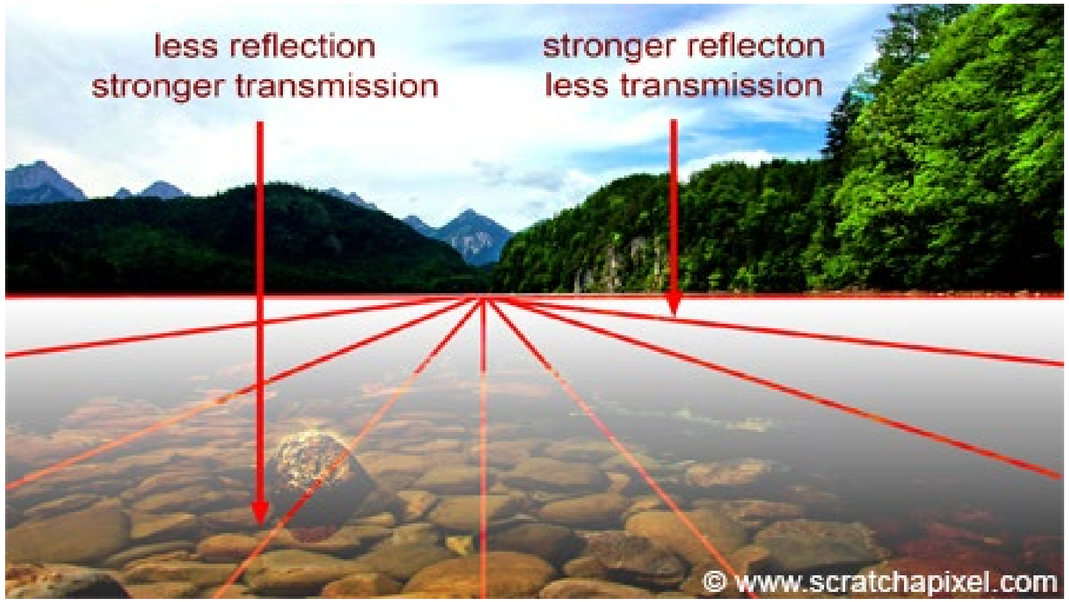
https://academy.substance3d.com/courses/the-pbr-guide-part-1

Physics behind PBR Continued

FRESNEL?

Fresnel is everywhere! The most common place we see it is when looking at water. When we look straight down, we can see to the bottom, but when we look at an angle, we cannot see to the bottom anymore.

https://www.scratchapixel.com/lessons/3d-basic-rendering/introduction-to-shading/reflection-refraction-fresnel?fbclid=IwAR3AzXPmdK2txPEzAkOJHAqGVKXhHFucG3317B6EKPt4TjgRAtpJvLCXVy4



Common Material Types for PBR

ALBEDO/DIFFUSE

This Albedo map is the base color of the material. The big difference between the Albedo map and the traditional **Diffuse map** is the Albedo map has the shadows removed from the texture. This is so our materials will look more natural in every lighting condition.

ROUGHNESS

Controls how the surface imperfections are being displayed. This is an inverted **Gloss Map**. Rough Materials scatter reflected light in more directions than smooth Materials, which controls how blurry or sharp a reflection is.

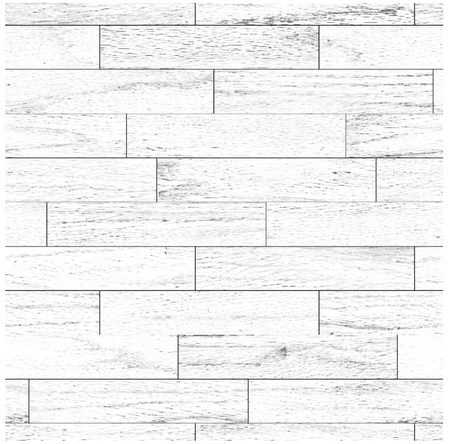
Common Material Types for PBR

BUMP/NORMAL

A Normal Map decides about dents and bumps on the object and is like the regular bump map but much more advanced. It will display a more 3d look due to the fact it has information about bumps and dents in the XYZ axes.

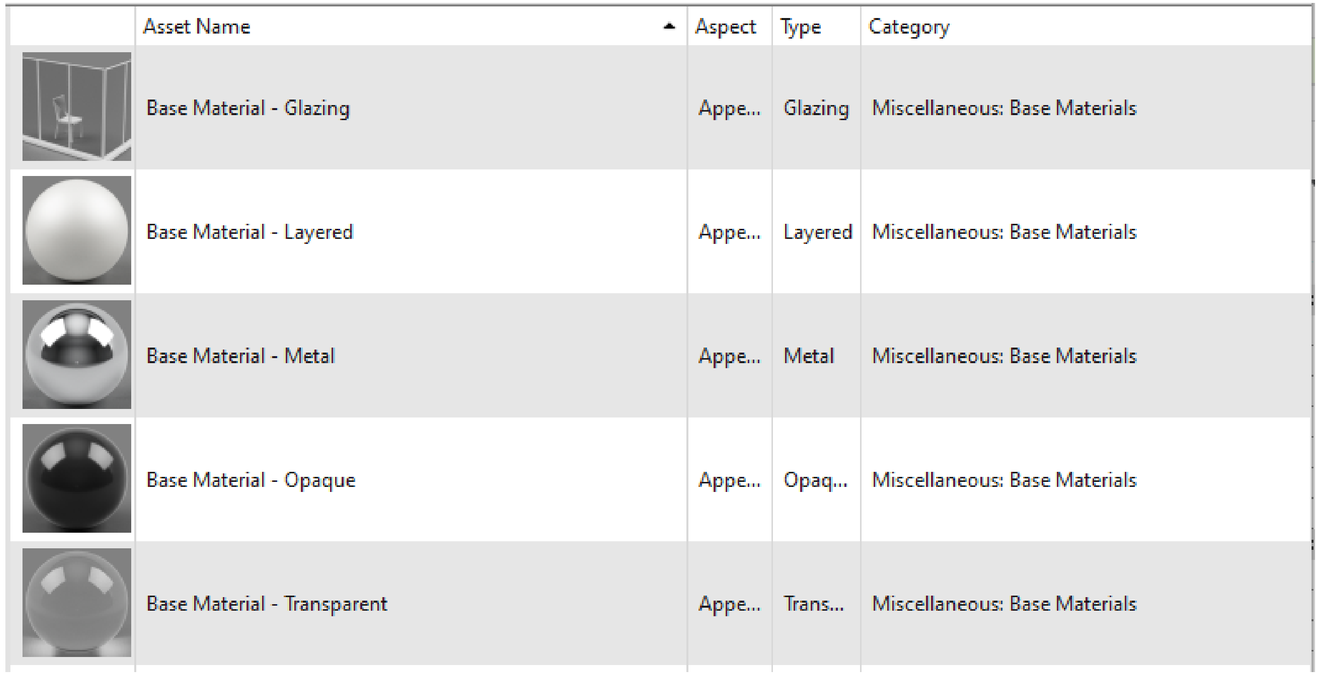
ADVANCED HIGHLIGHTS/AO

This is where we can use an Ambient Occlusion (AO) map to simulate the occlusion of dents and cracks or any other surface imperfections.



Revit Base Materials

- The materials with a yellow triangle in the bottom left corner will indicate it is a legacy material and are not setup to be Physically Accurate. Materials that do not have the yellow triangle are setup to be Physically Accurate. **Revit values are displayed like this **0.06** which translates to **6%****

