REVIT RTC TECHNOLOGY CONFERENCE NORTH AMERICA 2015

Session 2.3

Managing and Creating Custom Revit Materials

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Class Description

In this hands-on lab you'll gain the skills you need to begin getting the most out of your Revit Material Libraries. Learn to create and manage material libraries and share them with any Revit project or family. Create custom procedural materials and even image-based materials from your own photographs.

Key Learning Outcomes:

1. Learn to manage your Revit material libraries and create custom ones that you can share between projects and families
2. Learn to create custom materials using the vast array of built-in settings and controls
3. Create custom materials from your own photographs and learn to make the images completely seamless

About the Speaker:

Paul Aubin is the author of many Revit book titles including the widely acclaimed: The Aubin Academy Mastering Series: and the all new Renaissance Revit and Revit video training at www.lynda.com/paulaubin. Paul is an independent architectural consultant providing Revit® Architecture implementation, training, and support services. Paul's involvement in the architectural profession spans over 20 years, with experience in design, production, CAD management, mentoring, coaching and training. He is an active member of the Autodesk user community, and is a high-rated repeat speaker at Autodesk University, Revit Technology Conference and a national speaker at the BIM Workshops. His diverse experience in architectural firms, as a CAD manager, and as an educator gives his writing and his classroom instruction a fresh and credible focus. Paul is an associate member of the American Institute of Architects and a member of the Institute of Classical Architecture. He lives in Chicago with his wife and three children.

Materials

The primary function of materials in a Revit project is to establish the graphical characteristics of a physical element in the model. But materials are capable of doing much more than this. In additional to their graphical characteristics, a material can define the structural and thermal properties of an element as well. You can also associate meta data to a material to make them more useful for the information part of your BIM.

One thing that is little more challenging to achieve with Revit materials is defining finishes. For example, a concrete floor might have a clear coat finish. A gypsum board wall might be painted or have wall covering. If you wish to convey such finishes in your model, you will need to create materials specifically for that purpose and apply them to separate "finish" elements. You can also use the paint tool to finish elements.

While I raise this issue here, I do not want to dwell on it in this session. The subject of materials vs. finishes could be a session all its own. In this session I will be focusing instead on techniques to create and manage materials. If you choose to create "Finishes" as separate materials, you really just need to implement a naming convention to distinguish them from your physical materials, but all of the techniques we will discuss would still apply. So, with that, let's dig in.

Interface

The "Material Browser" dialog is your primary interface for all material related operations. In addition to the "Material Browser" you will also occasionally work with the "Asset Browser." Let's take a look at the major interface elements of these two dialogs starting with the "Material Browser" (see Figure 1). You can find the "Material Browser" tool on the Manage tab.

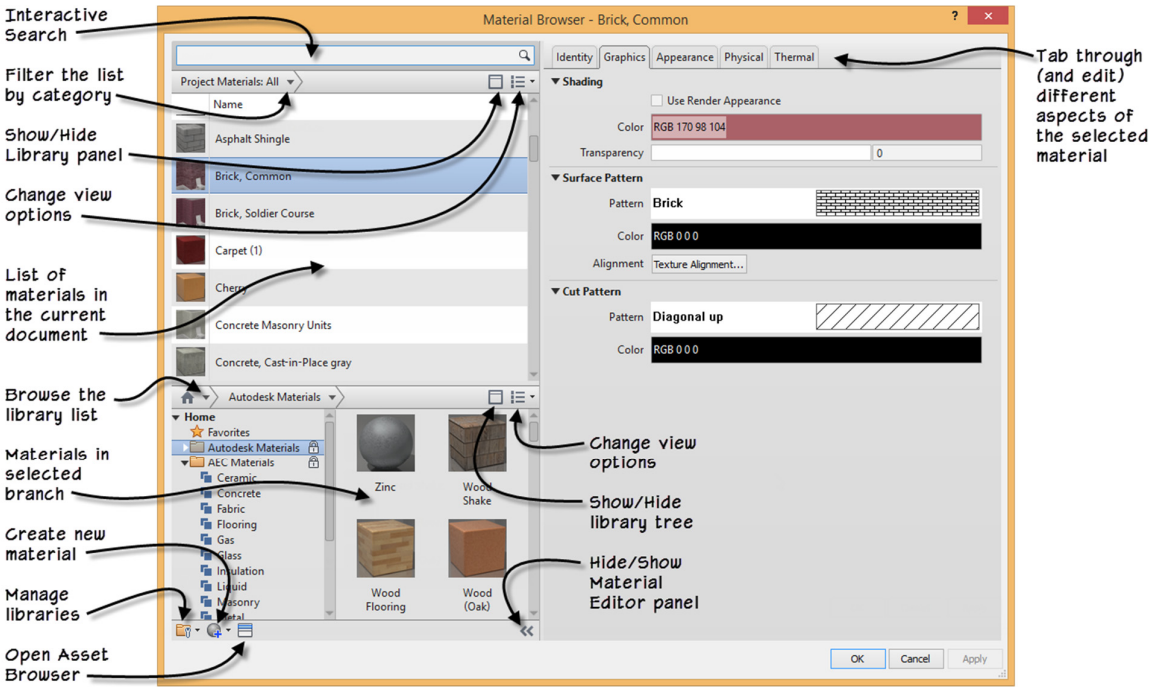


Figure 1—The Material Browser

As you can see in the figure, the "Material Browser" has three main areas or "panes." The top left is a list of the materials in the current project. At the top of the list is a search field that you can use to find specific materials quickly. It is a live search that instantly filters the list as you type. You can search on both the names of materials and any keywords associated with them. So if you type in "br" you will see not only brick materials but Oak Flooring might show up too. This is because the Description of Oak Flooring is: "Quercus Rubra" which contains "br." Naturally the more letters you type, the more specific a search will run and therefore a more filtered list with fewer results.

