AUTODESK UNIVERSITY

DV20887-L

# Material Hacks with Revit 2017

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## Learning Objectives

- Understand the fundamentals of material mapping
- Learn how to manipulate materials
- Learn how to create custom materials
- Learn how to apply materials to system, in-place, and loadable families

## Description

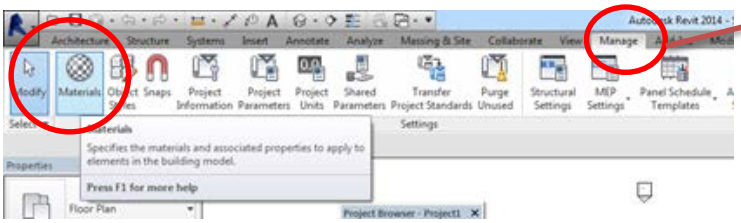
Attendees of this workshop will learn how to manipulate and create custom materials for their next photorealistic rendering. The presenter will highlight how material maps (such as bump, self-illumination, and cutouts) can give mental ray renderings added definition and appeal. Attendees will learn how to import images to create custom materials, and learn best practices for material image preparation—as well as how to scale and tile material maps. Attendees will gain insight into the various techniques used to apply materials, including surface painting and family properties. This session features Revit Architecture. AIA Approved

## Your AU Expert(s)

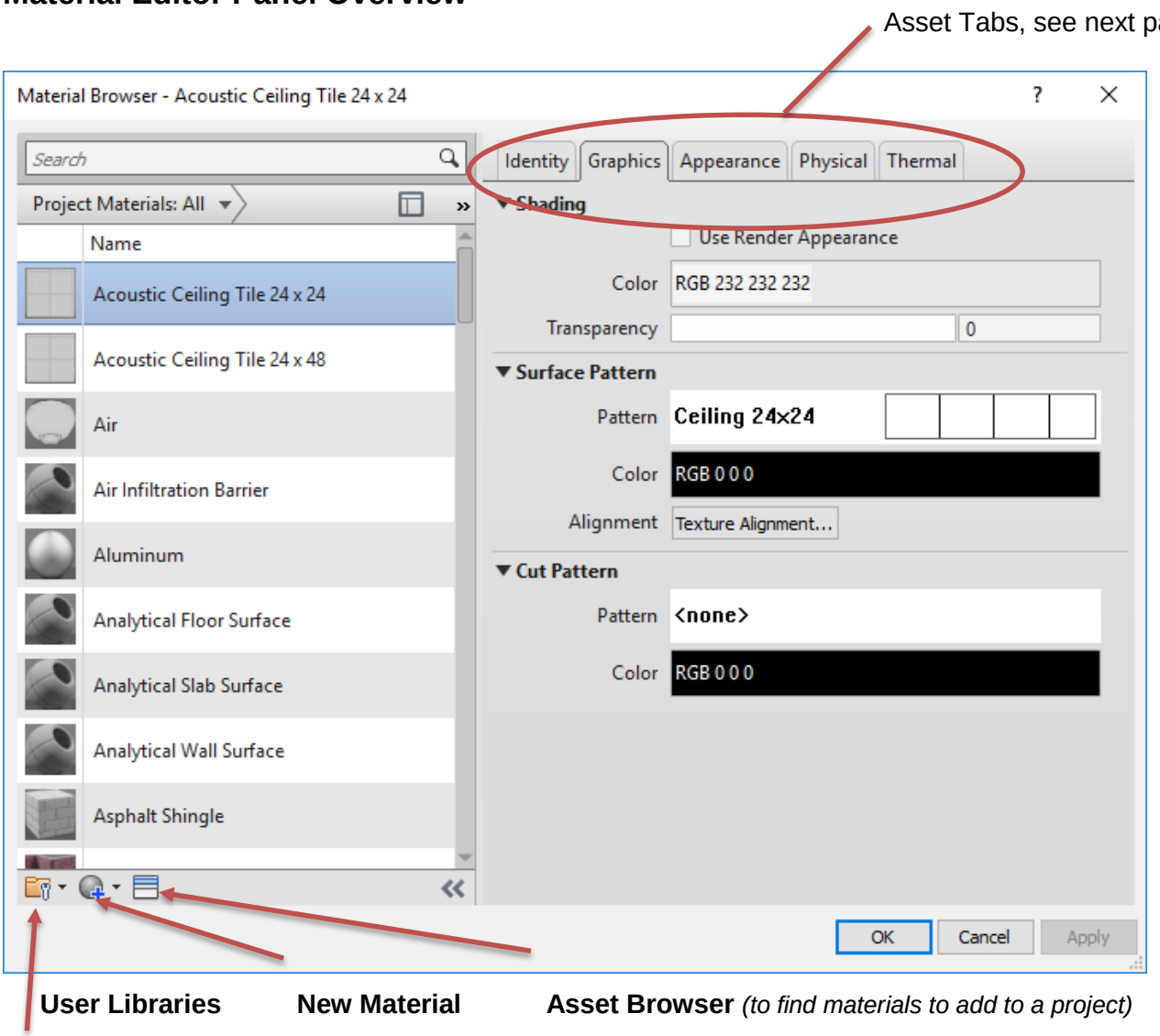
Amy Huber, IDEC, LEED AP, CDT, NCIDQ is an Assistant Professor at Florida State University. As technology lead for the Dept. of Interior Architecture and Design, Huber draws on a decade of Revit experience in teaching: Advanced Computer Aided Design, Advanced Visual Communications, and design studios. Her student's work includes: virtual and augmented reality, animations, videos, lighting studies, and rendering. As a Senior Designer with Gensler, she played an instrumental role in projects that have been recognized on state and national venues, including a 2014 AIA National Merit Award. An inaugural board member of the Denver Revit Uses Group, Huber helped lead Gensler--Denver's transition to BIM. Huber has been published in the Journal of Interior Design and the Int. Journal of Architectural Research, and has presented on the topic of design technology and communications at conferences including: Interior Design Educators Council, NeoCON, and the European Academy of Design.

## Finding the Material Editor Panel & Material Libraries

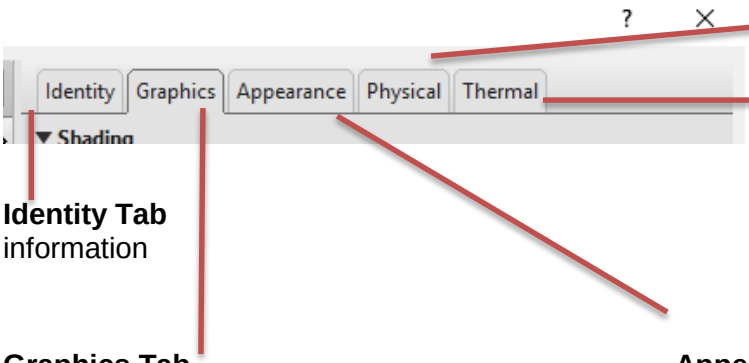
The materials editor is located in the Manage Tab.




## Material Editor Panel Overview



## Asset Tabs Overview



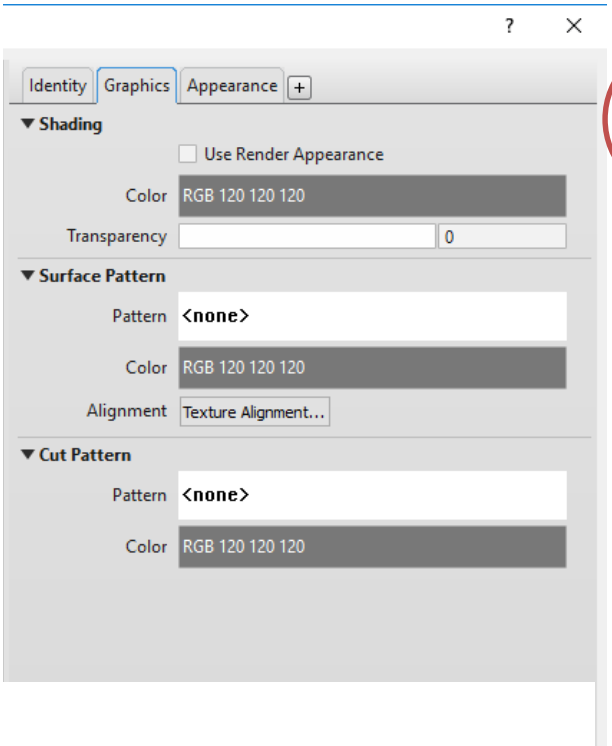

**Physical Tab**-used for structural analysis

**Thermal Tab** –used for energy analysis

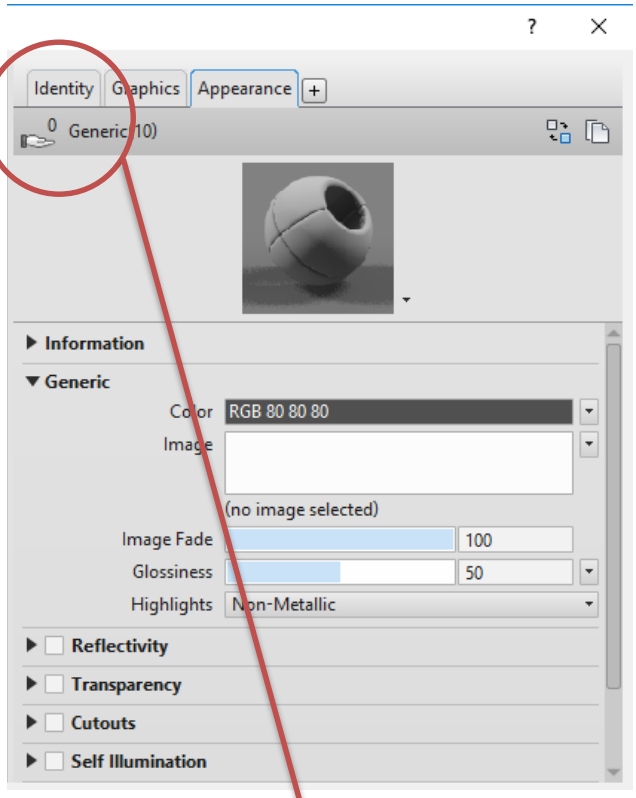
**Identity Tab**
information

**Graphics Tab**
displays material in non-rendered views (i.e. fill patterns & cut patterns)

**Appearance Tab**
displays the material in a Rendered, Realistic & Ray Trace views




*TIP* You can modify the graphics tab to track material application in Shaded Views




Indicates how many materials in the current project use this material

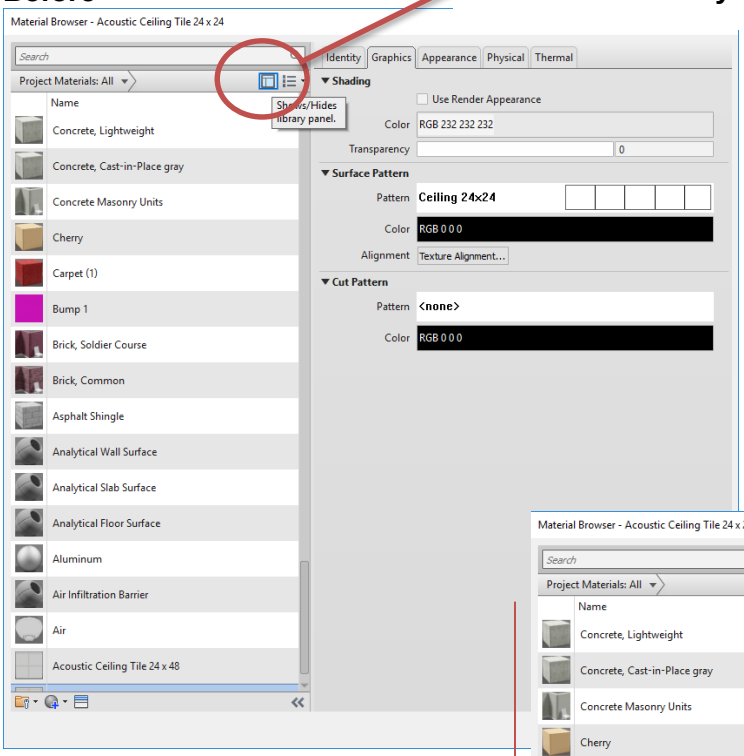
## Manipulating Existing Materials

Manipulating materials (instead of creating new ones) can save time.