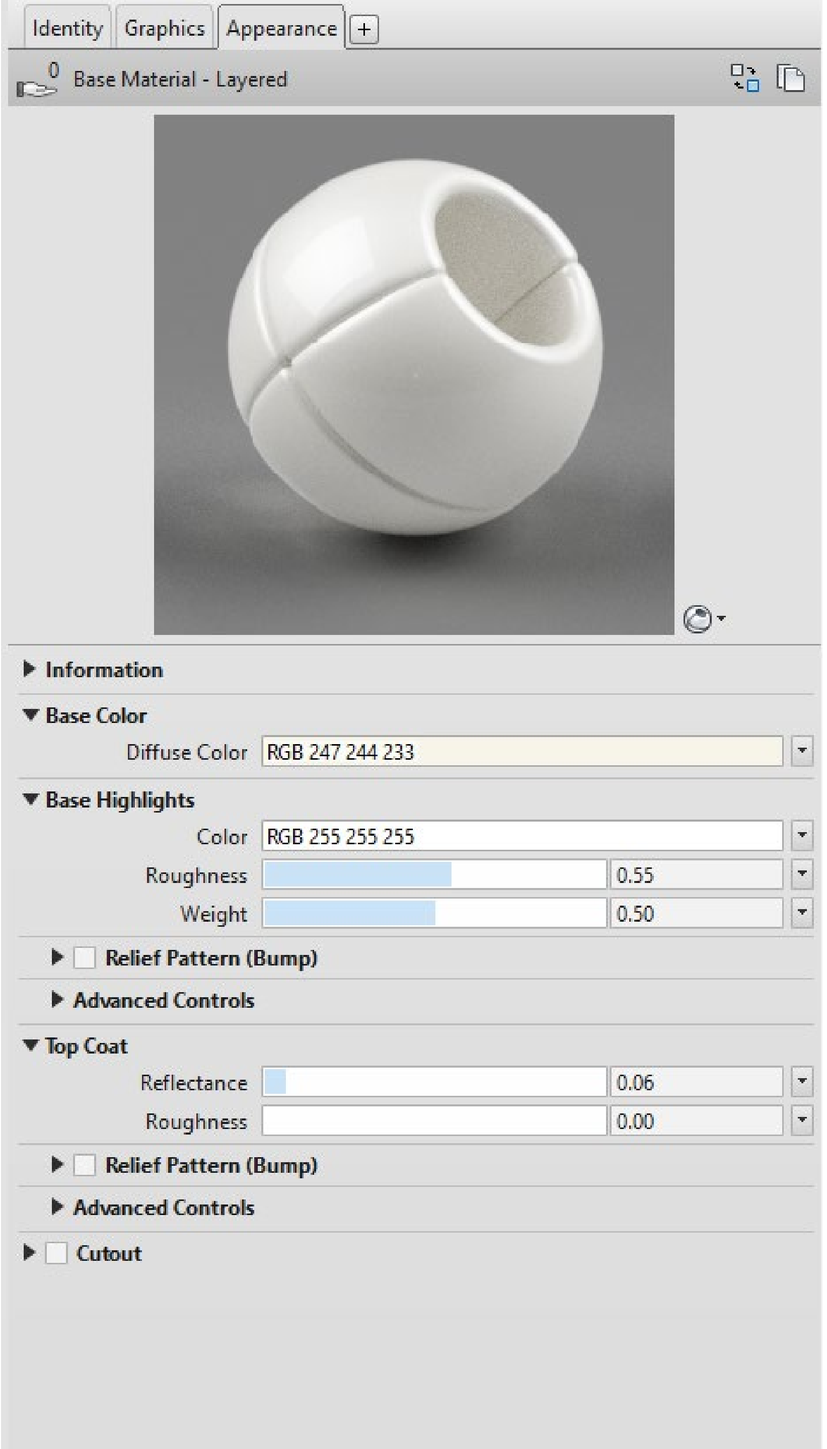


	Asset Name	Aspect	Type	Category
	Base Material - Glazing	Appe...	Glazing	Miscellaneous: Base Materials
	Base Material - Layered	Appe...	Layered	Miscellaneous: Base Materials
	Base Material - Metal	Appe...	Metal	Miscellaneous: Base Materials
	Base Material - Opaque	Appe...	Opaq...	Miscellaneous: Base Materials
	Base Material - Transparent	Appe...	Trans...	Miscellaneous: Base Materials

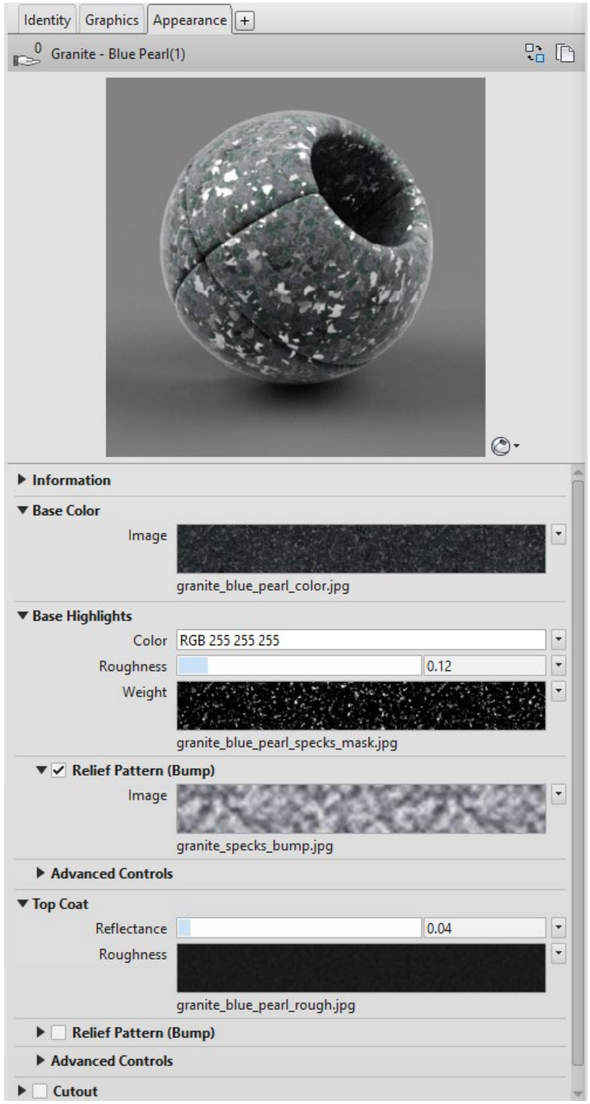
Layered Materials

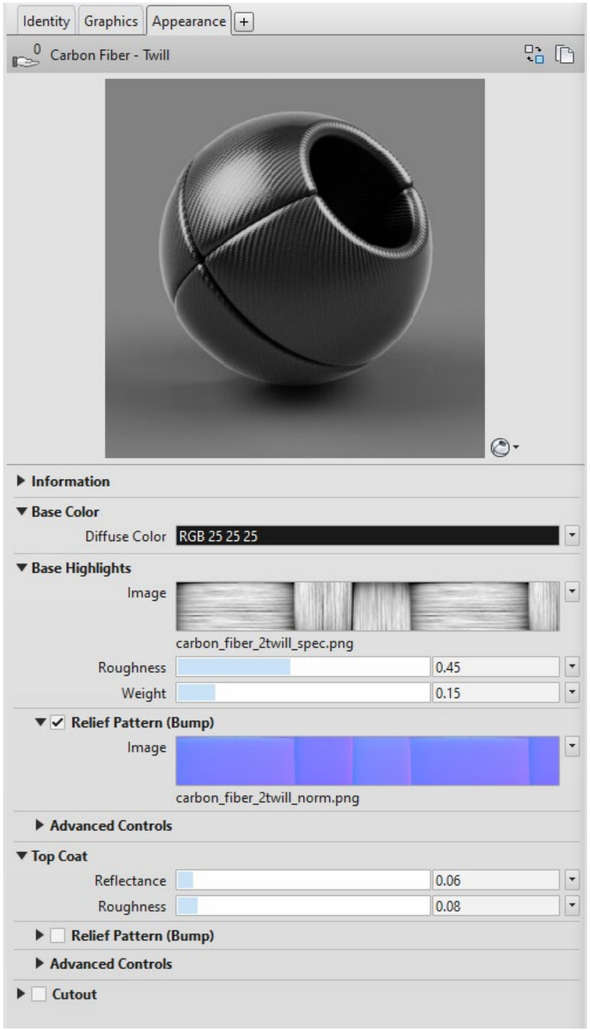
Layered Material is used to represent materials that have a bottom specular surface and a top clear coat.

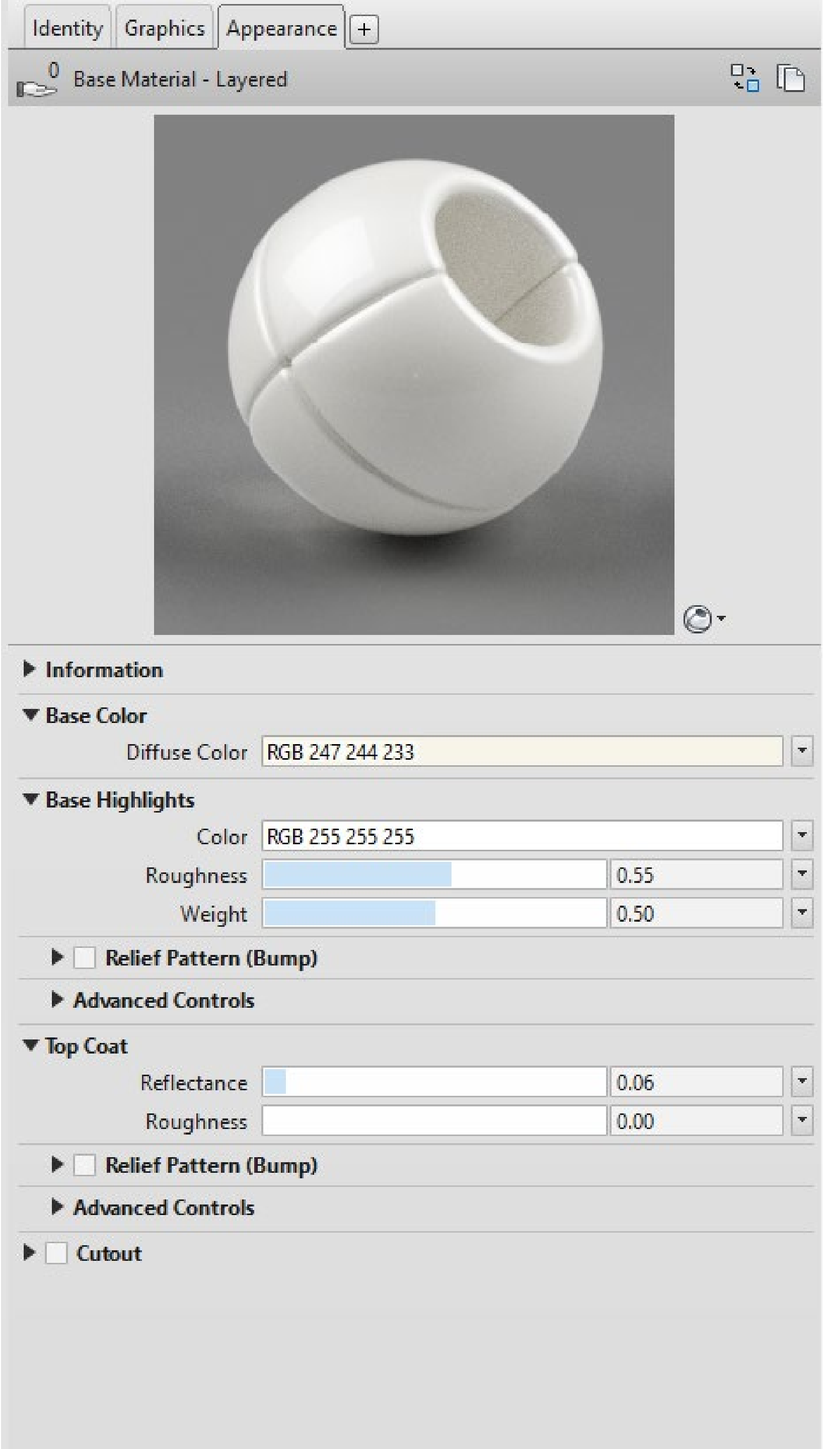
- Typical uses for this material are carbon fibers panels, metallic paints, and surfaces that might have reflective specks like granite and car paint.