When you select a material in the list, its properties will appear on the right side of the dialog in the editor pane. This pane can have up to five tabs across the top: Identity, Graphics, Appearance and possibly Physical and Thermal. Some materials will not have Physical or Thermal properties, so these tabs would be missing. The Identity tab is used to input meta data for the material. You can add a description, class, comments, keywords, product information and even keynotes. Adding useful information here makes your materials more powerful in tagging, scheduling, searching and exporting. The Graphics and Appearance tabs control how the material will look. Graphics controls non-rendered appearance and rendered appearance (including Realistic shading) is configured on the Appearance tab.

If your material has physical (as in structural) characteristics, those properties will be assigned and configured on the Physical tab. Thermal characteristics such as conductivity, density, porosity and reflectivity are configured on the Thermal tab. If one of the tabs is missing, there will be a small plus (+) sign that you can click to add any missing assets (see Figure 2).

Figure 2—Add missing assets in the Material Browser

The third pane of the "Material Browser" is below the list of materials and may be hidden in your copy of Revit. You can display the Material Library pane by clicking the small Show/Hide Library Panel icon near the top of the dialog, just below the search field. The library panel is divided horizontally into two panels. You can also hide or show the library tree panel if you choose. Use the library panel to load material libraries and access additional materials not currently loaded in your project (see Figure 1 above).

The "Asset Editor" is a separate browser window that gives access to assets from external libraries installed with the software. On the Manage tab, click the Additional Settings drop-down and then choose: **Material Assets**.
This will display the "Asset Editor" which will appear as an empty dialog at first. Click the small icon at the bottom right to open the "Asset Browser" and access various assets available in the library. Depending on which options you installed with Revit, you may have several libraries loaded (see Figure 3).

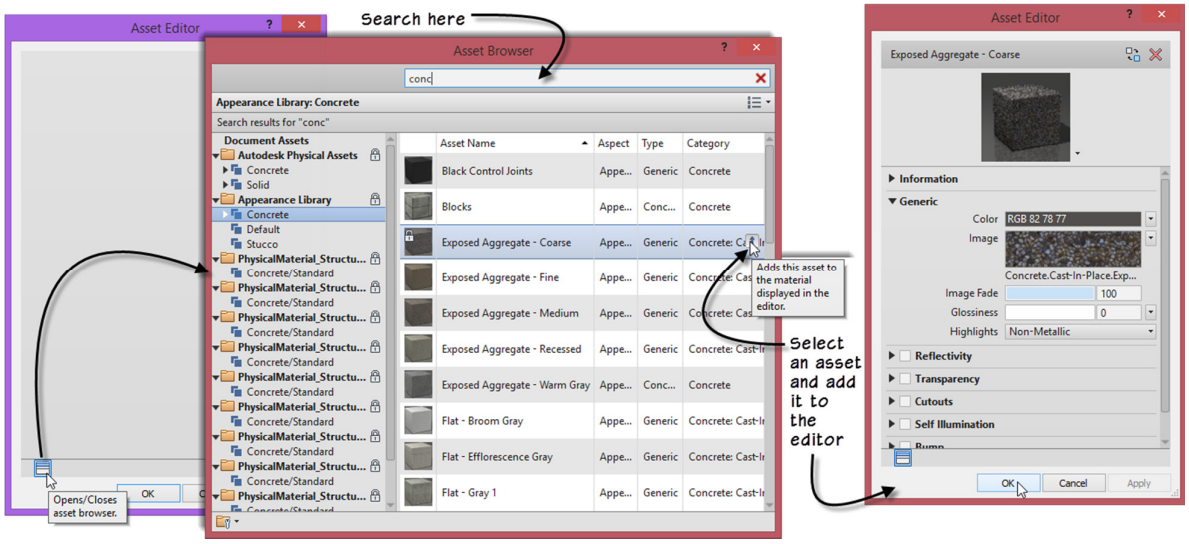


Figure 3—Asset Editor and Asset Browser

After you find an asset you like, you can click the small icon that appears to the right to add it to the editor. There you can edit the properties of the asset if you wish. Apply your changes and then click OK to dismiss.

Creating New Materials

Now that we have a brief introduction to the material interface, let's create some custom materials. You can create a material in a couple ways. You can duplicate an existing one and modify it, or you can create a new material.

Create a Simple Material

Let's start with something simple. Depending on the stage you are at you're your project design, you can often suggest materiality with simple materials of different colors. This is the easiest material to make.

1. Launch Revit and open the file: *01_Simple Material.rvt*.
2. On the Manage tab, click the Materials button.

⇨ At the bottom-left corner of the dialog, click new material icon and choose: **Create New Material**.

This will create: Default New Material.

⇨ Right-click Default New Material and choose: **Rename**. Name it: ***White Foam Core***.

3. On the Graphics tab on the right, in the Shading area, click the color swatch and then choose solid white. Click OK to accept the color and then click OK again to dismiss the dialog (see Figure 4).