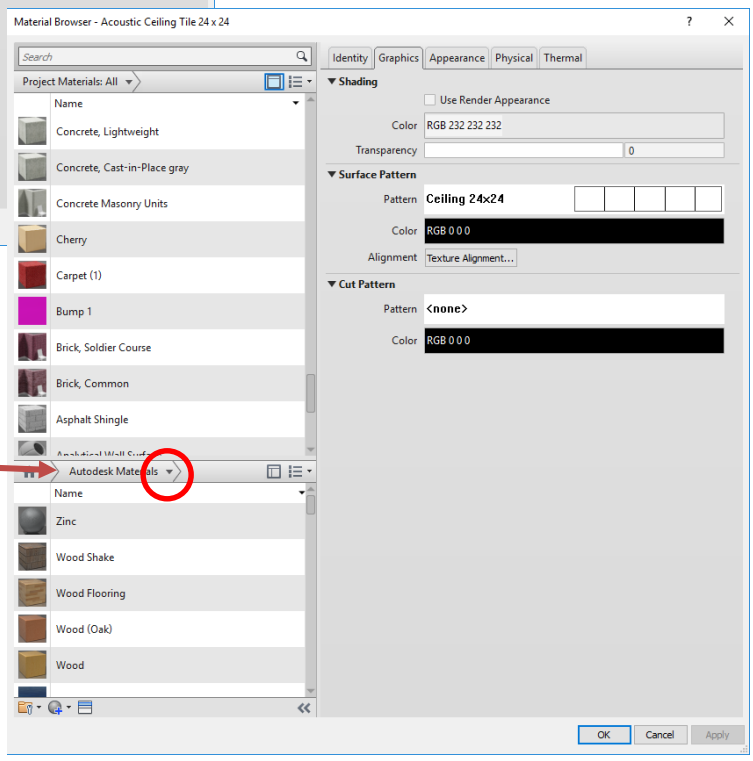
1. To start the process, click the show hides/panel button to show the Autodesk materials libraries.

**Before**

**Show/Hide Library Panel**




**After**




Materials loaded in the project material browser

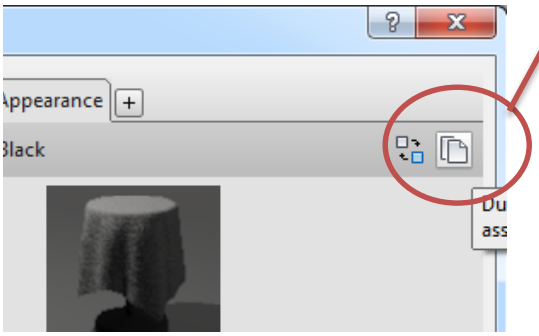
Material library title *(use arrow to browse by category)*

Once a material has been selected double click or use blue up arrow to add these materials into the project(above)

*TIP* To save time double click on the most similar material

2. Once the material is loaded in the project browser right click on it to rename or duplicate the material *(duplicate if you want to retain the old material as well)*

*3.* Under the Appearance tab, click **Duplicate the Asset,** (*this prevents rewriting over assets*)



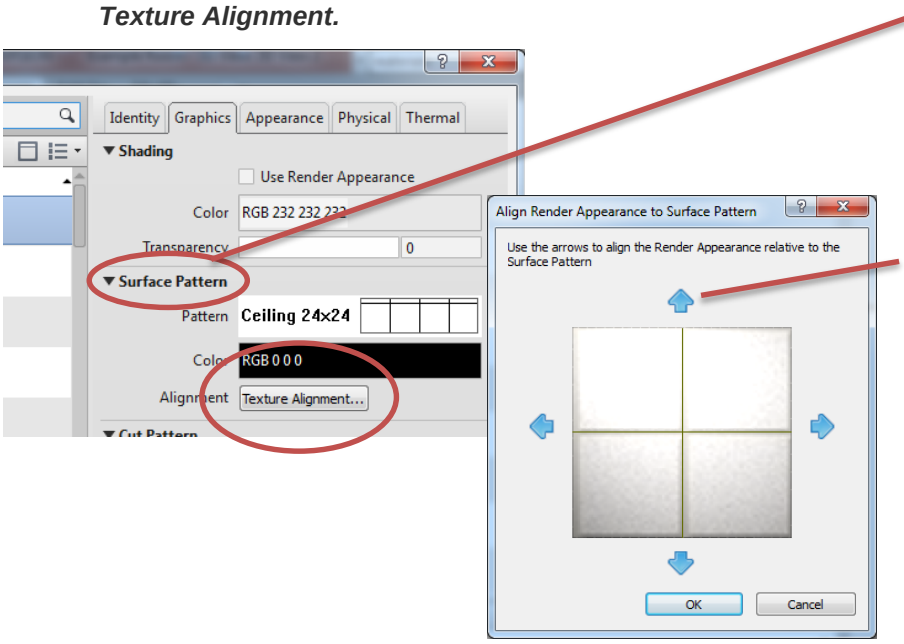

*TIP* Duplicating assets is important if you have similar materials and don't wish to rewrite their properties,

*Example: if a project has walls painted red and others walls white, if both materials referring to the same asset, changing properties to one will change the properties of both*

## Modifying Non-Rendered Material Properties

To track material application it's helpful to change their properties in the **graphics** tab. Click on **Graphics Tab,** then modify surface pattern, color, and/or cut pattern

*TIP To align textures between **Graphics** and **Appearance** Tabs, under **Surface Pattern,** click **Texture Alignment.***

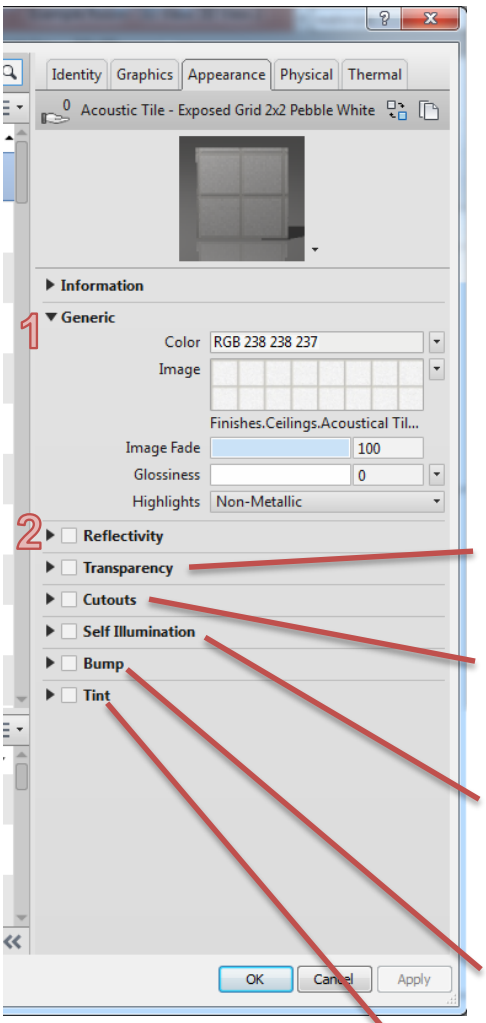



Use arrows to move texture as needed

## Modifying Rendered (& Realistic) Material Properties

Material maps can be modified to alter the appearance of the material.

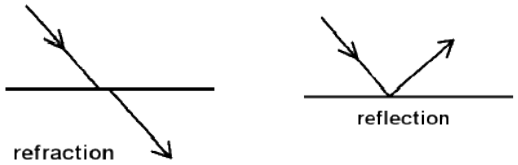
1. Click on **Appearance** Tab




### Appearance Properties Map Overview
*(listed in order of appearance)*

**1. Generic Maps** (pages 7-12)
Depicts the general qualities of the rendered material
*Examples: upholstery or carpet pattern*

**2. Reflectivity Maps** (pages 13-14)
Depicts the amount of light that bounces off of the surface
*Examples: chromes, mirrors*




**3. Transparency** (pages 15-16)
Depicts the amount of light that passes through a material
*Examples: glass, acrylics*

**4. Cutouts Map** (pages 17-18)
Can make portions of a material transparent.
*Examples: metal mesh, resin panels*

**5. Self Illumination Map** (page 19)
Used for glowing objects,
*(the object does not receive shadow, but instead glows)*
*Examples: backlit materials*

**6. Bump Map** (page 20-21)
Depict a surface's texture,
*(high values = higher relief)*
*Examples, carpets, rough stones*

**7. Tint Maps** (page 22)
Can be used to add or correct color

## PREPPING MATERIAL IMAGES

There may be instances when materials need to be depicted based upon an image such as a photograph or manufacturer's image. A minimal amount of photo editing can prepare these materials for application.

## *HACK #1* MANIPULATING MATERIAL MAPS FOR MONOLITHIC MATERIALS

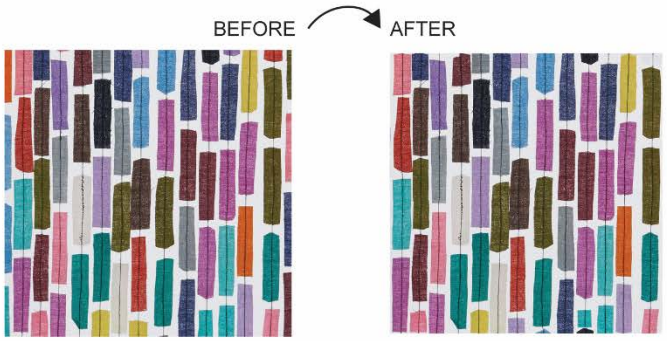
Monolithic materials are those that need to be stretched across a large surface, yet the material image is small.