Layered Material examples



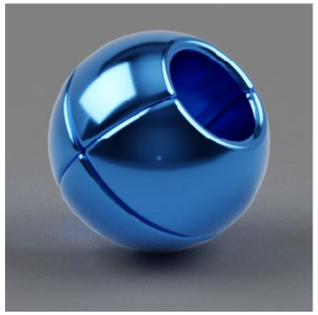


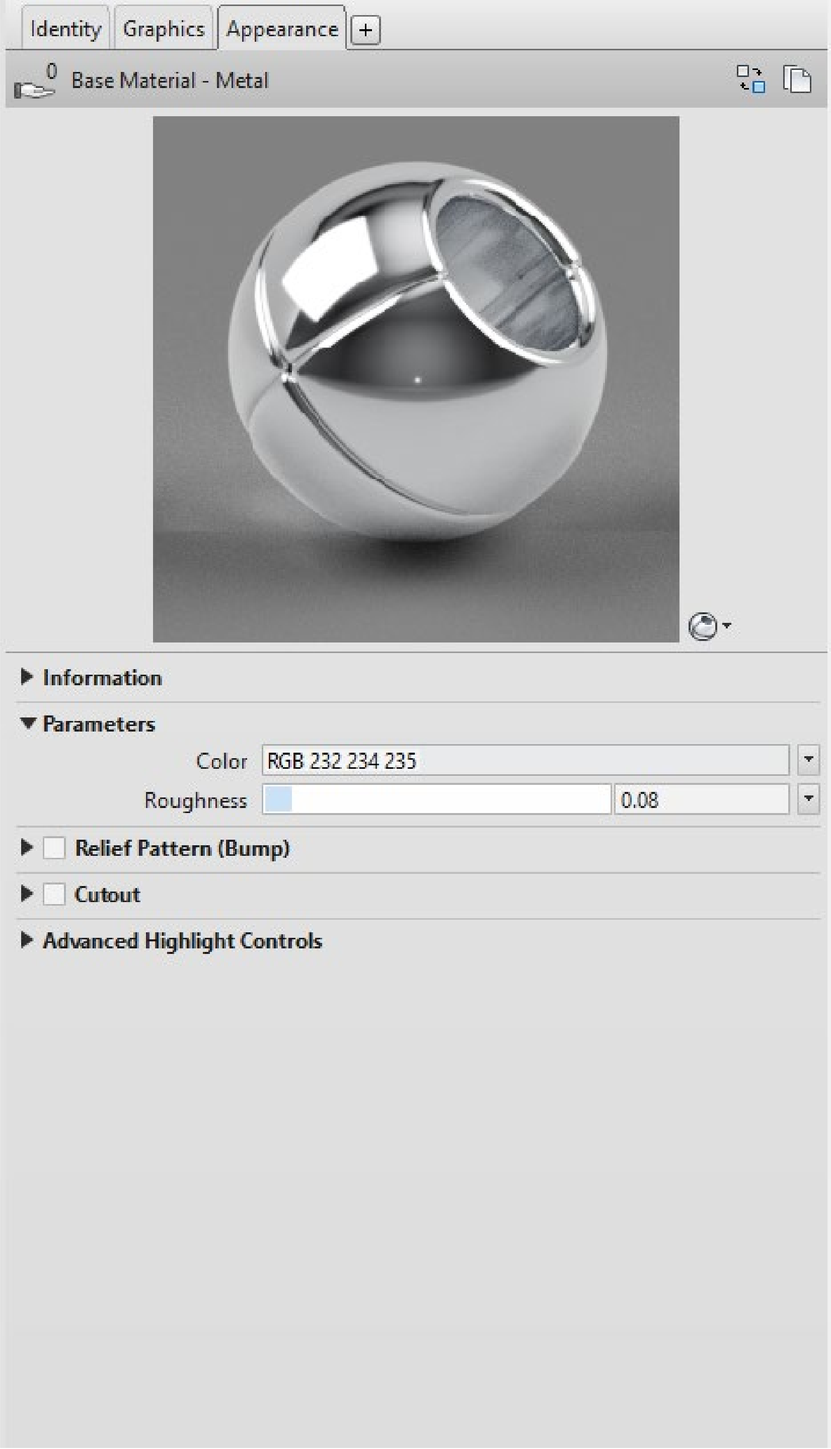


Metal Materials

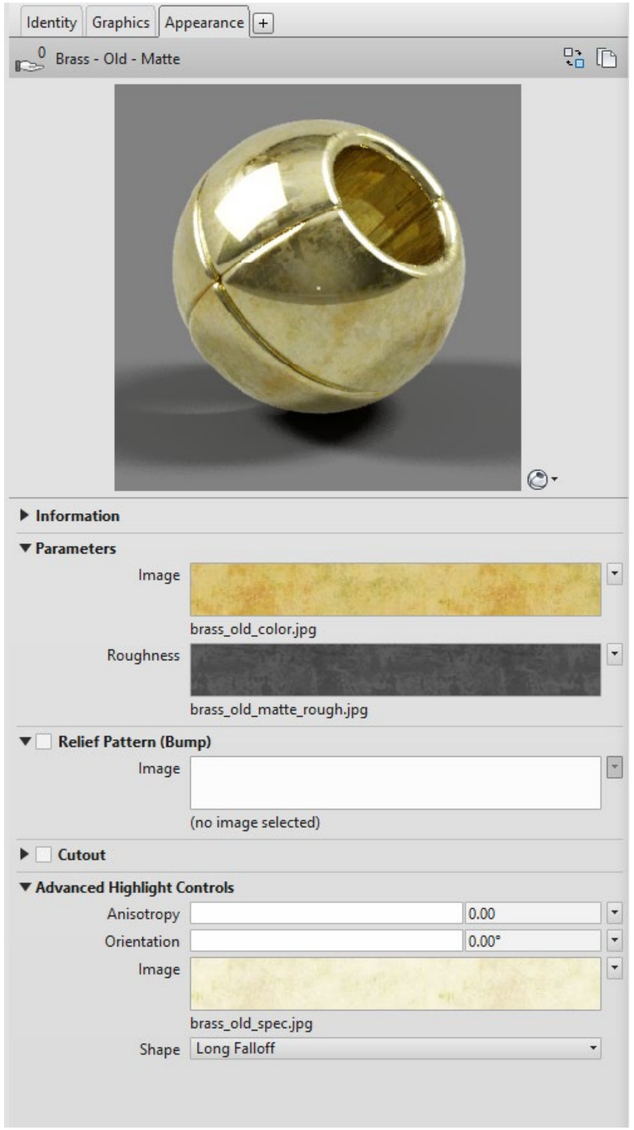
The Metal Material is setup to be used for all Metal materials.

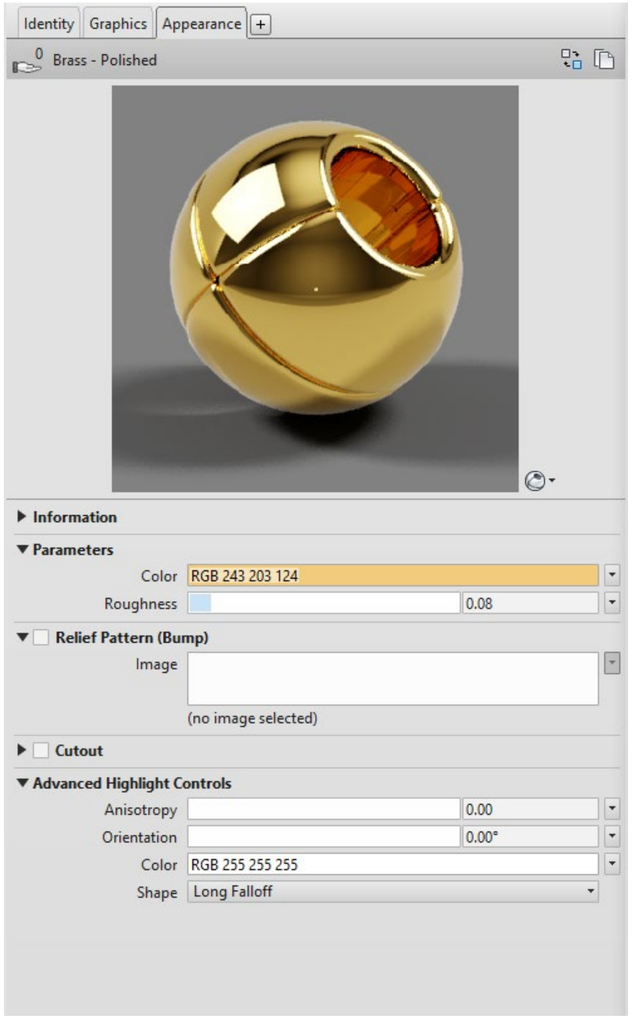
- Typical examples of this material are Iron, Aluminum, brass, etc etc.