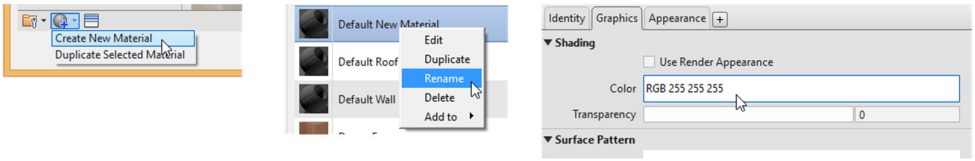


Figure 4—Create a new material assigned to solid white

There are many ways to apply a material. Let's apply this one as the default.

4. On the Manage tab, click the Object Styles button.

⇨ Scroll down and next to walls, click the browse button in the Material column.

⇨ Choose your new White Foam Core and then click OK.

OK. Really basic stuff to be sure. And I am pretty sure you knew how to do that much already. There are of course other settings on the Graphics tab.

5. On the Manage tab, click the Materials button again.

Beneath the color we just set, we can add transparency if we need to. Surface pattern is displayed when you look at the element and cut pattern when you cut through this material in either section or plan. These patterns display in non-rendered views.

⇨ Click the Identity tab.

There are many data fields here. Input as many of the values as you can. As mentioned above, this will aid in searching and you will be able to include most of these values in schedules and even in material tags. Let's take a look at one of the settings: Class.

6. In the Descriptive Information area, click the Class drop-down and choose: **Plastic**.

This provides a grouping for your materials. Try to choose the class that best suits the type of material you are making.

7. In the material list at the left, click the drop-down at the left just beneath the search field. Choose: **Plastic**.

Notice how this filters the list of materials to only include those that are designated as: Plastic. The really cool thing about this setting is that you can type in your own custom Class. Just click in the field and type it.

⇨ In the Class field, type: RTC. Then choose this as the filter on the left (see Figure 5).

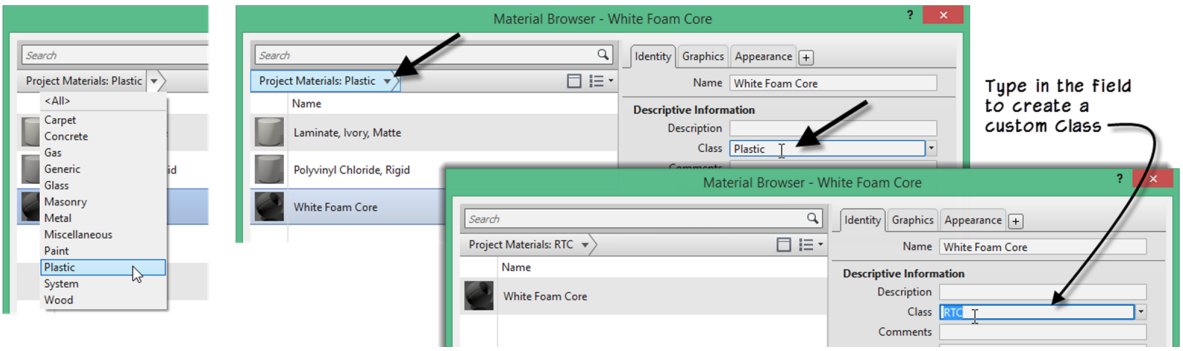


Figure 5—The Class setting lets you group and filter your list of materials

8. Set the filter back to <All> before continuing.

Go ahead input test values in the Description, Comments and Keywords fields. You can put more than one keyword separated by commas. Then on the left, try searching for each of the values you typed in. The list will filter again, but this time showing materials that contain these values. So can search on any of the descriptive information and the name of the material. So this will make working with large lists more manageable.

Appearance Tab

Now that we have a good understanding of what we can do on the Identity and Graphics tabs, I am going to focus our attention in the remaining examples on the Appearance tab.

1. Clear any searches and be sure the filter is set to: **<All>**.

2. Make sure that White Foam Core is selected and then click the Appearance tab.

Notice that the color here is a medium gray not white. Also notice that most of the available settings are not enabled (they are unchecked). So if you were to render this material, the results would be mostly unsatisfactory.
Look at the top of the Appearance tab, to the left. You will see a small hand icon with a zero above it. (Next to it the name of the Asset appears: Generic (10) in Figure 6).

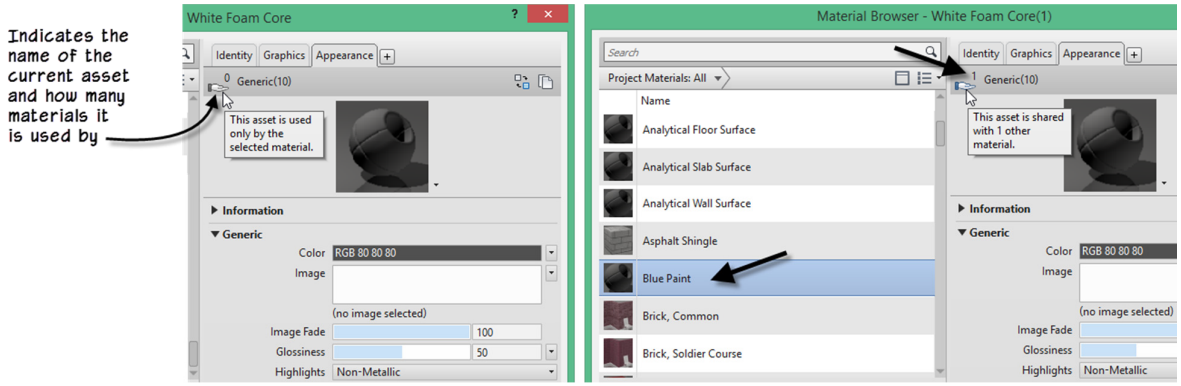


Figure 6—Assets must be carefully managed to avoid unexpected results

When you pause your mouse over the hand icon a tooltip tells you that the asset is only being used by the current material. This is also indicated by the zero above it. In other words, there are zero assets also using this asset. If the number read 1, it would mean that one other material is using this asset.