Examples: *materials with patterns that repeat with little distinction*

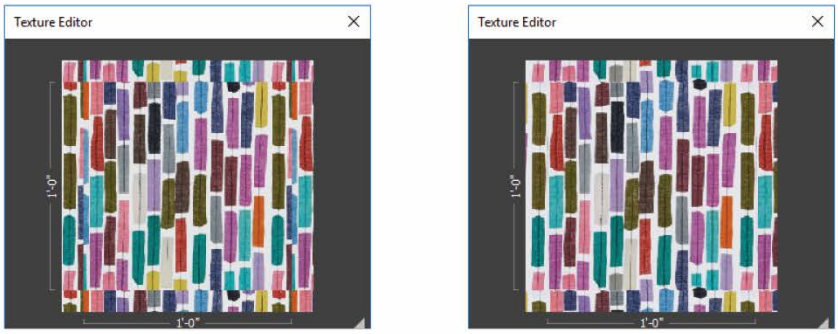
MONOLITHIC IMAGE
(to be tiled along a surface)

Image File Comparison

Used photo editing program to crop and modify all edges to allow for smoother repeat (10mins)




Revit Texture Editor Comparison



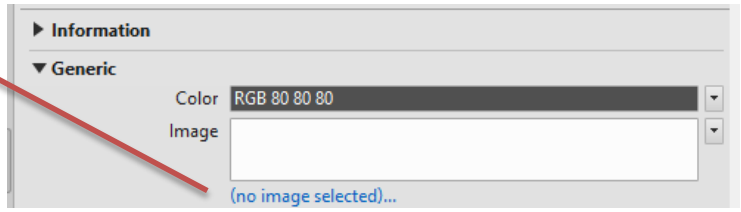

Rendering Output

## Steps

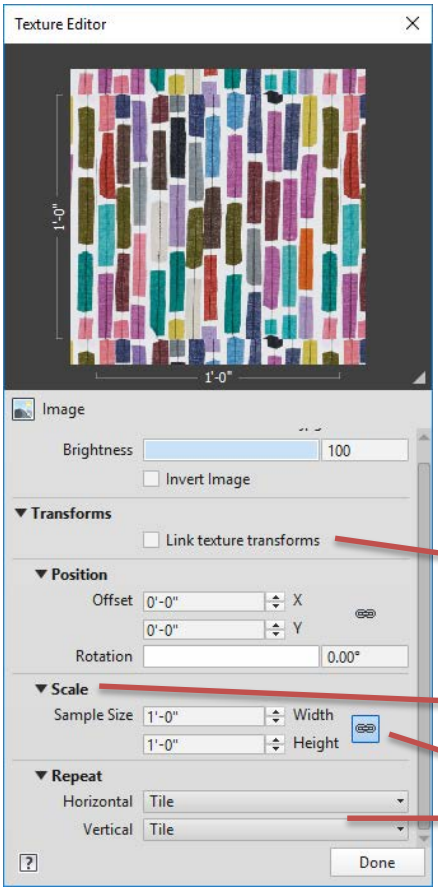
1. Create a new material in Revit  Manage>Materials>Add Material 
2. Rename the material **Resin Panel**
3. Duplicate the Asset 
4. Use Generic maps to apply image titled **Resin Panel Color After**

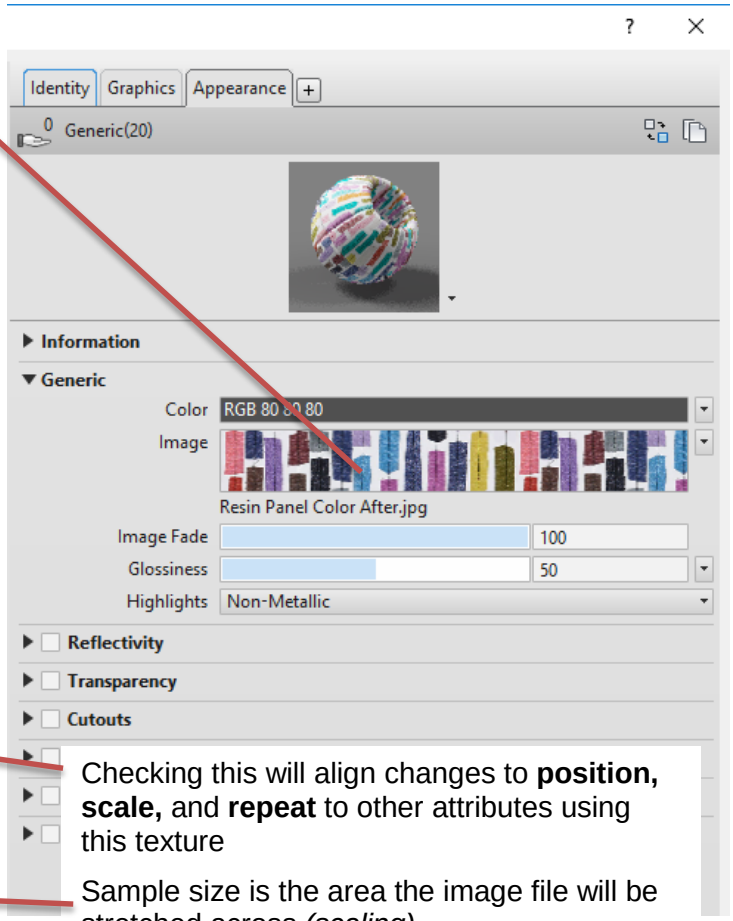
Click on words to browse for the file

Revit accepts multiple image file types including .jpg, .tiff, .bmp, .hdr (no .pdf)




5. Click on the image to scale the material, then click done




Checking this will align changes to **position, scale,** and **repeat** to other attributes using this texture

Sample size is the area the image file will be stretched across *(scaling)*

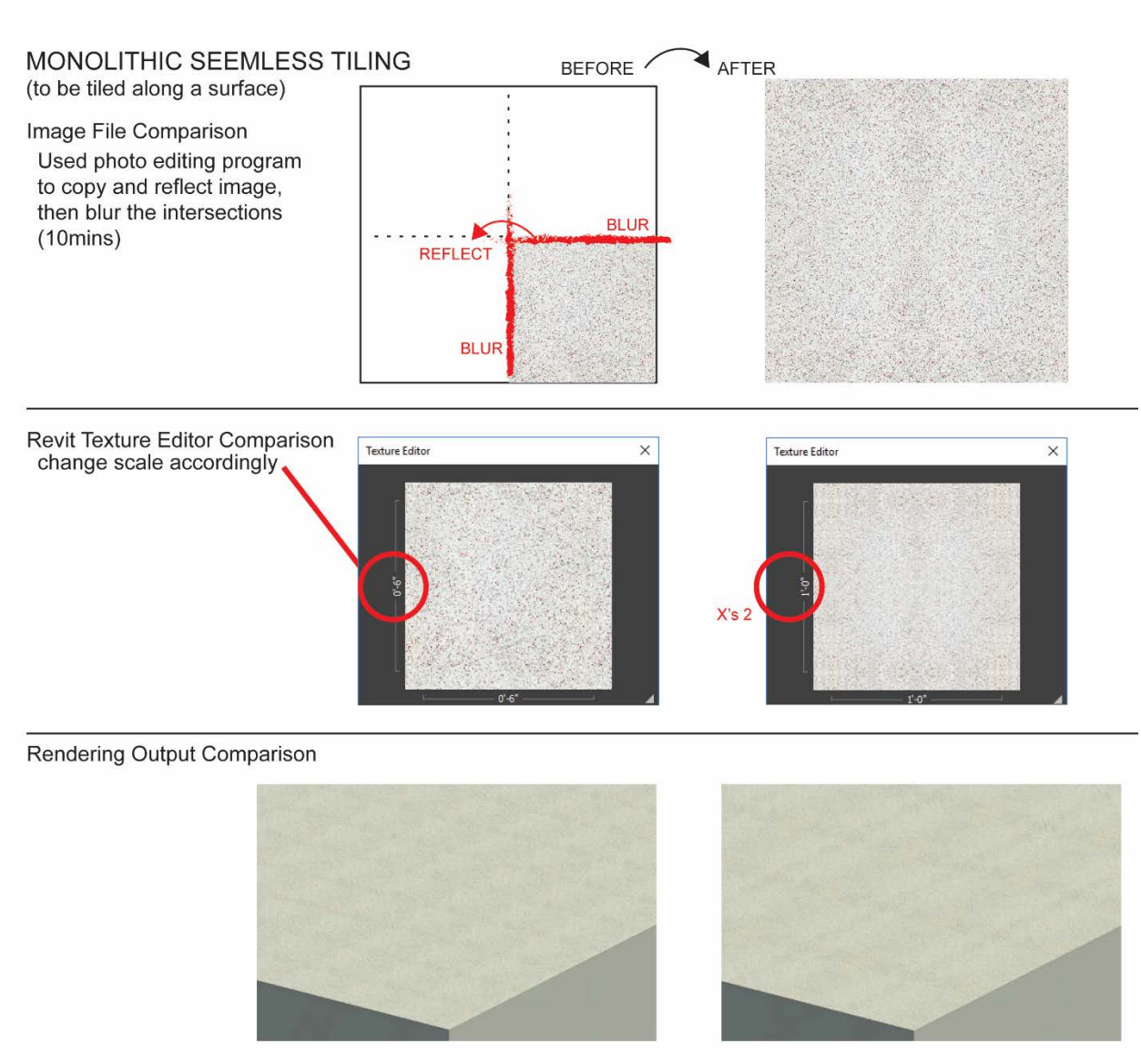
The chain maintains image proportions

**Repeat,** controls whether the image will be tiled in the event the image is smaller than the surface size of the material it will applied to

## *HACK #2* MANIPULATING MATERIAL MAPS FOR SEEMLESS MONOLITHIC MATERIALS

Monolithic materials are those that need to be stretched across a large surface, yet the material image is small, and no distinguishable repeat is desired.

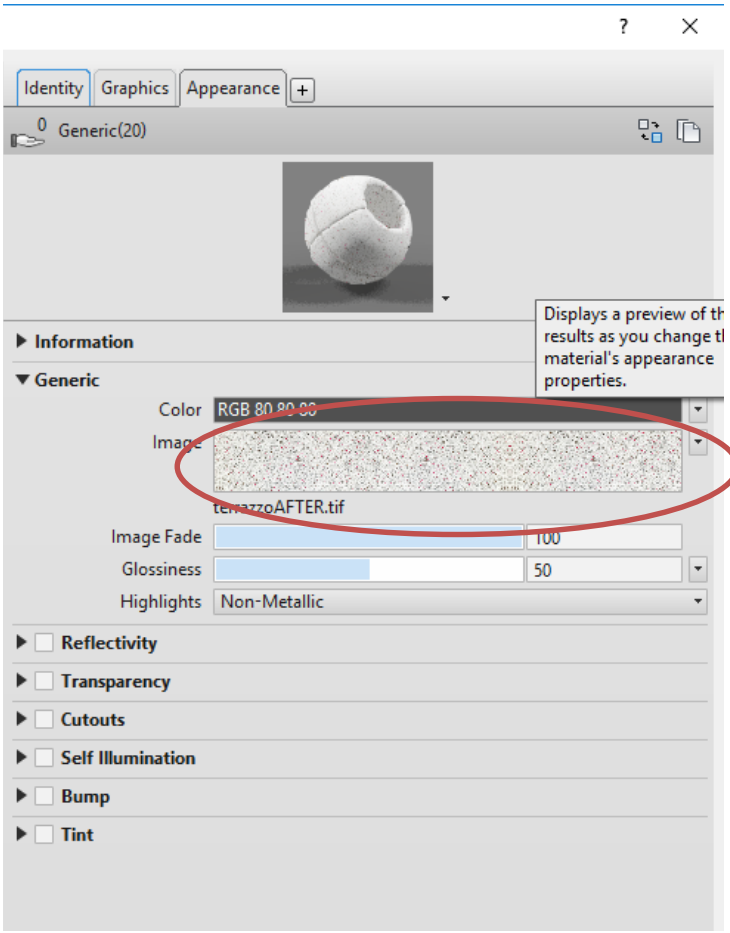
*Examples: concrete, terrazzo*

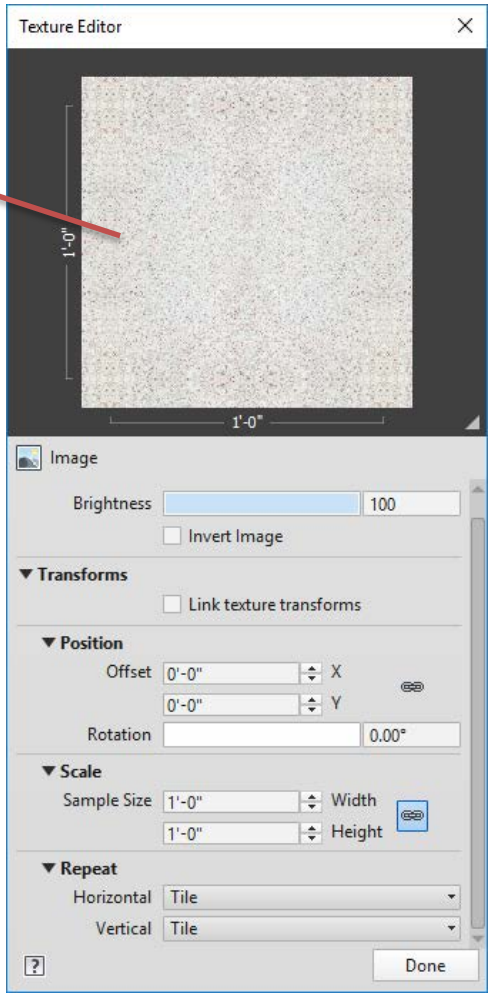


## Steps

1. Create a new material in Revit  Manage>Materials>Add Material 
2. Rename the material **Terrazzo**
3. Duplicate the Asset 
4. Use Generic maps to apply image titled **Terrazzo Color After**
5. Click Done.