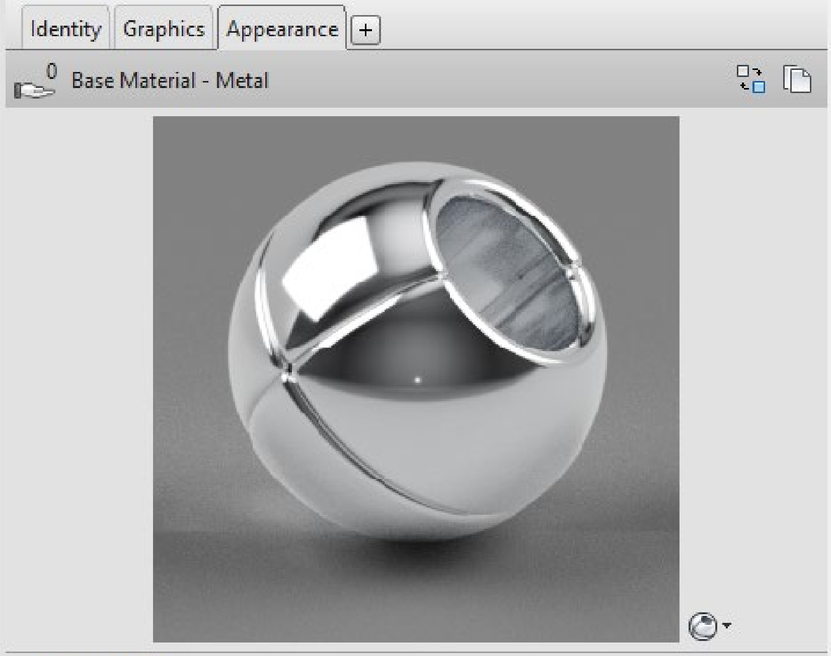




Metal Material examples



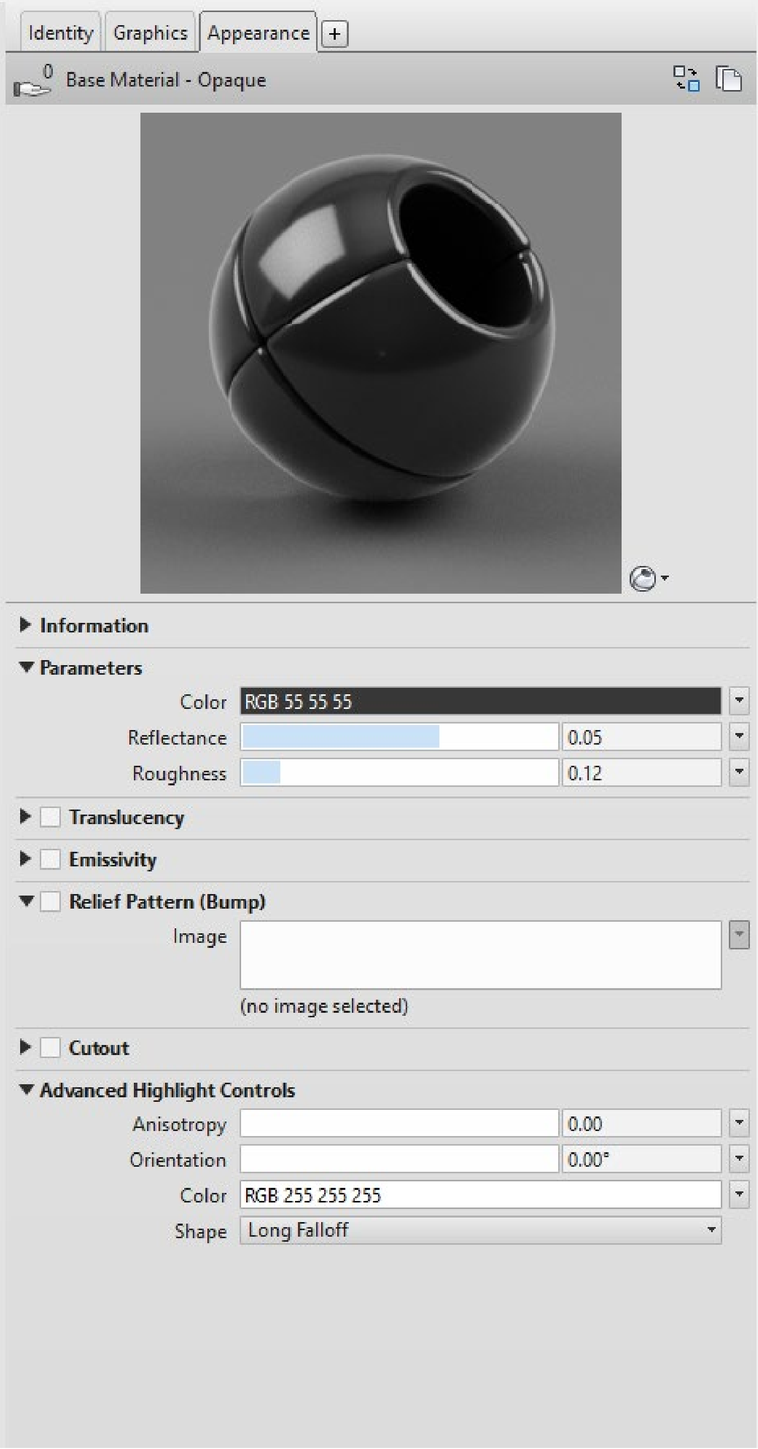




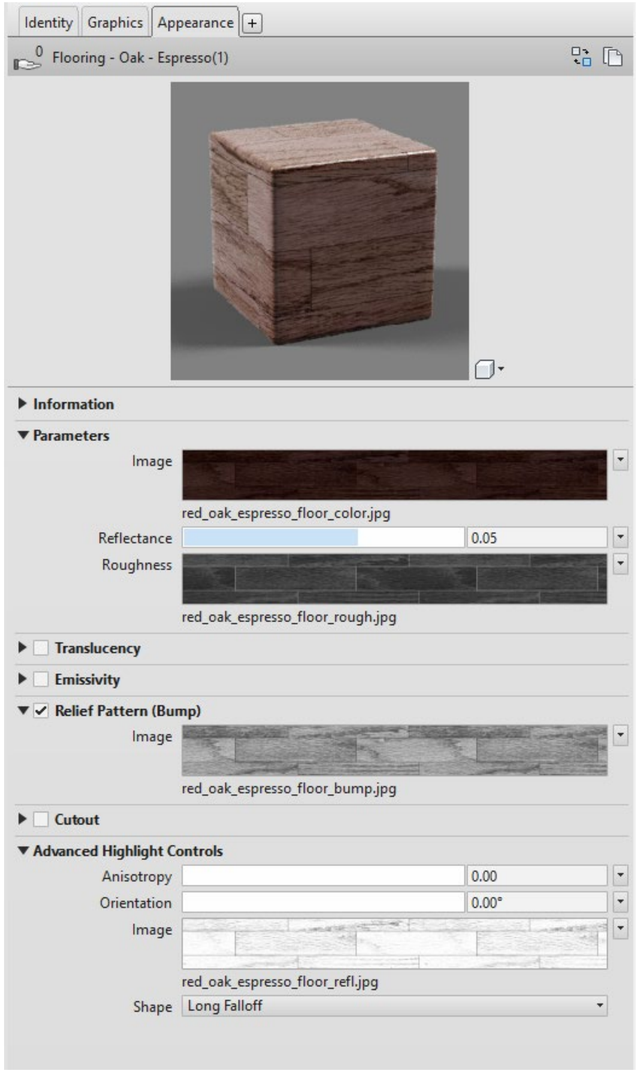
Opaque Materials

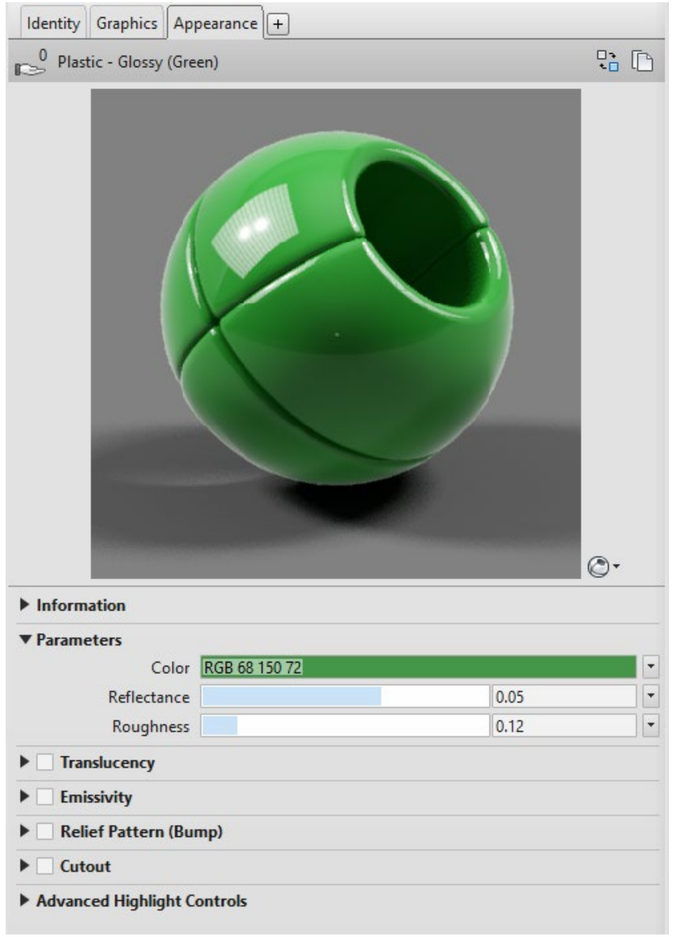
The Opaque material is setup to be used for materials that are non-metallic or transparent.