3. Right-click White Foam Core and choose: **Duplicate**. (You can also access duplicate from the same pop-up at the bottom left where we accessed Create New Material).

⇨ The name will still be in rename mode, type in: ***Blue Paint*** and then press ENTER.

*(**Note:** if the title bar at the top of "Material Browser" still says "White Foam Core(1)" after you rename, select a different material in the list and then select Blue Paint again to update it).*

Take notice of the small hand icon now. It will now have the number 1 above it indicating that the asset is shared with one other material. In my case, this asset is called: Generic(10). Yours may vary, but whatever the name, it will be shared by both the Blue Paint and White Foam Core materials at the moment. We need to address this before continuing. If you make any changes to the appearance asset right now, it will change on both materials. In some cases, this may be what you want, but in this case we want each material to reference separate assets.
I should note that if you create a new material like we did at the beginning for White Foam Core, the new material will create a new asset too; called: Generic(11). Try it if you like! But just be sure to reselect Blue Paint before continuing. So why wouldn't you always use: Create New Material instead of Duplicate? It really depends. Sometimes you want a material that is very close in

configuration to an existing one. Duplicate is useful for that. Otherwise, new is probably better. There is an easy way to duplicate the asset after duplicating the material. Let's do that now.

4. At the top-right corner of the editor pane, click the small duplicate asset icon (see the left side of Figure 7).

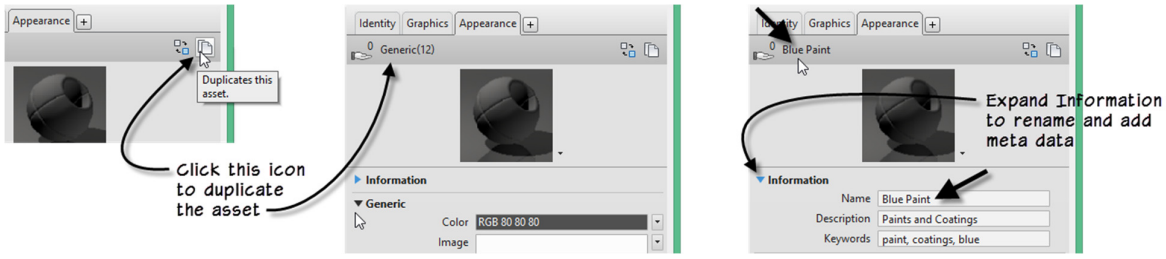


Figure 7—Duplicate and rename the appearance asset

Simply clicking this icon will create a new asset for this material. Notice that the name will be something like: Generic(12) and that the number above the hand icon will change to zero. This is because the newly copied asset applies only to this material now. This is really important to do when duplicating materials or you run the risk of having your edits affect many materials at once.
It is also a good idea to rename the asset while we are here.

5. Expand the Information grouping directly beneath the preview image.

⇨ In the Name field, replace the existing name with: ***Blue Paint***.

Notice that there are additional meta data fields here. You should also input some values here as well. But just why are there two description and keyword fields? Well, the ones we edited above applied to the entire material definition. In other words they were the description and keywords for this Revit material. However, the current description and keywords apply *only* to the Appearance asset. This may seem strange until you consider that assets can actually be shared between projects and even to other Autodesk products like AutoCAD or Showcase. We will discuss this further below. So take the extra moment to input some data here as well. Finally, since, we have named this: Blue Paint, if you like, you can return to the Identity tab and change the Class to: Paint. You can also just add Paint to the keywords instead. It is up to you.

So now that we have duplicated, renamed and added data, we should probably make our Blue Paint actually blue.

6. In the Generic grouping, click the Color swatch and choose a nice blue color and then click OK.

   By default, the color assigned to the appearance and the color on the Graphics tab are not the same. Typically you will want them to be however. So let's take care of that next.

⇨ Click on the Graphics tab.

⇨ Check the "use Render Appearance" checkbox and then click OK (see Figure 8).

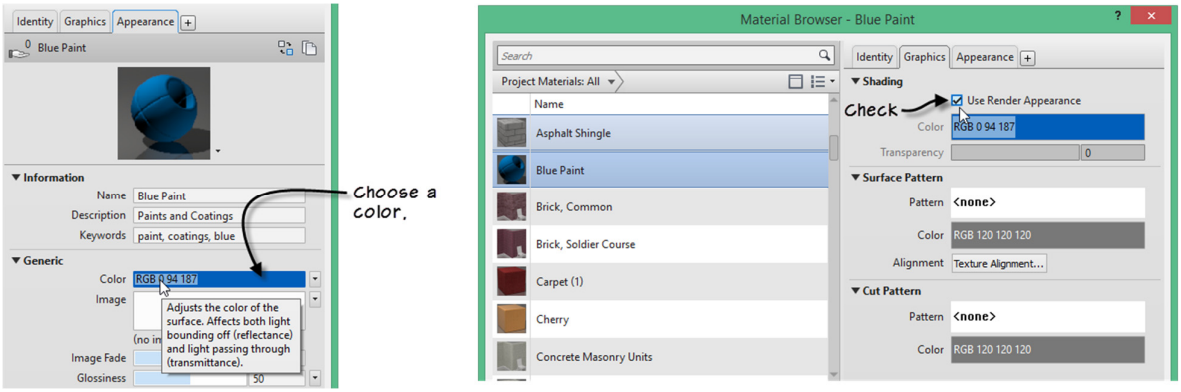


Figure 8—Assign a color and link the Graphics tab to the Appearance

In this case, this will use the same color number on Graphics that is used on Appearance. However, if you use an image instead, then this checkbox will take an average color from the bitmap image and use it for the Graphics color. We'll see this below.