Scaling isn't required for this image but can be modified by clicking the image & using the texture editor



## PREPPING MATERIAL IMAGES

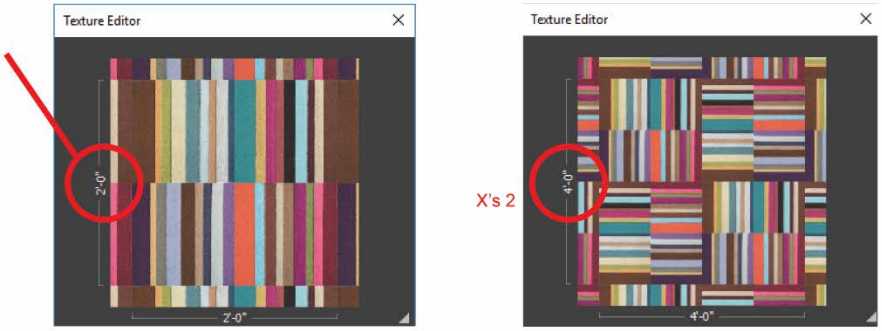
### *HACK #3* MANIPULATING MATERIAL MAPS FOR SPECIFIC TILE PATTERN

Examples: *quarter turned carpet tiles*

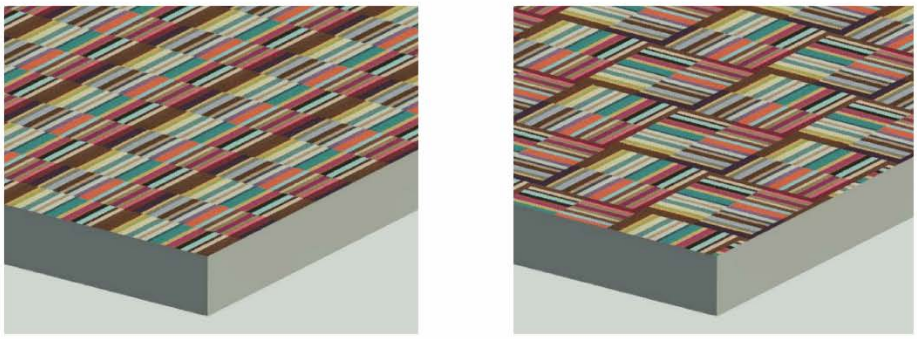
QUARTER TURNED TILED IMAGE
(to be tiled along a surface)

Image File Comparison
Used photo editing program
to copy and rotate image


Revit Texture Editor
change scale accordingly

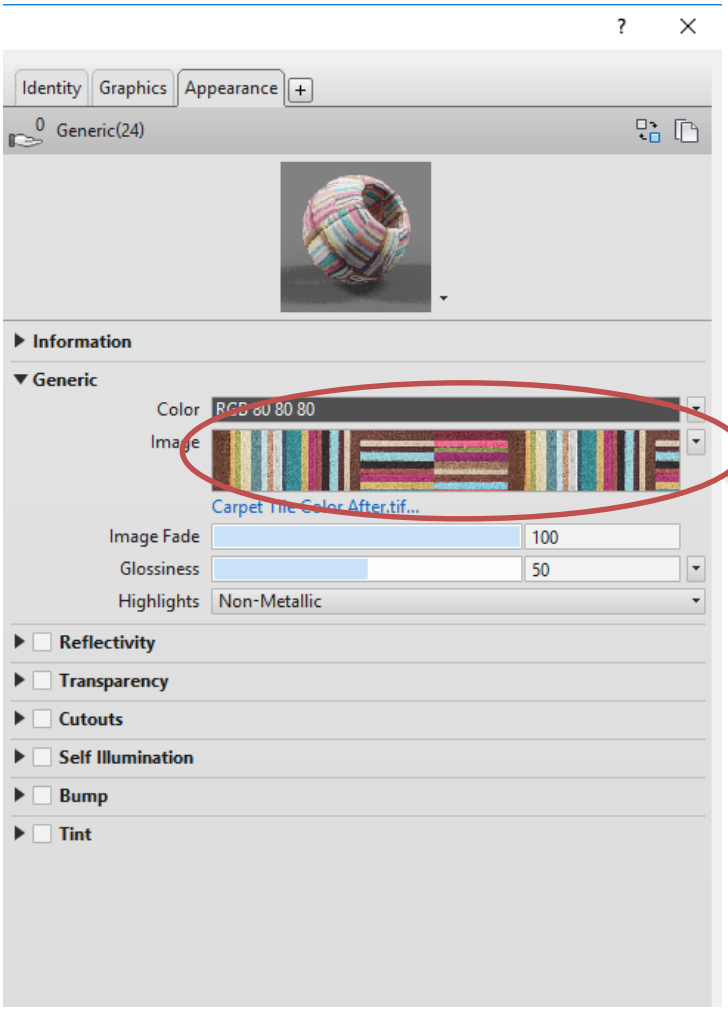


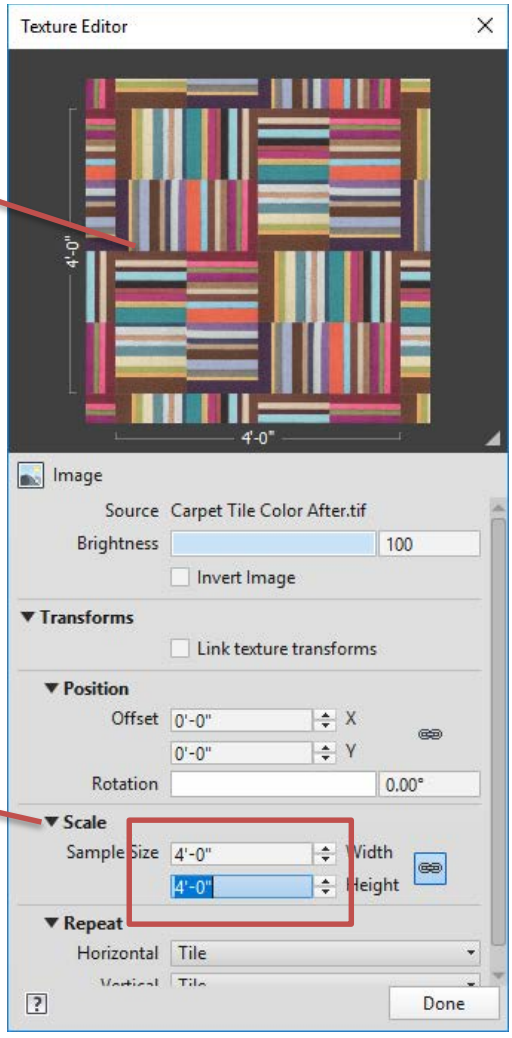

Rendering Output Comparison



## Steps

1. Create a new material in Revit  Manage>Materials>Add Material 
2. Rename the material **Carpet**
3. Duplicate the Asset 
4. Use Generic maps to apply image titled **Carpet Tile Color After**




5. Since the carpet tile is 2’-0” x 2’-0” scale the image sample size to 4’-0” x 4’-0”

   *(since we have 4 carpet tiles)*

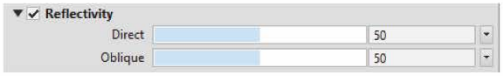
6. Click Done.

## REFLECTIVITY MAPS

Reflectivity maps can be used to add shine to a surface.

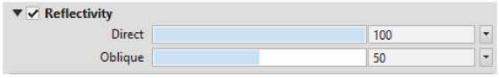
Reflectivity comparison

Default Reflectivity



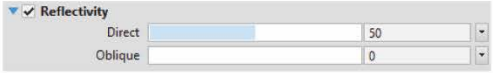

Direct

How much light the material reflects when the surface is directly facing the camera.

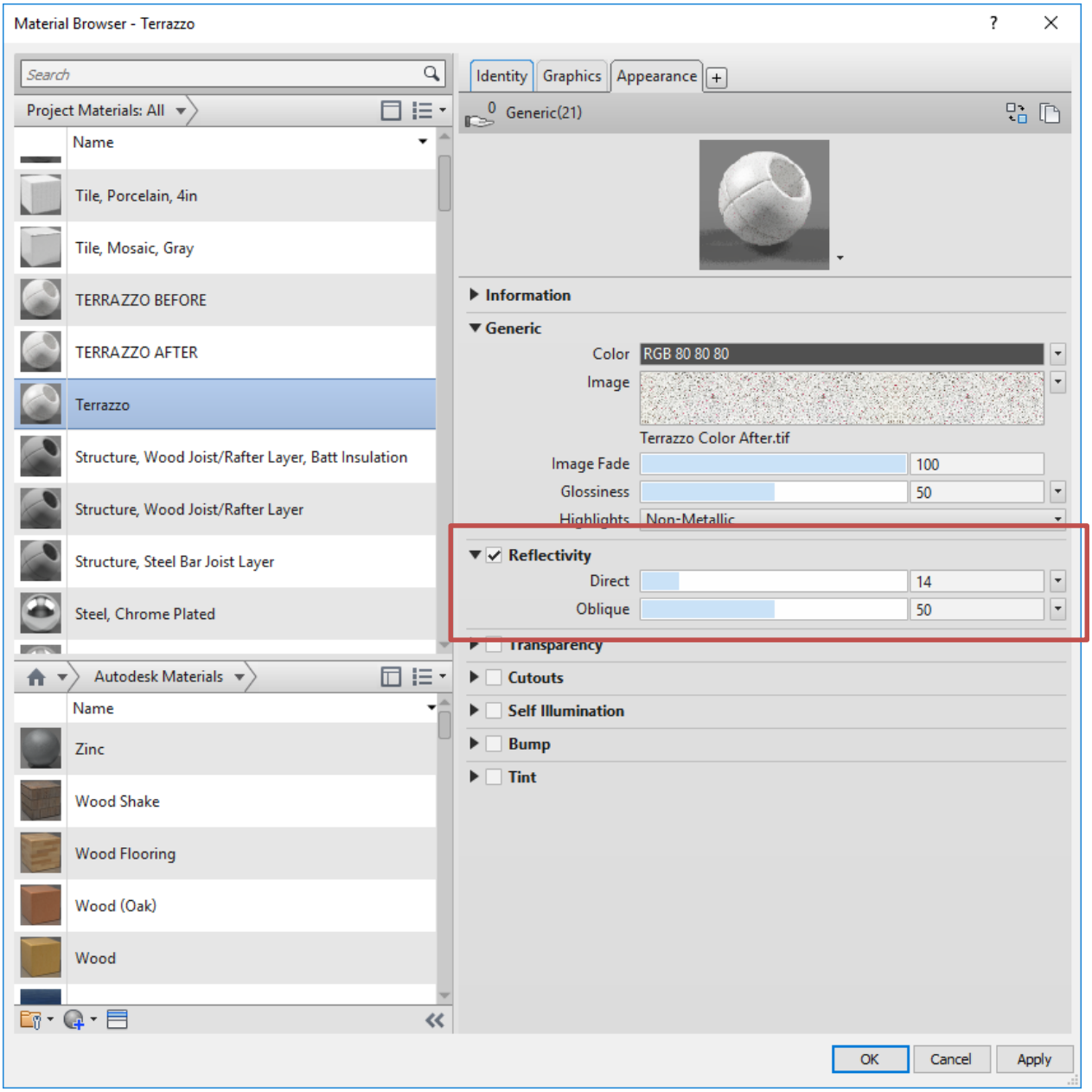

Oblique

How much light the material reflects when the surface is at an angle to the camera.