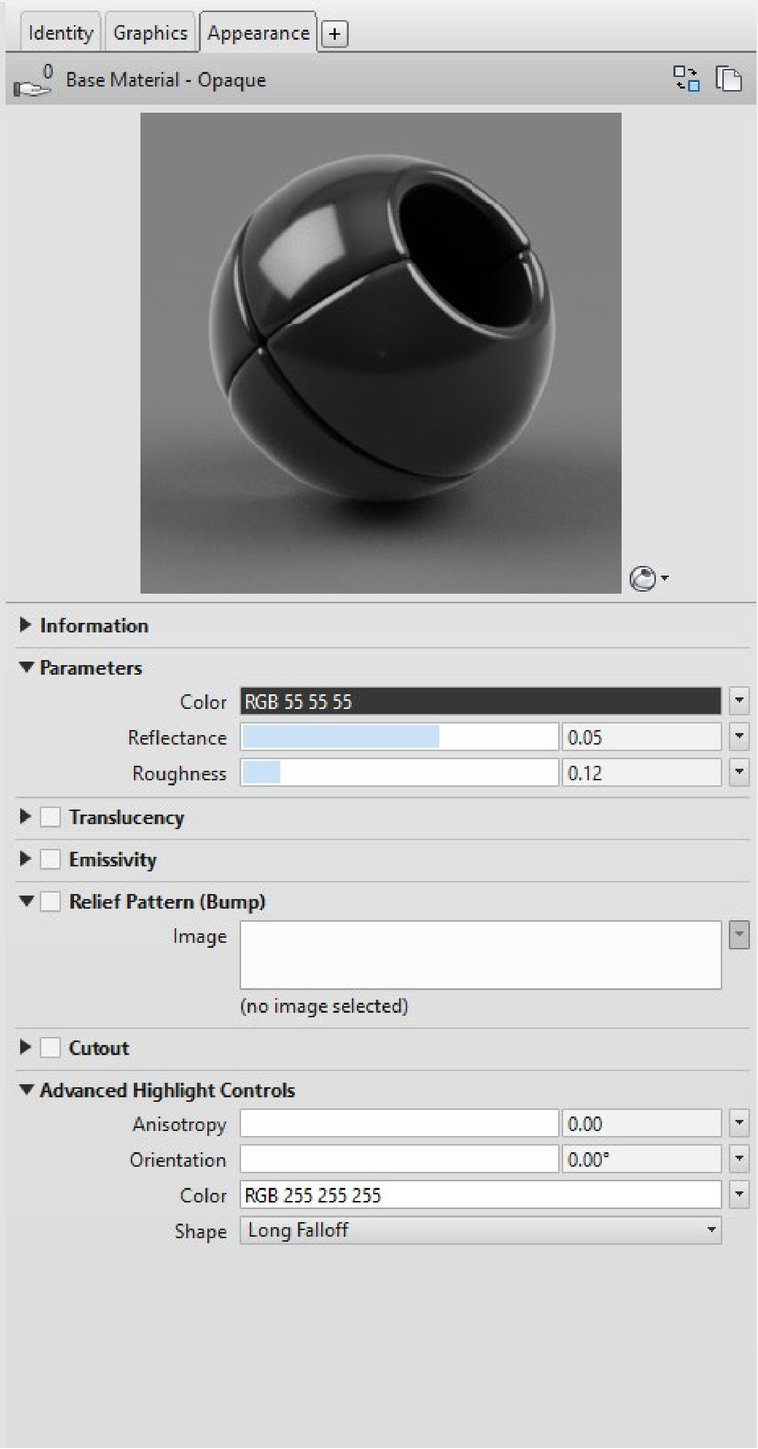
- Typical uses for this material are: Plastic, wood, stone, ceramics etc etc.