There are three groups of walls in the file. Each group uses a different wall type. Let's assign our new Blue Paint material to one of these types.

7. Select any wall onscreen, and then on the Properties palette, click the Edit Type button.

⇨ Edit the Structure and then assign the Blue Paint material to the Structure layer. Click OK three times to see the result.

So once again, this is not a very sophisticated material. But please keep in mind the importance of the procedures we followed to ensure that we were editing the correct material and asset. Furthermore, the meta data we added is also quite valuable for ongoing project management.

(Note: if all of your walls turned blue, you missed the step where we duplicated the Appearance asset. A Catch up file is provided).

Replacing Assets

There is a large collection of assets included with the software. The specifics of exactly what you have available will vary with your region and the installation options you chose. But regardless of the specific collection of assets available to you, you can use the following procedure to swap out the assets applied to a material with another one from the library.

CATCH UP! If you get behind, look for these boxes. I have saved versions of the files at various stages of completion. You can open the file completed to this point named: ***02_Material Assets.rvt***.

You can continue in the same file or open the provided catch-up file.

1. Open the "Material Browser" and then select the Blue Paint material.

2. Click the Appearance tab and at the top click the **Replace this asset** icon (next to the Duplicate icon).

This will display the "Asset Browser" dialog. We introduced this dialog above. Simply search for an asset and then you can replace the one in the editor with the new one. There many kinds of assets, each with their own unique properties. For example, there is an asset type for paint. This asset will give more realistic results than the generic one we are currently using.

3. In the Search field at the top, type: ***paint***.

In the provided "*Appearance Library*" there are many more assets to choose from than the "*Autodesk Physical Assets*" library. However, you should be able to find something acceptable in whatever library have access to.

⇨ Expand the *Wall Paint* category and select the *Matte* category.

⇨ Select any color you like in the list.

The color does not matter, as we can change it.

⇨ On the right side, a small double arrow icon will appear. Click this to replace the current asset with this one (see Figure 9).

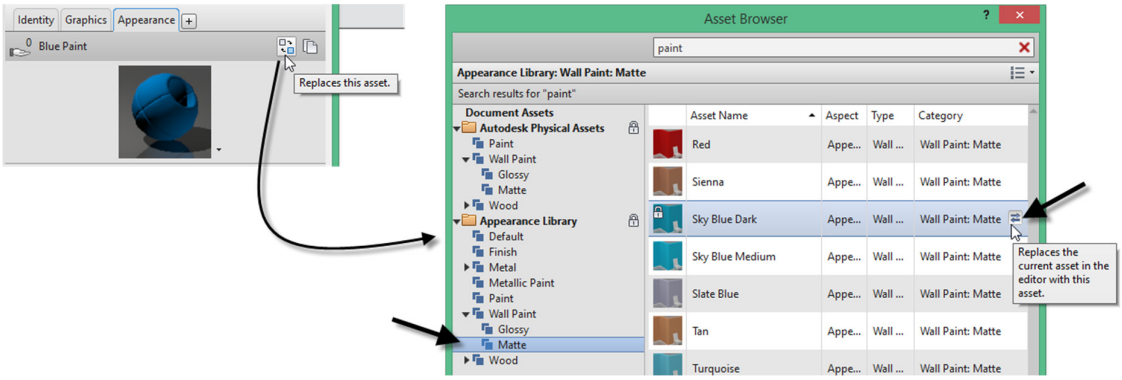


Figure 9—Replace the asset with a paint asset

4. Close the "Asset Browser."

If you want, you can rename the asset and you can change the color too if you wish.

Notice that the settings available to the Appearance asset are now different. The main grouping is Wall Paint and this is where you can modify the color if you like. Also, there is a Finish parameter and an Application parameter. These offer many common paint characteristics (see Figure 10). Also take note of the description and keywords. Most of the assets from the provided library come with these values already filled in. You can of course edit any setting as necessary.