**Reflectivity** can be added to the **Terrazzo** material

1. Find Terrazzo (materials are listed in alphabetic order
2. Check the **reflectivity** box
3. Match Direct and Oblique reflectivity properties below

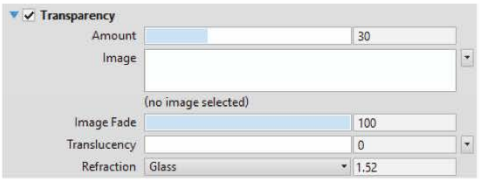


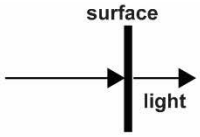

*TIP:* Reflectivity does add to render time, so use only on materials that need to have a shiny surface that is visible in the rendering.

## TRANSPARENCY MAPS

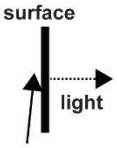
Transparency maps give the effect of transparency & opacity

Default Transparency



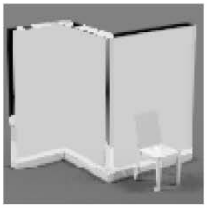



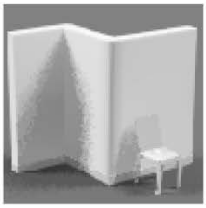

**Transparency** specifies the amount of light that strikes the surface at a 90-degree angle and bounces off.



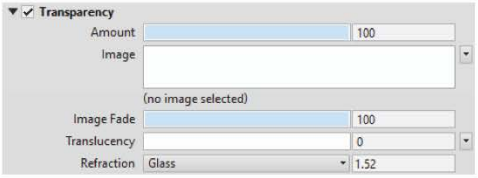

**Translucency** specifies the amount of light that strikes the surface at a very shallow angle

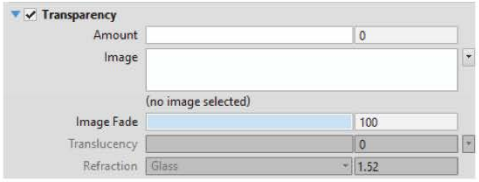
Transparency Amount



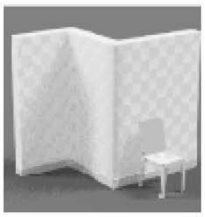


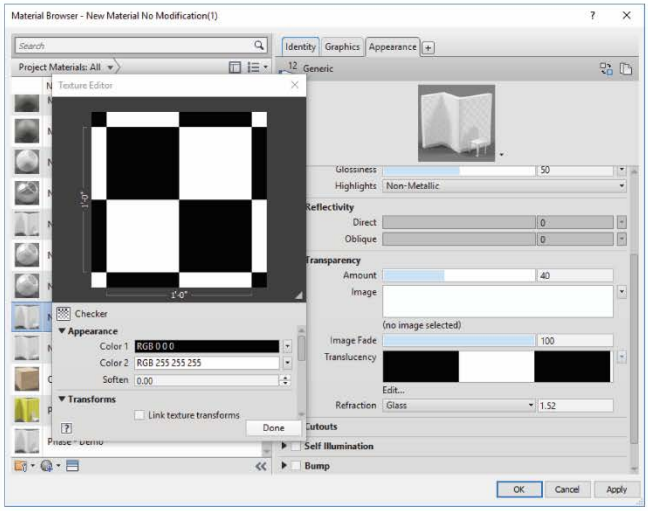
solid



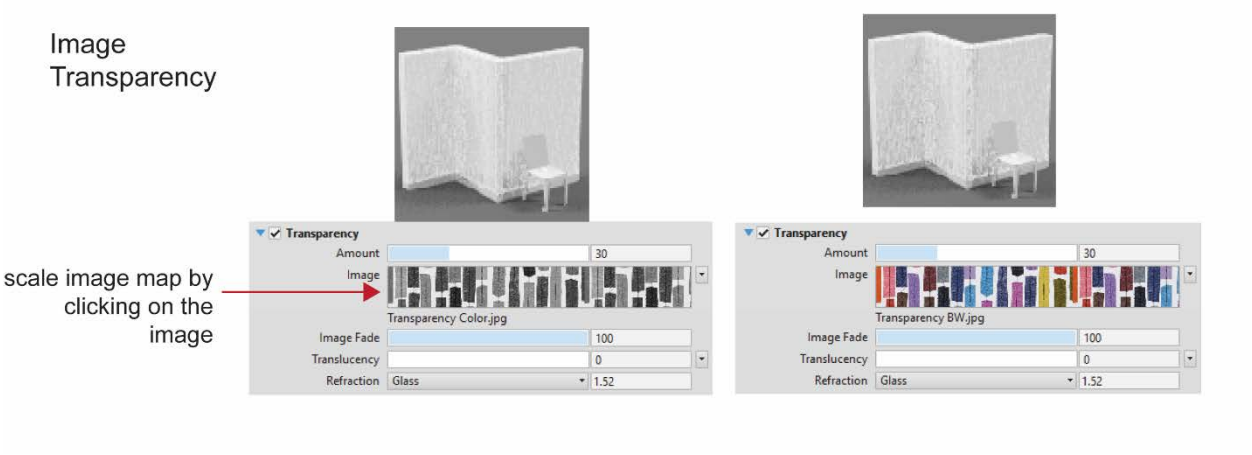




Translucency





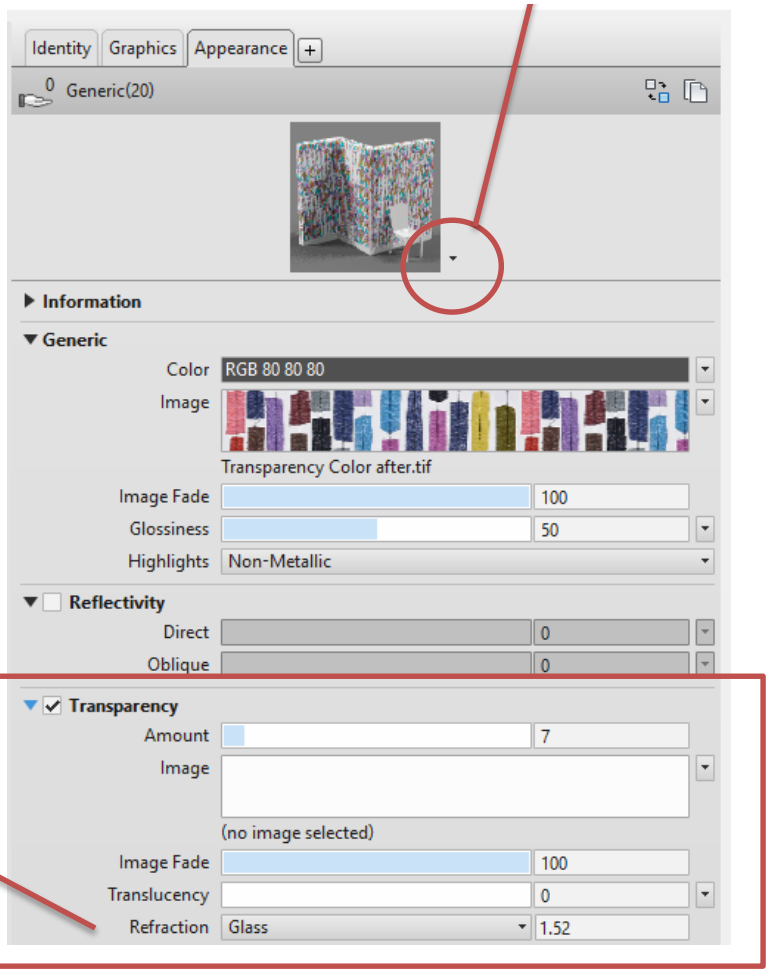
## TRANSPARNCY CON'T.




**Transparency** can be added to the **Resin** material

1. Find Resin (materials are listed in alphabetic order
2. Check the **transparency** box
3. Match transparency properties below

Preview shape can be changed by clicking the arrow




**Refraction** is the measurement of how much light bends rather than is absorbed

## CUT OUT MAP

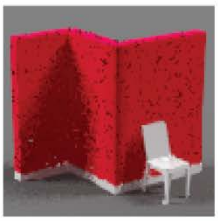
Makes a surface partially transparent. Lighter colors render more opaque and darker colors more transparent.

*TIP* Grey and colors will result in partial transparency. For a sharp image use a B&W image, white areas will be opaque and black areas transparent.