Opaque Material examples



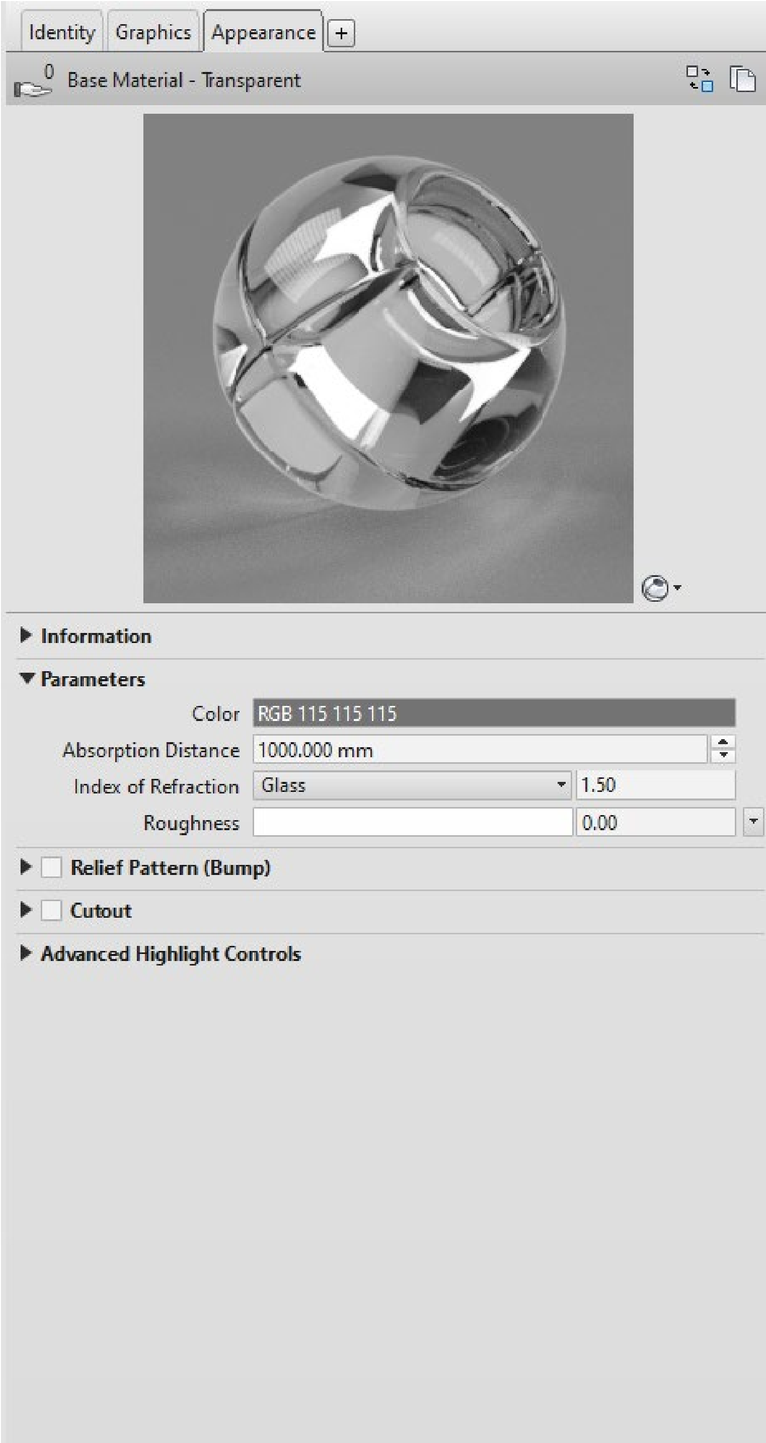




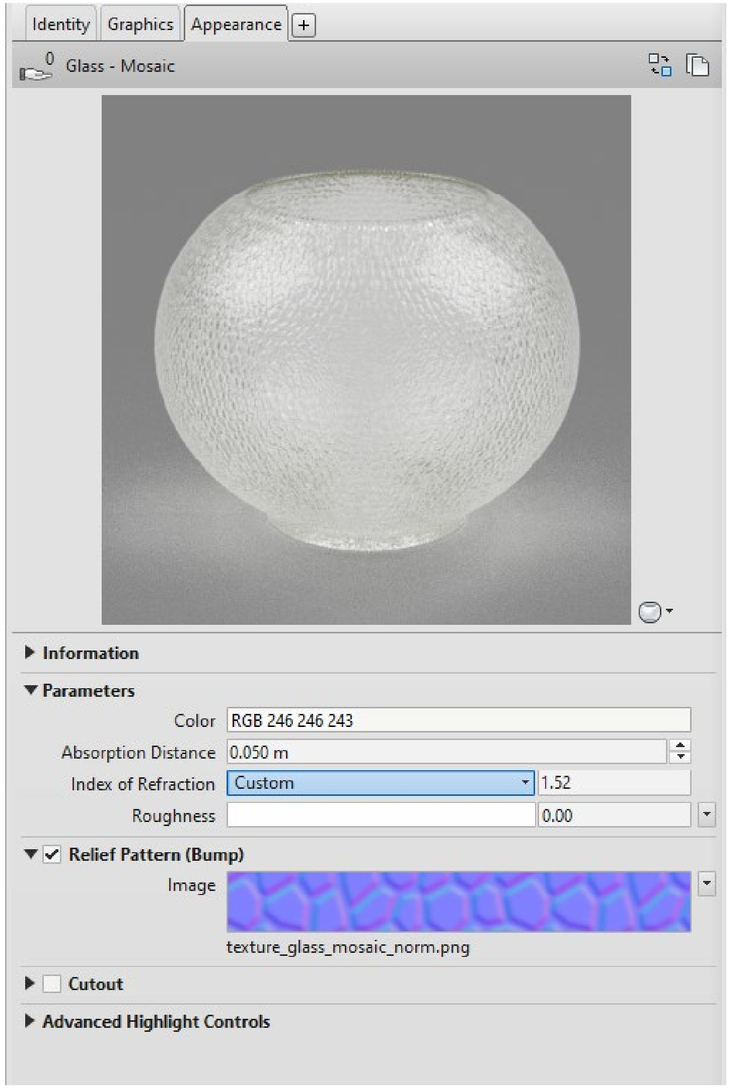
Transparent Materials

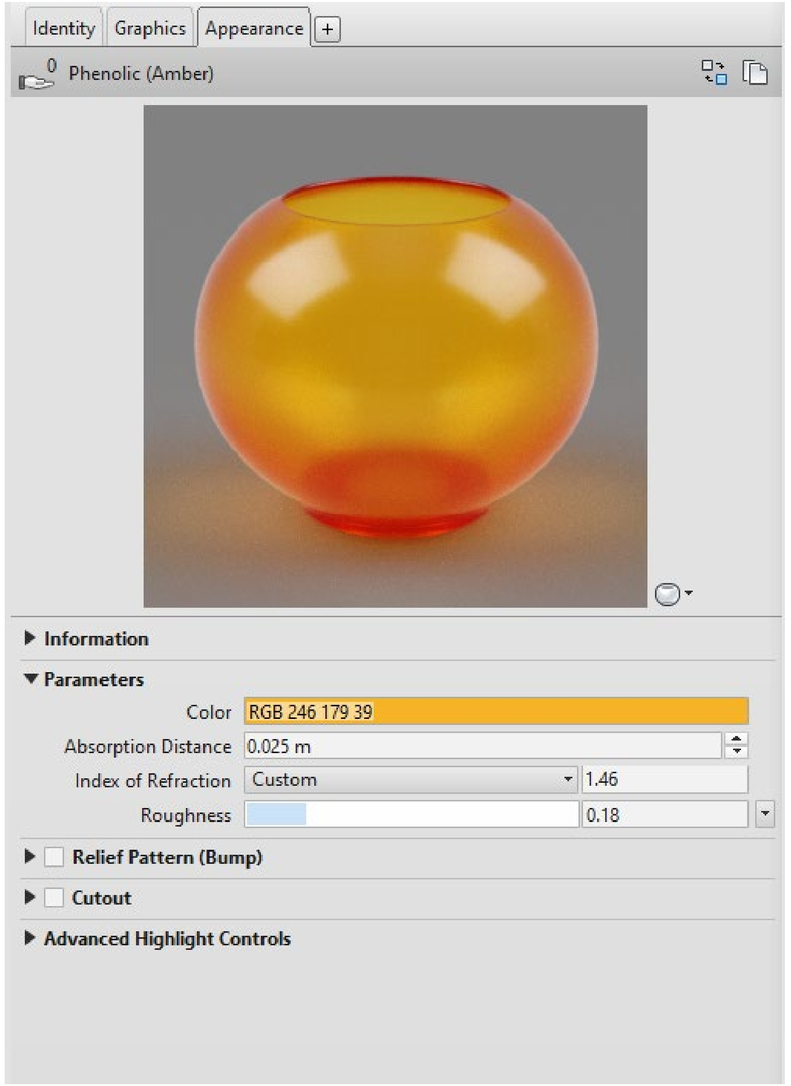
The Transparent material is used for all materials where most of the light rays can pass through the material without any scattering.

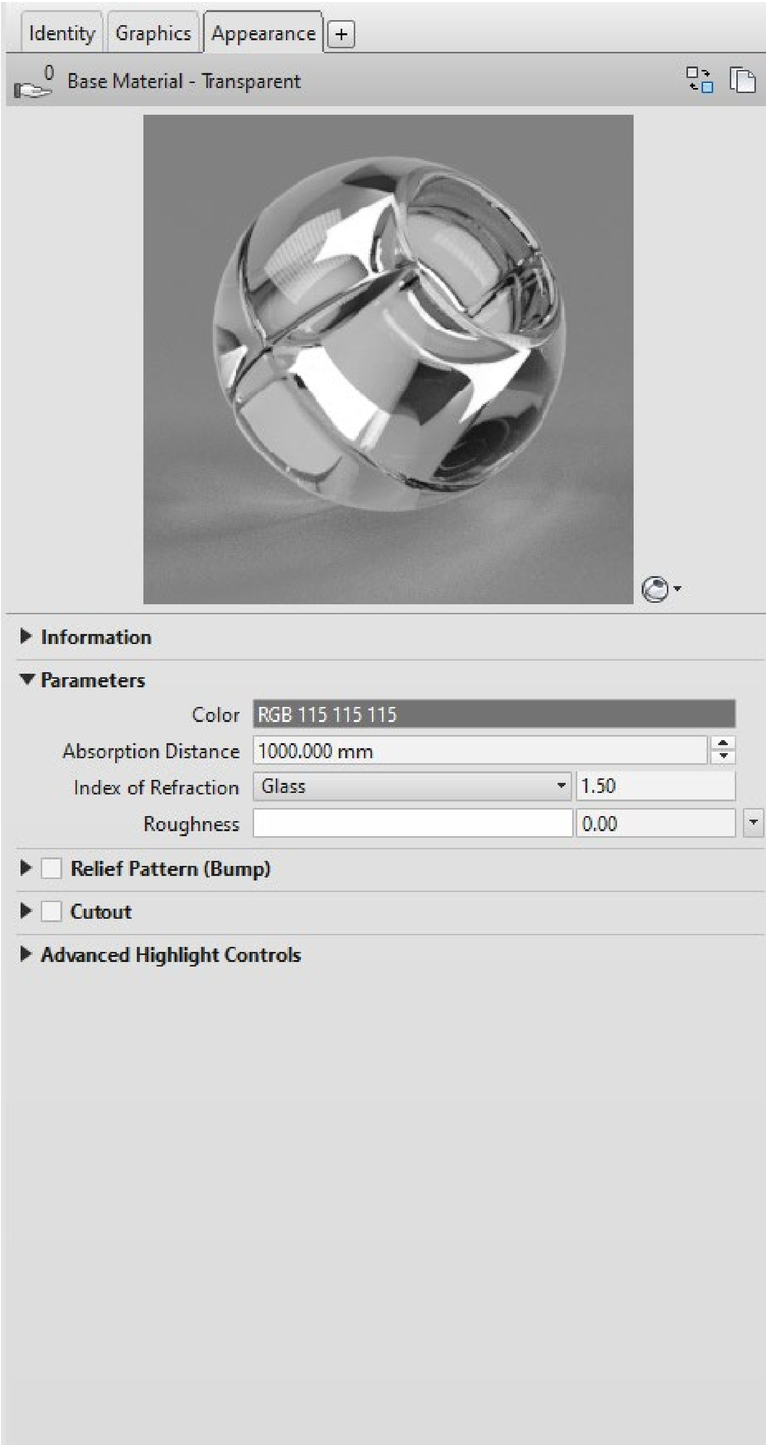
- Typical uses for this material are: Glass, water, acrylic, etc etc.