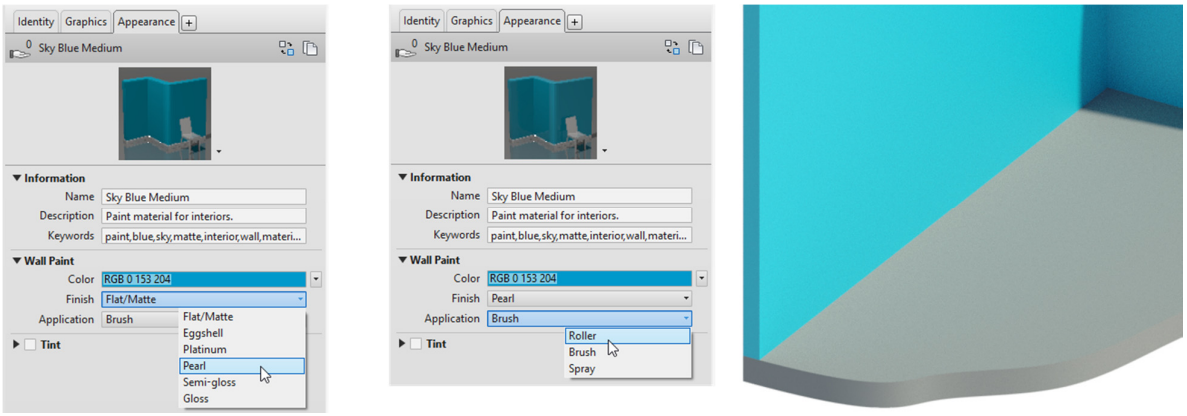


Figure 10—Edit the Finish and Application to get more realistic looking paint

Procedurals

As you can see, using various asset types and simple color settings can give a great deal of variety. But this is barely the tip of the iceberg. We can assign images to our materials to make more complex and realistic appearance. Images can be either bitmap image files (photographs) or procedurals. A procedural is a bitmap that is generated with a mathematical formula instead of a photograph.

CATCH UP! If you get behind, you can open the file completed to this point named: ***03_Procedurals.rvt***.

1. Select one of the other walls onscreen. Edit Type and then edit the structure. Finally, click the material browse icon to open the "Material Editor."
2. At the bottom of the dialog, click the New icon and choose: **Create New Material**.

⇨ Rename the new material and call it: ***Checkerboard Tile***.

3. Click the Identity tab and from the Class drop-down, choose: **RTC**. Input a Description and Keywords.
4. Click the Graphics tab and check the "Use Render Appearance" checkbox.
5. On the Appearance tab, edit the Information:

⇨ Change the Name to: ***Checkerboard Tile***. Input a Description and Keywords.

6. In the Generic grouping, click the drop-down next to the Image item. Choose: **Checker** from the list.

The "Texture Editor" will open. There are several settings here. At the top you will see a preview of a black and white checkerboard. At the bottom you will see settings that control the size of this pattern and how it repeats. By default, it is one by one and repeats in both directions. Let's leave all that as-is for now and focus on the pattern.

7. Near the top, click on the swatch for Color 1 and choose a different color. Repeat for Color 2.

   Let's see what this looks like in the model.

⇨ Click the Done button, and then OK three times (see Figure 11).

If your material does not display, make sure shading is set to: **Realistic**.

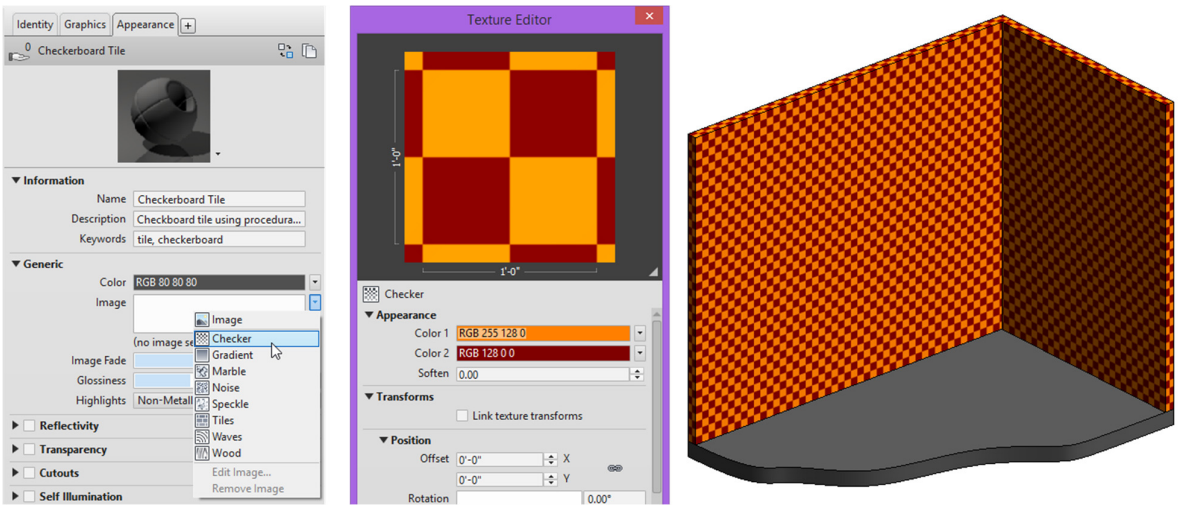


Figure 11—Add a checkboard pattern to the material

8. Return to the "Material Browser," select Checkboard Tile and then click the Appearance tab.

⇨ Click on the Checker swatch to edit the pattern again.

So that we can see our results better in the project, let's increase the size of the tile.

9. For the Scale, change the sample size to: ***4'-0"***.

> ***Note:*** *Interestingly, if you are working in imperial units, the "Texture Editor" defaults to inches even if the project uses feet.*

10. Leave the "Texture Editor" open and click on the "Material Editor" window to make it active. Then click the Apply button to see the change in the model. Click back to the "Texture Editor" to make it active again.