Cut Out Map Comparision

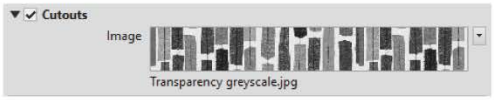
**note generic color has been changed to red for clarity*

Procedural Maps



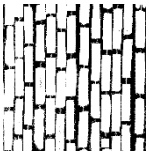


Custom Cut Out Map

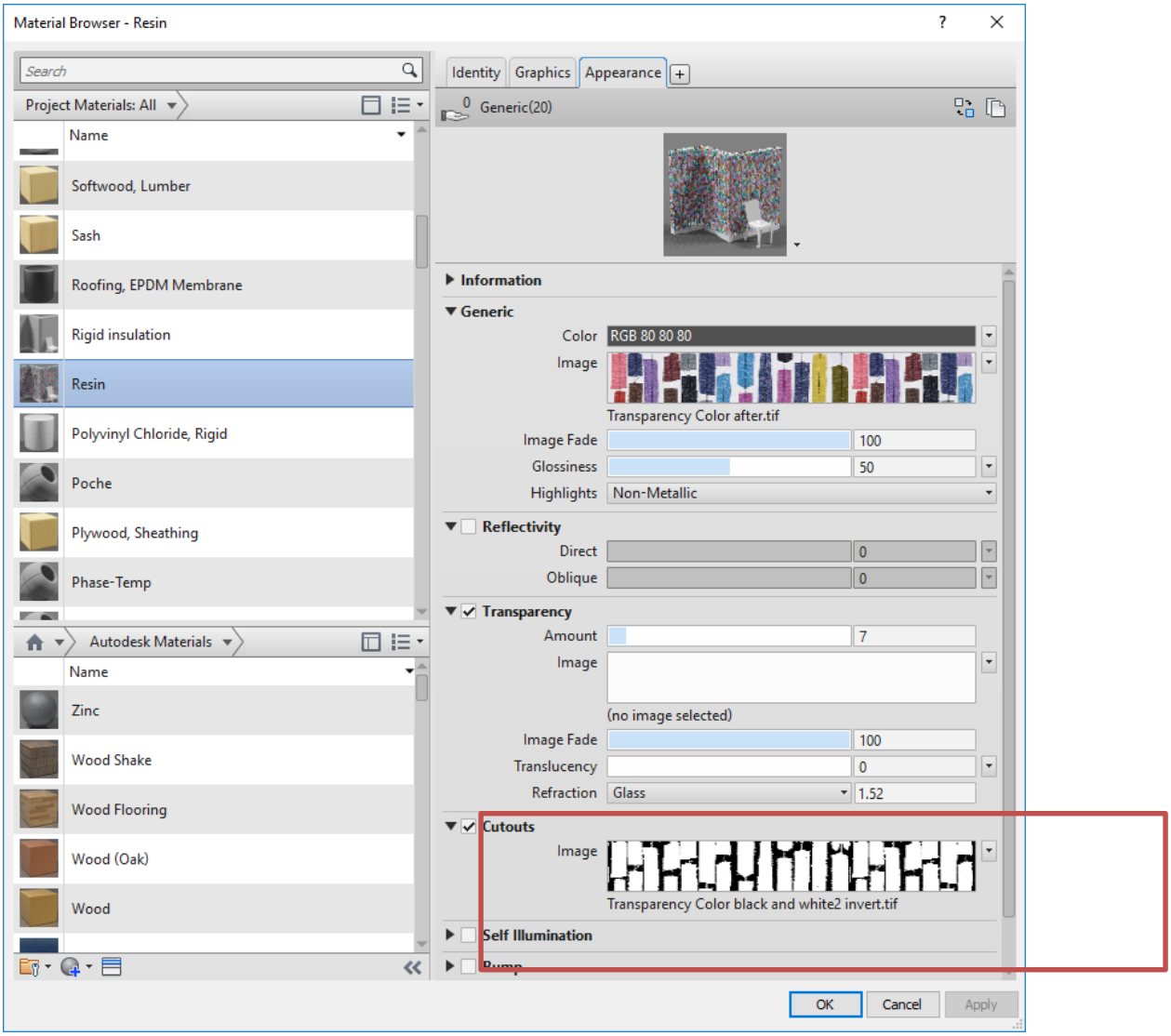



**Cut Out** can be added to the **Resin** material

1. Find Resin (materials are listed in alphabetic order
2. Check the **cut out** box
3. Click on the text box and browse to **Resin Panel B&W After**



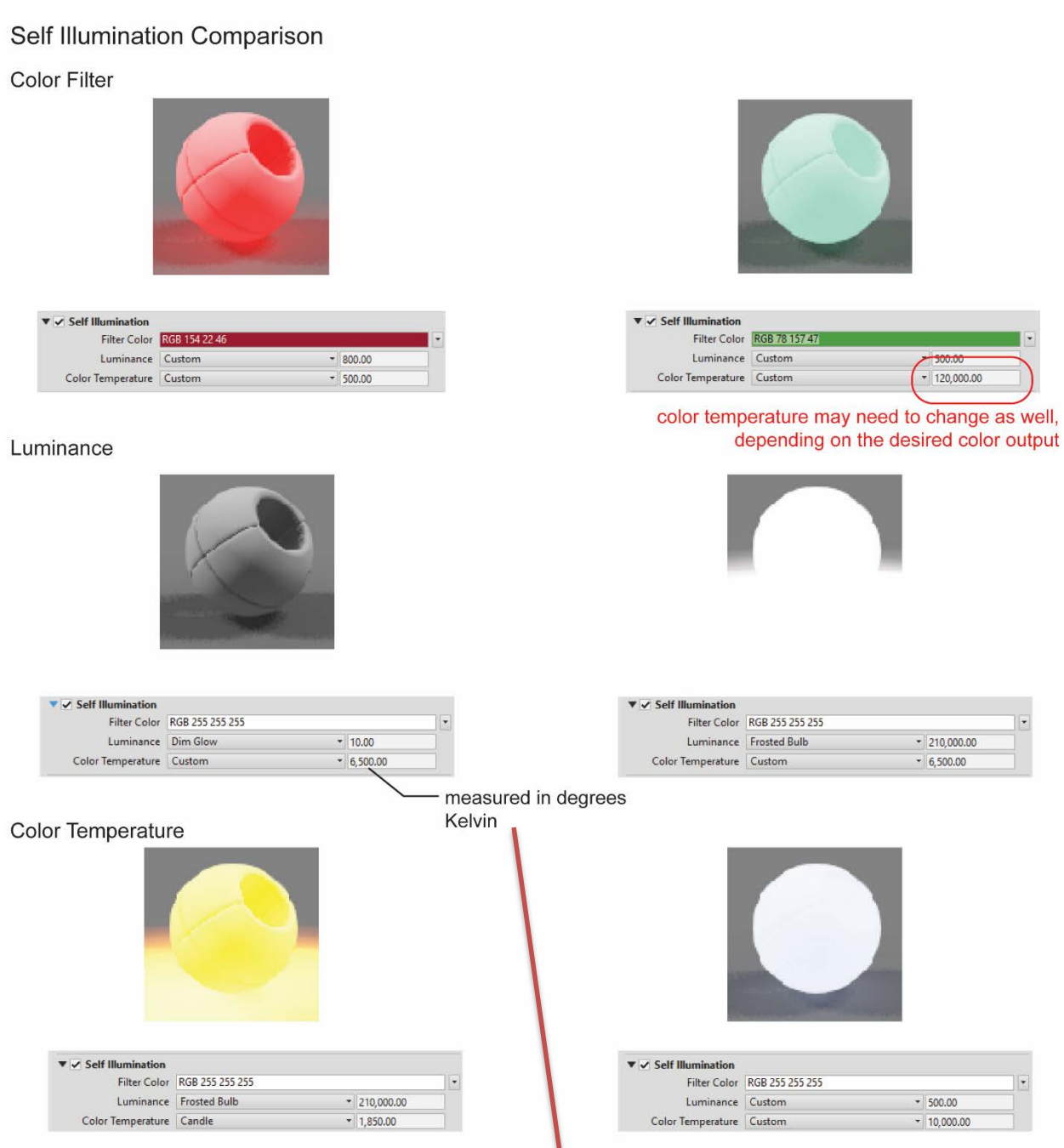
The **Resin Panel B&W After** image file
was modified in a photo editing program by using a threshold command and inverting its colors.
This allows the white areas of the map to read the colors of the generic map, whereas black areas will be transparent.



## SELF ILLUMINATION

Maps make objects appear as though they are glowing (they will not accept shadows)

There are several self illumination settings that can be manipulated to achieve desired effects.




The higher the degrees Kelvin the “bluer” the quality of light.

## BUMP MAPS

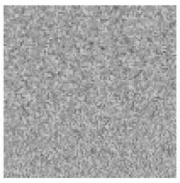
Add texture or an embossed/debossed appearance to a surface material. Bump mapping increases rendering time significantly, but adds realism.

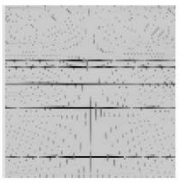
If an image is used for a bump map *lighter (whiter) areas of the map appear to be raised, (blacker) areas appear recessed. If the image is in color, the gray-scale value of each color is used to determine bump texture.*

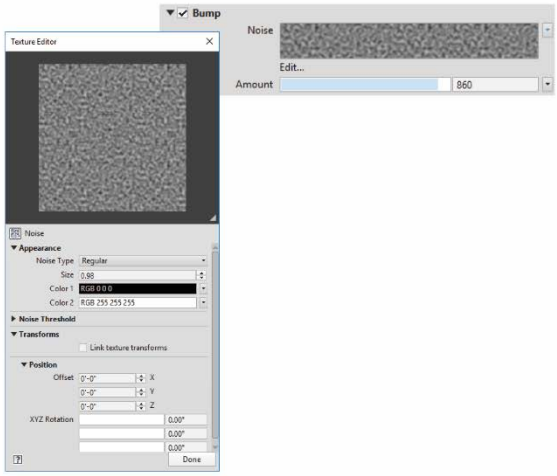
The depth effect of a bump map is limited because it does not affect the profile of the object itself (i.e.. raised areas of the surface cannot cast shadows on depressed areas). For greater level changes, modeling techniques (such as model in place) should be used instead.