Transparent Material examples



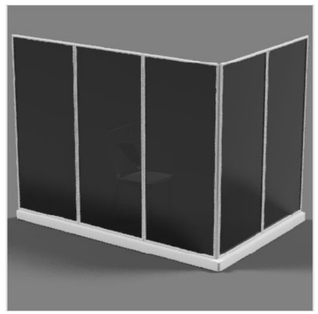


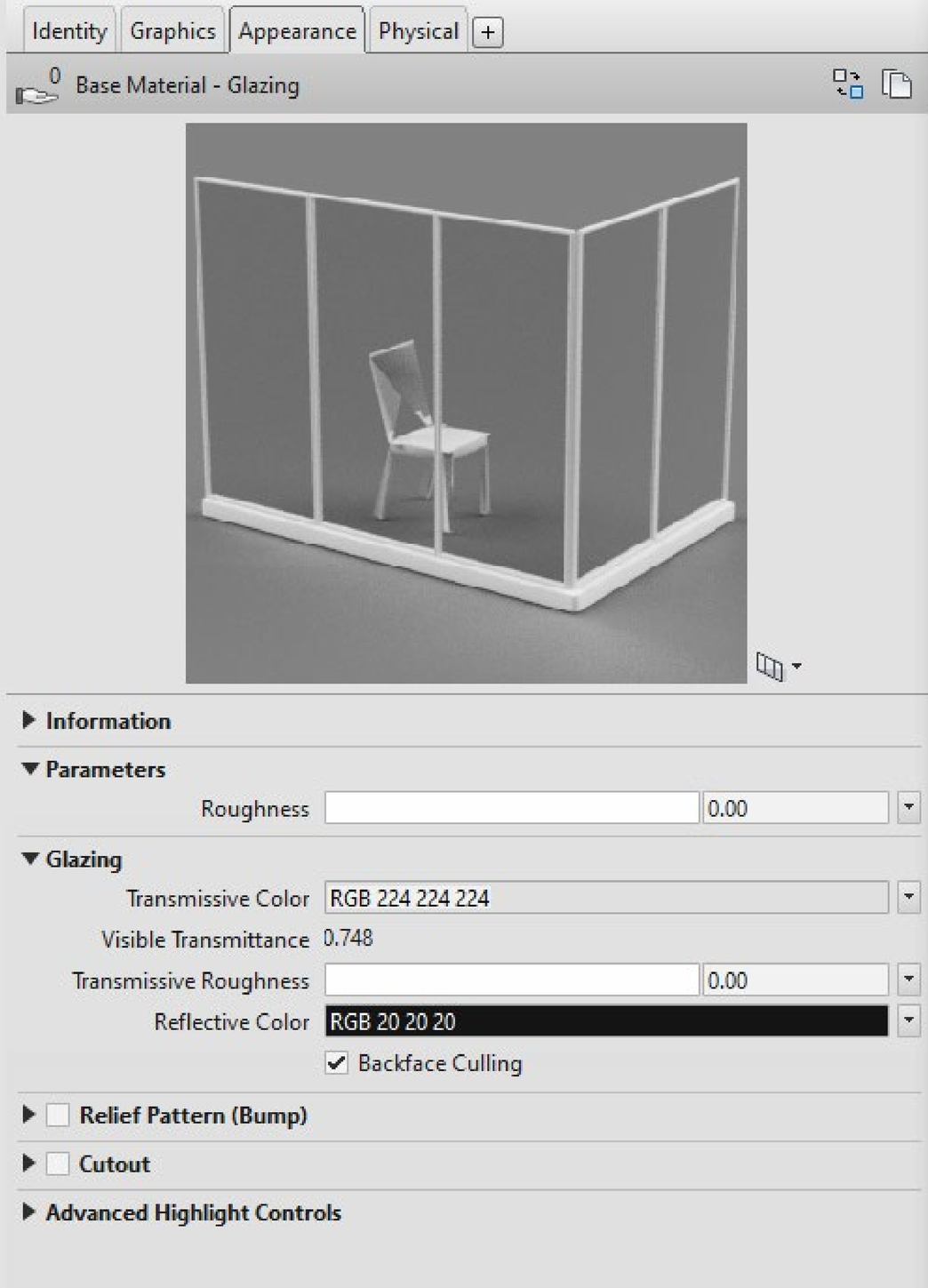


Glazing Materials

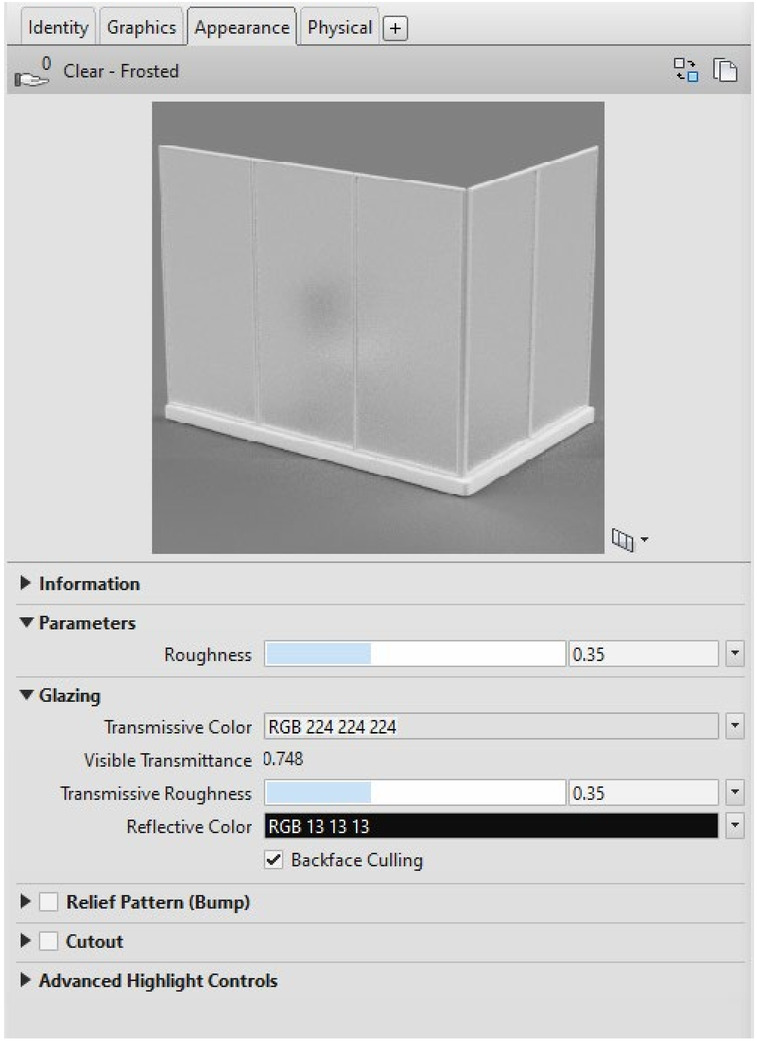
The Glazing material is mainly used for large pieces of glass

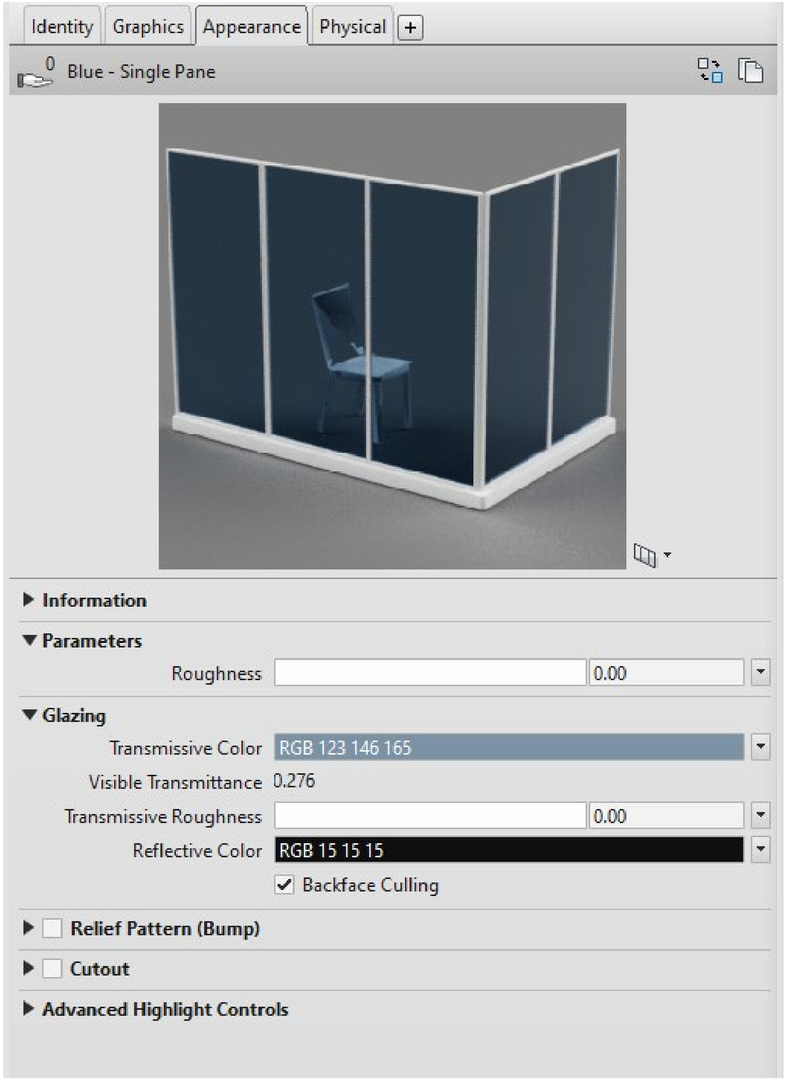
- Typical uses for this material are: Windows

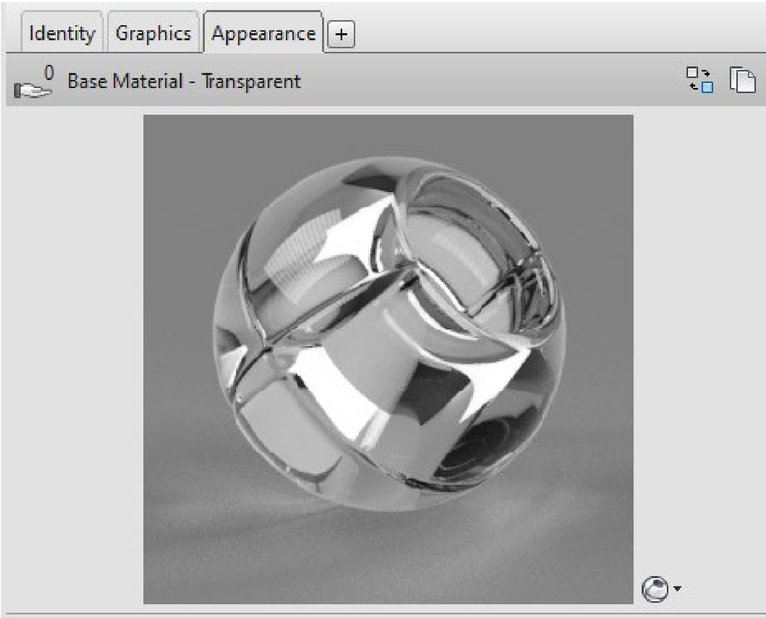




Glazing Material examples







Where to find textures!