Let's just briefly discuss the remaining settings in this texture before continuing.
Appearance—in addition to the color swatches, there is a setting called Soften. This blurs the edge between the two colors making it a soft instead of crisp edge. It does not take much. A value of: 0.1 is quite dramatic. Much more than that and it starts to look like a solid color. Go ahead and try it if you like, just be sure to set it back to zero before you continue.
Transforms—we can apply images to other channels in the texture. The most common one is Bump or Relief Pattern. We have only this one texture at the moment, but if we add a bump pattern, the "Link texture transforms" checkbox would make sure that any adjustments to Position, Scale and Repeat would be applied to both textures. Without this checkbox, you would have to configure the settings the same manually in two different editors. If you think you might add a Bump, you should check this box. It won't hurt anything if there is no Bump applied.

11. Check the "Link texture transforms" checkbox.

Position—you can offset the pattern in the X or Y directions as well as apply rotation. Feel free to experiment with these, but reset to zero offsets and rotation before continuing.
Scale—we have already adjusted the scale of the sample size above. However, you may have noticed that the two settings changed together. If you want to set Width and Height separately, click the small link icon to the right to disable it.

12. Click the small link icon next to Width and Height, change the Width sample size to: ***8'-0"*** and then in the "Material Browser" window click the Apply button.

Repeat—two choices here: Tile and None. Most of the time you will want Tile which simply repeats the texture across the surface. If you are creating a material with an image you don't want repeated, you can change it to None. If you do this, make sure that you also set the scale carefully. For example, I recently created a flag in the family editor. I created a material using a bitmap image of the American flag and then here, set tile to none and made the scale match the size of the flag.

CATCH UP! If you get behind, you can open the file completed to this point named: ***04_Nested Textures_01.rvt***.

Using Nested Textures

At this point, if you have been following along, your texture should have an elongated rectangular proportion and two colors. Take a closer look at the two color swatches above. There is a small drop-down next to each color. With these dropdowns, we can add nested textures!

If necessary, reopen the "Material Browser," select Checkerboard Tile and then click the Appearance tab.

1. Click the dropdown next to Color 1 and then choose: **Gradient**.

The "Texture Editor" will change to show the properties of the gradient map. By default, we get a linear gradient with three colors (black, gray and white) equally spaced. When you have nested textures, there will be a dropdown at the top just beneath the preview image where you can navigate up and down the tree.
To adjust the colors, click the small node indicators and then change the color. You can drag the node in the middle to increase or decrease the progression between it and the colors at the ends. You can also drag the middle node away from the ramp and release to remove it. You can click the two nodes at the ends to change their colors, but you cannot drag them or remove them. The middle node position can also be adjusted numerically using the Position field (see Figure 12).

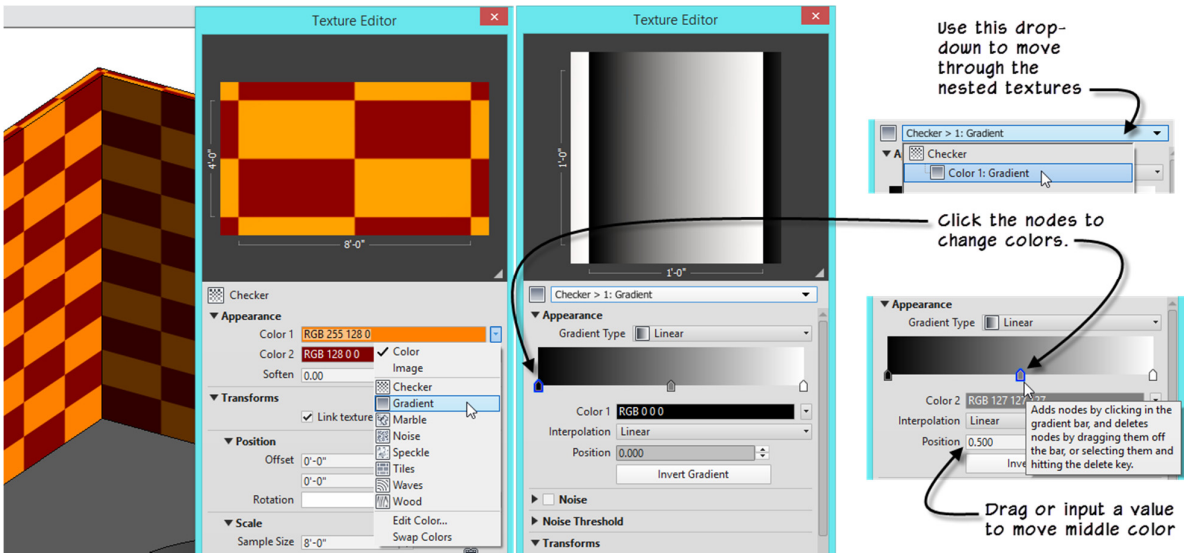


Figure 12—Add a nested gradient texture to one of the colors

> ***Undo and Cancel***—*If you make any adjustments you don't like, there is no undo. But you can cancel the "Material Browser" and then reopen it to try again. Any changes made will be lost when you cancel. So while it is encouraged to experiment, it will take some time to get used to lack of undo. I recommend making changes slowly and when arrive at a change you like, close the "Material Editor" with OK and save your file. Then come back into the editor and continue. This will be a little inconvenient, but not as much as pressing ESC in frustration only to realize that doing so means you have lost everything since you entered the Material Editor!*

Take a look at the preview shown back in the "Material Browser" for the Checker bitmap. Notice that the gradient is being repeated four times within the square on the left (see the left side of Figure 13). This is because the size of the gradient bitmap is currently using the default of: 1'-0". Let's change it.