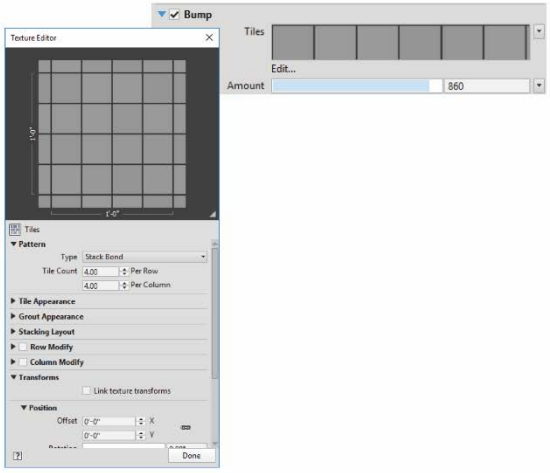
Bump Map Comparison

Procedural Maps

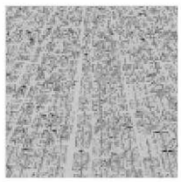







Custom Maps



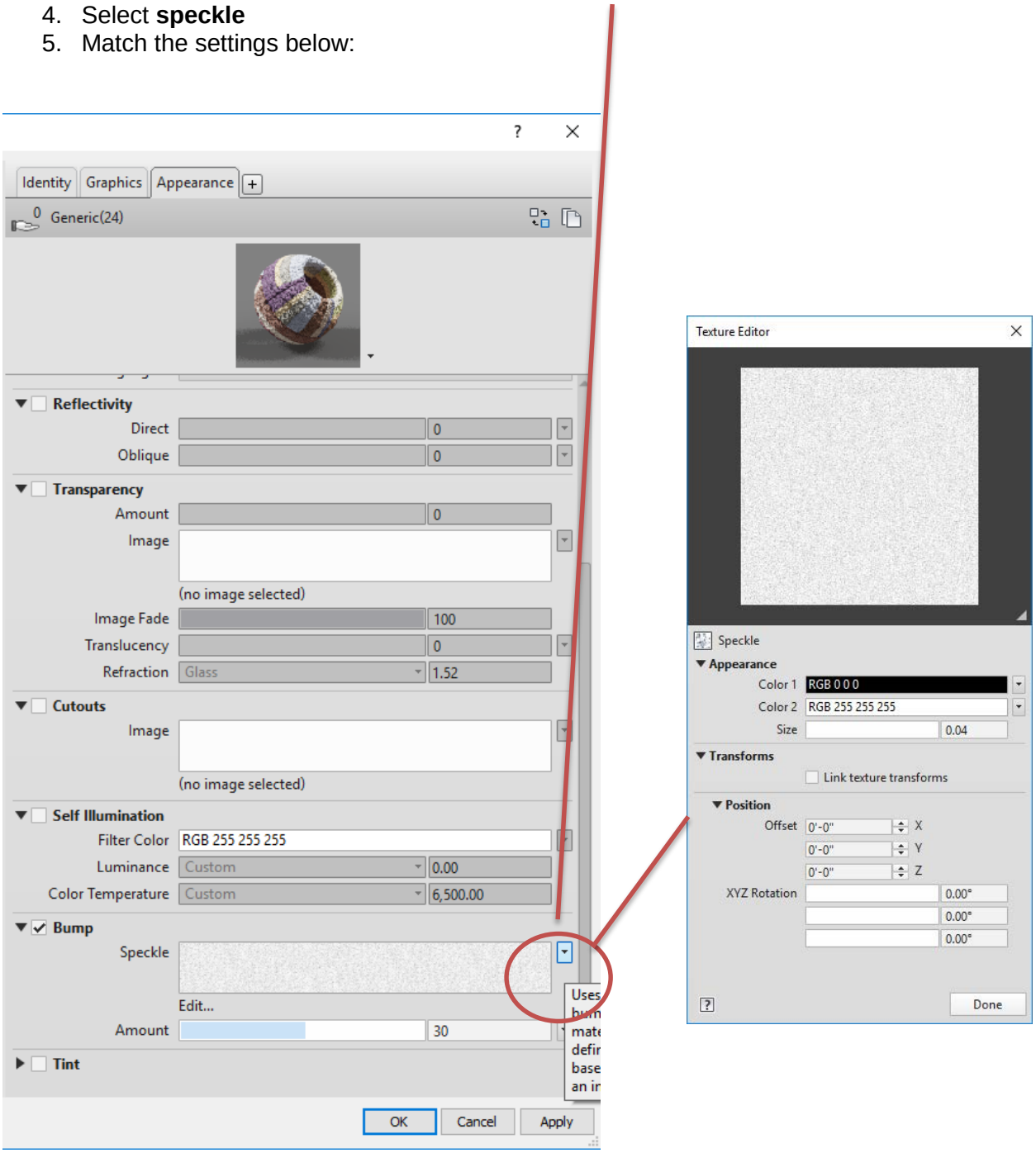
black & white images give a more crisp appearance


**Bump map** can be added to the **carpet**

While it is sometimes appropriate to use an image map for texture (such as a debossed surface) for our carpet a **Speckle** procedural map to depict fiber texture instead of pattern texture.

**Bump Map** can be added to the **Carpet** material

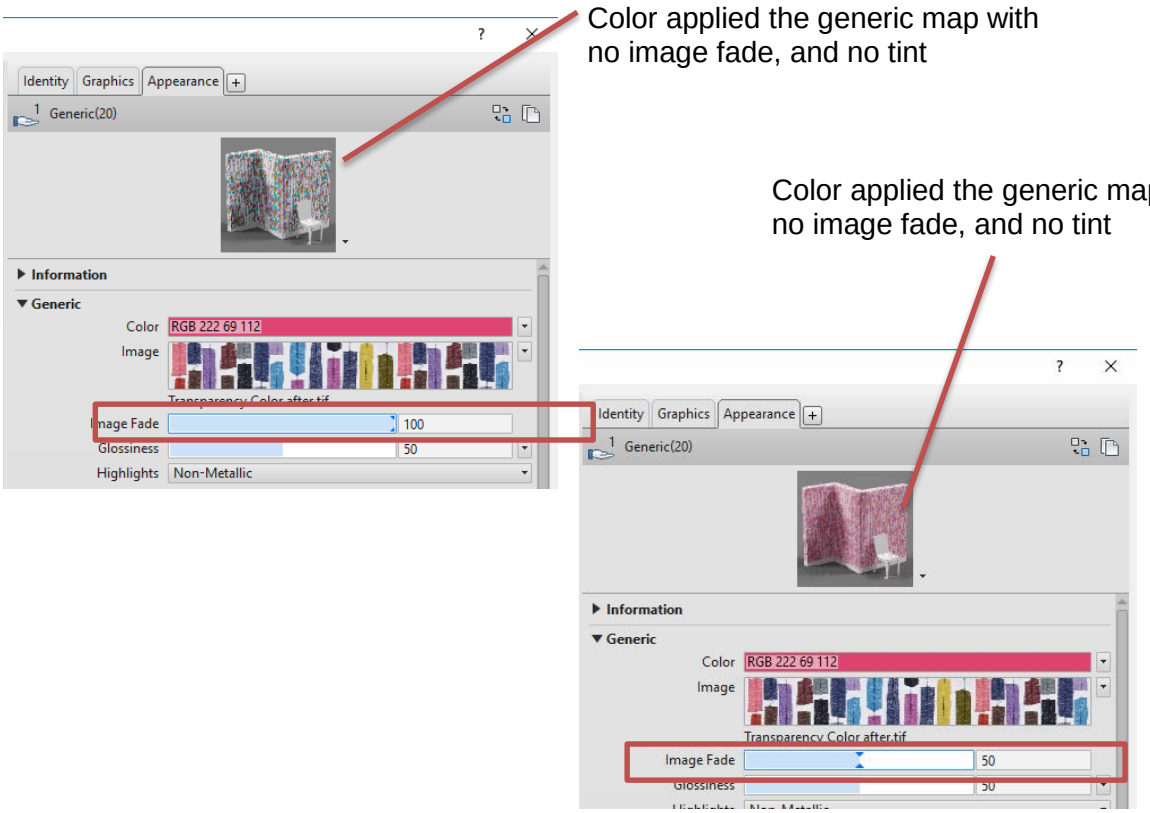
1. Find Carpet (materials are listed in alphabetic order)
2. Check the **bump** box
3. Click on the arrow next to the image to see the procedural maps options
4. Select **speckle**
5. Match the settings below:



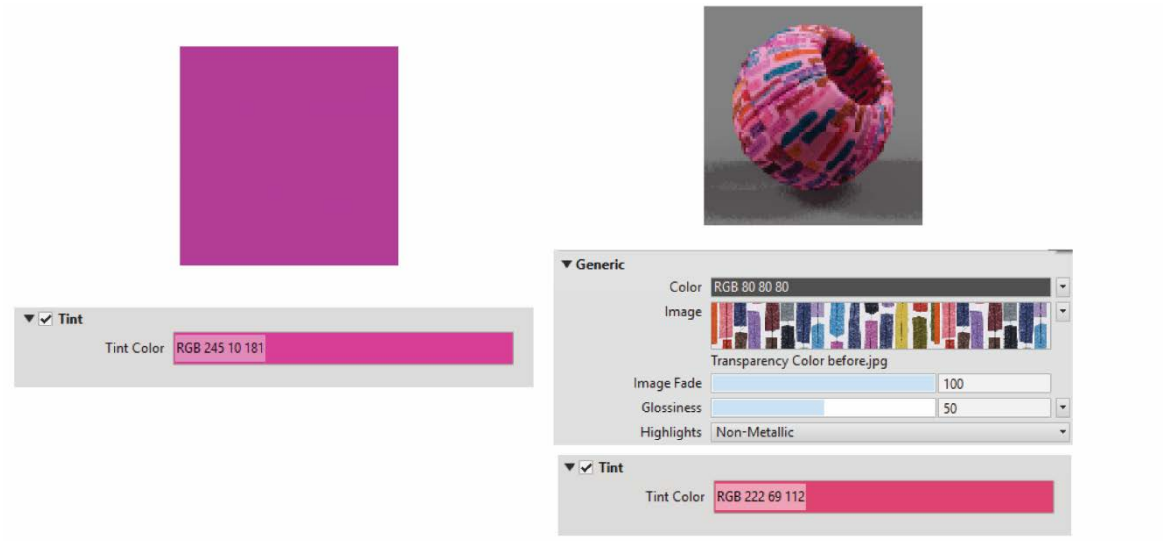
## TINT MAP

Tint maps can be an easy way to overlay color on a generic image file. This is different from the **color** modifier in the **generic** settings as it sits on top of the image, whereas color in the image file requires image fade as the color is behind the image.

Comparison between **color** in the **generic map** and the application of **tint**



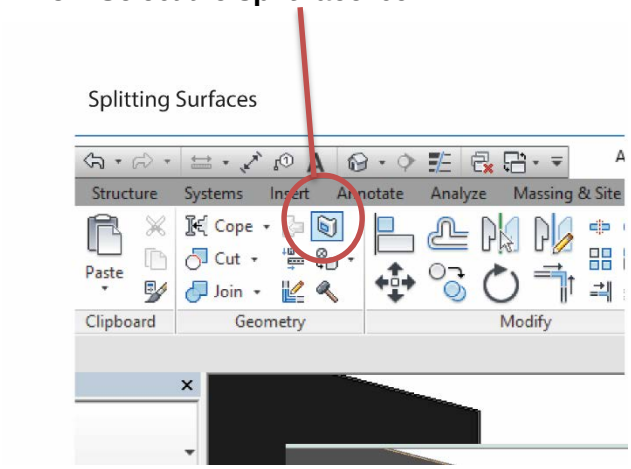

Same color with **tint** applied, **no generic color**



## PRPARING SURFACES FOR MATERIALS

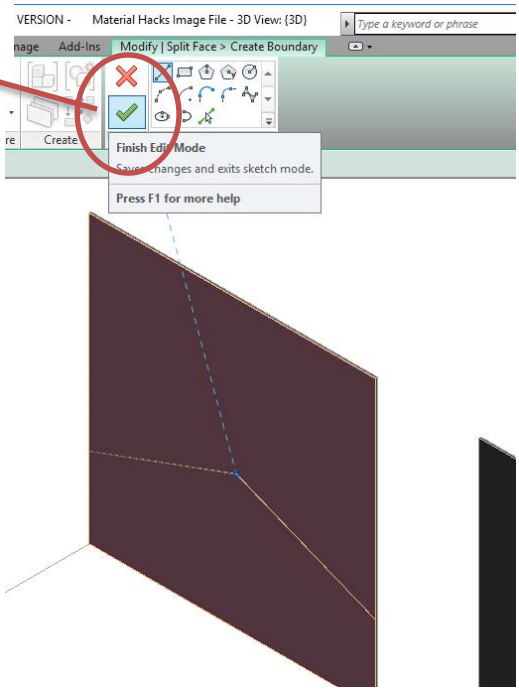
There may be times when a wall needs to be sectioned off so that it can be mapped with two different materials. To do this, the wall can be **split.**

1. Select the wall
2. Go to the **Modify** tab (with the wall selected)
3. Select the **split face** icon



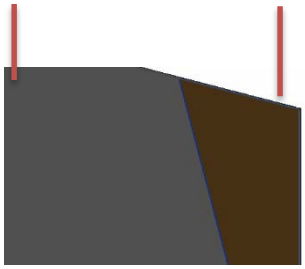

4. Use **sketch lines** *(pink lines)* to draw the location of the split *(lines will need to be connected)*

5. Click **green** check box to **finish**




Different materials can now be applied

**Material 1** **Material 2**



## APPLYING MATERIALS TO SURFACES

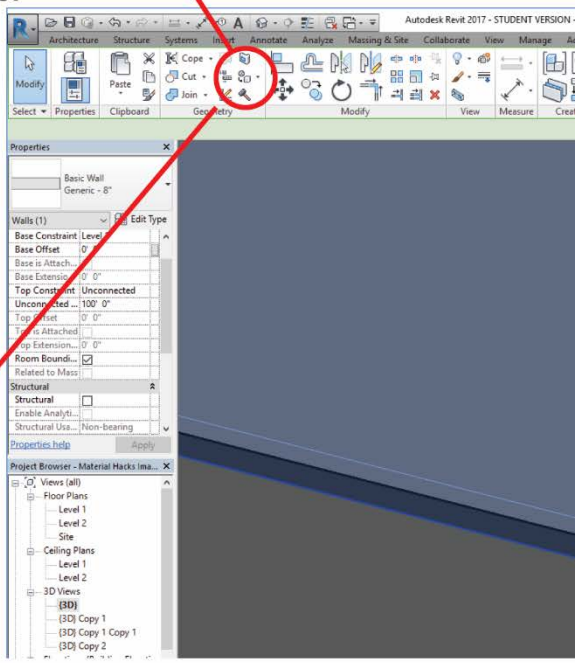
There are multiple ways to apply materials to modeled surfaces. This depends on how the object was modeled (i.e. **system families** *(walls, floors, ceilings),* **loadable families** *(furniture, windows, etc.),* or **in-place families**) AND the thickness of the material (i.e. thick stone vs. wall paint).