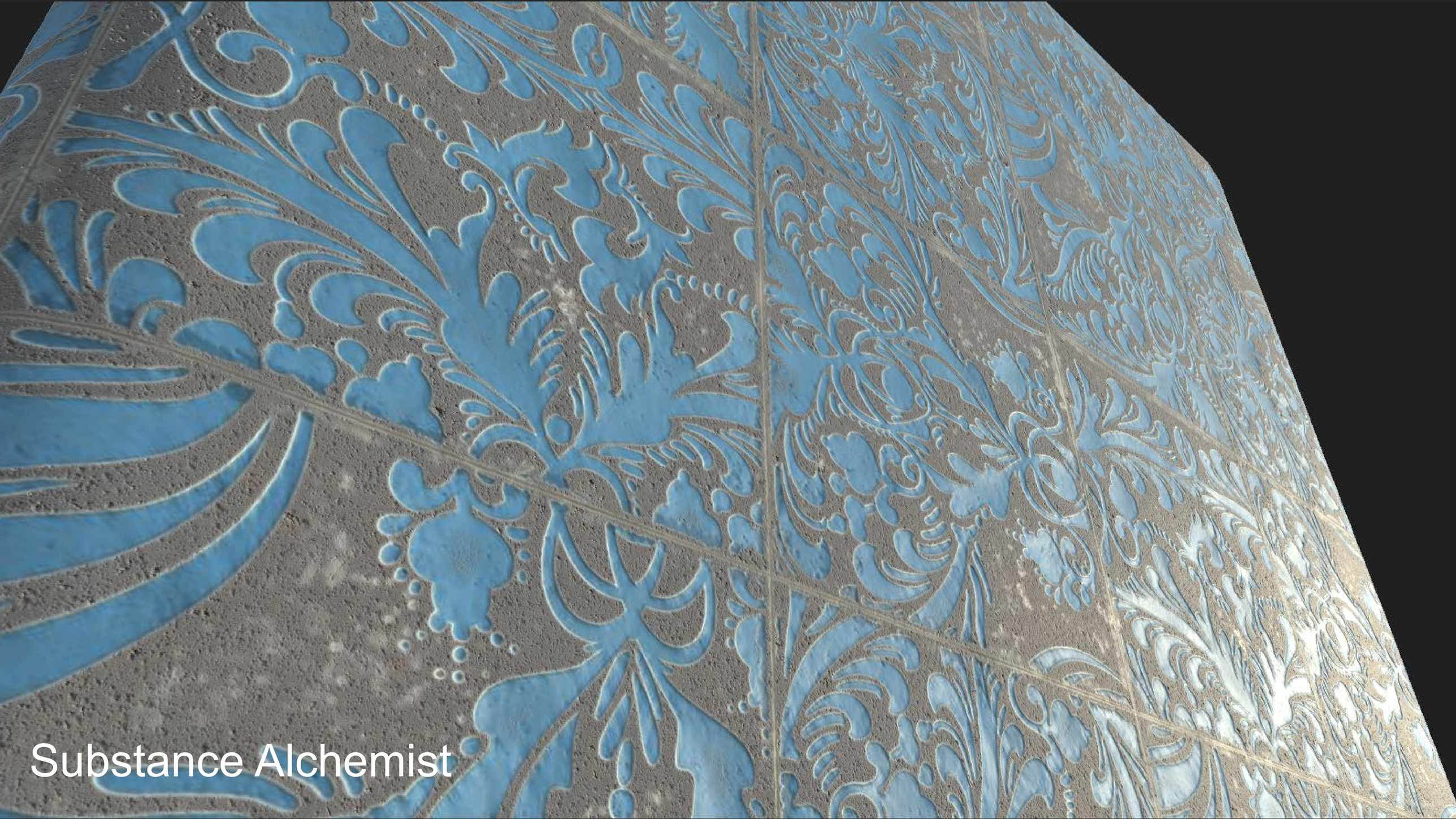
https://texturehaven.com/

https://texturehaven.com/

https://3dtextures.me/

https://source.substance3d.com/

https://cc0textures.com/


Substance Alchemist

Autodesk Raytracer

Legacy Revit Materials

This render shows what the Render in the cloud feature will produce with Revit’s Legacy Materials applied to the model.

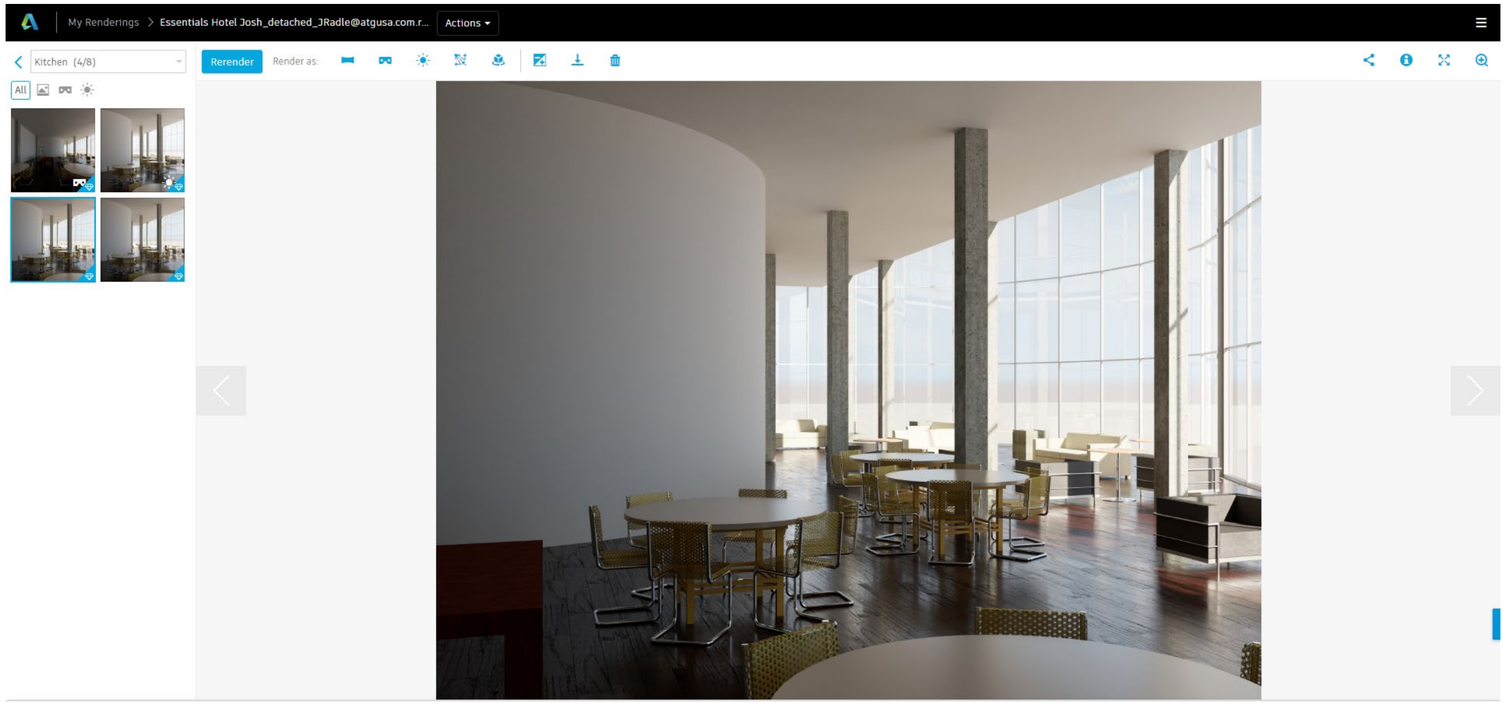
New PBR Materials

This render shows what the Render in the cloud feature will produce with the Revit’s new PBR Materials applied to the model.

Cloud Rendering

AUTODESK RAYTRACER

Raytracer (ART) is Autodesk’s unbiased rendering engine. It can be accessed through Revit, 3dsMAX, Fusion 360, AutoCAD, Infraworks and Navisworks. With Raytracer you can create Photoreal renderings, Panoramas and Solar Studies.



QR Codes!

Real-Time Rendering

THANK YOU FOR LISTENING

ANY QUESTIONS??

makeameme.org

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