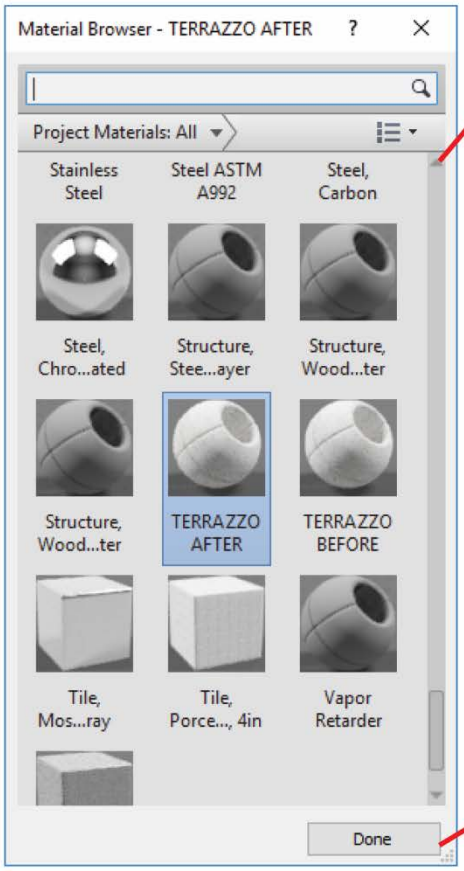
### 1. Painting on a surface

This application method can be done for a **system family** where the **material has little to no thickness.**

1. Select Wall (or other system family)
2. Select **Paint** Icon
3. Select desired material in the **material browser**
   *(but don't close the material browser)*
4. Click on the surface face to apply the material

**note this does not add thickness*





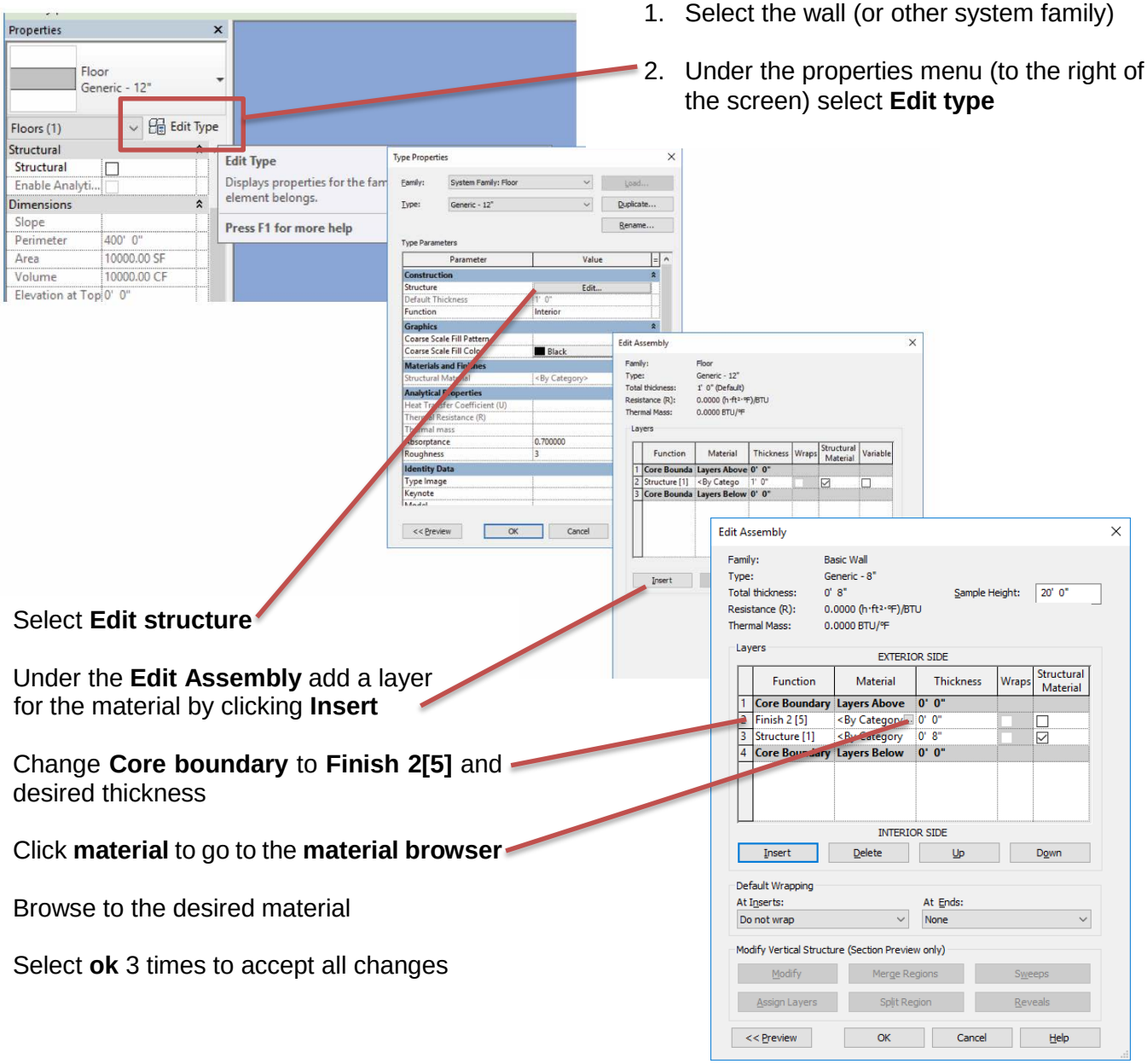

*Tip:* Do this in the realistic view if you have not modified the graphics tab properties.
*This will allow you to track which surfaces the materials have been appl.ied to.*

Do not select Done until you have applied the material

## APPLYING MATERIALS TO SURFACES

### 2. Material Properties

This should be done to **system families** where the **material has thickness.**



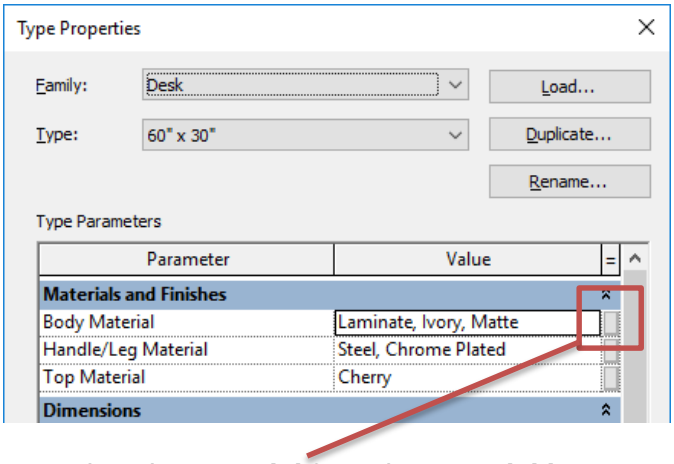

1. Select the wall (or other system family)
2. Under the properties menu (to the right of the screen) select **Edit type**
3. Select **Edit structure**
4. Under the **Edit Assembly** add a layer for the material by clicking **Insert**
5. Change **Core boundary** to **Finish 2[5]** and desired thickness
6. Click **material** to go to the **material browser**
7. Browse to the desired material
8. Select **ok** 3 times to accept all changes

## 3. APPLYING MATERIALS USING PROPERITES

This is done for **loadable families.** Some families will have multiple materials (such as a chair with upholstery and wood), these options depend on how the family was built.

Depending on the object, the materials category might be listed under the **instance properties** or the **type properties.**

1. Select the object
2. Use the properties window to select **material**, if not listed click **Edit properties**

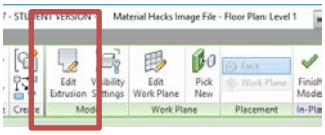



3. Select the **material** from the **material browser.**
4. Click ok

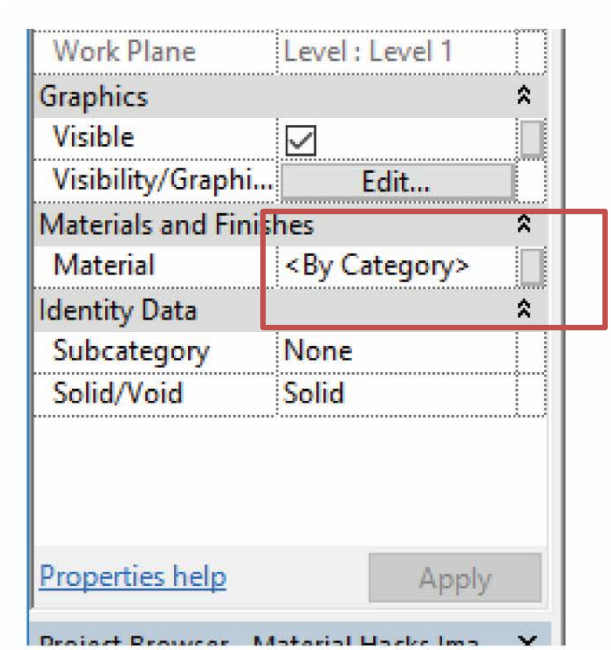
## 4. APPLYING MATERIALS TO SURFACES

This can be done for **in-place families**. Note the family will be that material throughout, meaning if a section was cut through the object it would appear as though it is made entirely of that material.

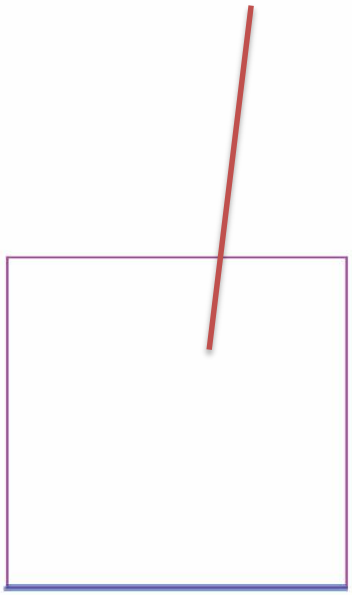
Material application can be done when the model was created or by editing it with the **Edit Extrusion** tool. To see the Edit extrusion button, select the object first.



1. While in sketch mode (pink lines)
2. Use the **properties** window to select **material.**
3. Select the material from the **material browser.**
4. Select ok




**Sketch mode**



Materials can be rendered in the software or using the cloud.