2. Beneath Scale, set the Width to: ***8'-0"*** (see the left side of Figure 13).

Notice that the gradient is actually applied across two rectangles of the checkboard before it repeats. This is because the checkerboard includes two bays in each direction. So if you want to have a full gradient in each rectangle, you will need to adjust the scale a bit more. We need to unlink the gradient to make it rectangular to match the proportion of the checkerboard and then set the sizes to half as big so that we get two repeats for every one checkboard.

⇨ Beneath Scale, click the link icon to unlink, set the Width to: ***4'-0"***, set the Height to: ***2'-0"*** and then click Apply (see the right side of Figure 13).

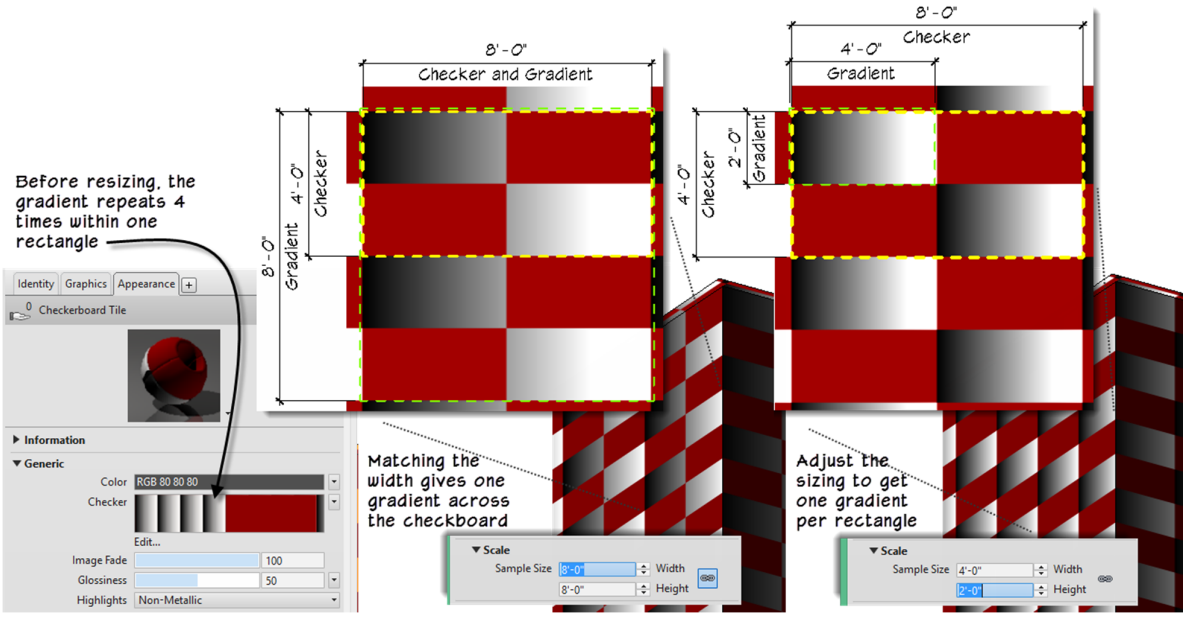


Figure 13—Adjust the sizing to make the tiling match the checkerboard

Naturally we could make further adjustments to scale and rotation and get some interesting affects. You are welcome to experiment further. For example, try some of the settings shown in Figure 14.

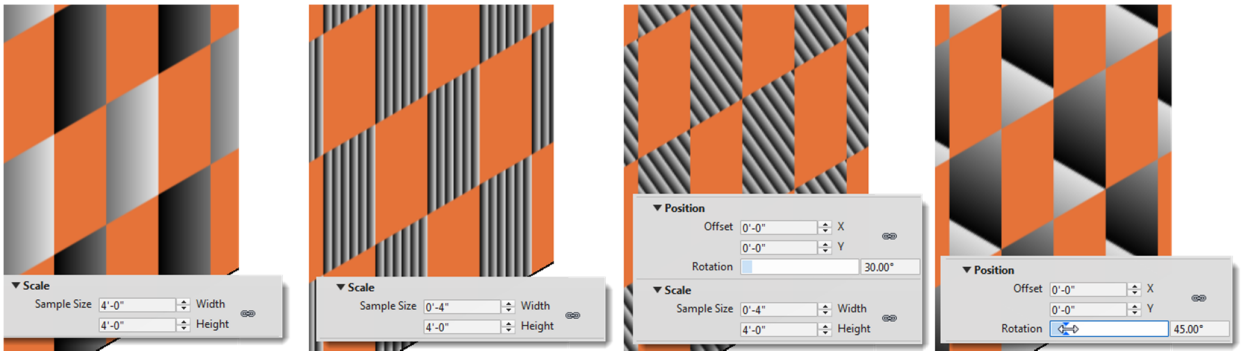


Figure 14—Try variations of Width, Height and Rotation to get many interesting effects

Meanwhile, let's adjust the colors to choose something a little bit more interesting than basic black and white. There are three colors. So to edit Color 1 (currently black), click the first node marker, then click the color swatch.

3. Make sure node 1 is selected (Color 1) and then click the color swatch next to Color 1. Choose a new color and then click OK.

⇨ Repeat for the other two nodes.

If you would prefer to only have two colors, drag the middle marker off of the ramp and release. It will be removed. Alternatively, you can drag it left or right to have blend differently with the start and end colors.

If you want to experiment further, feel free. Notice the choices on the Gradient Type dropdown. Furthermore, when you combine them with the choices on the Interpolation dropdown, the possibilities are nearly limitless. I have included a few examples here (see Figure 15).

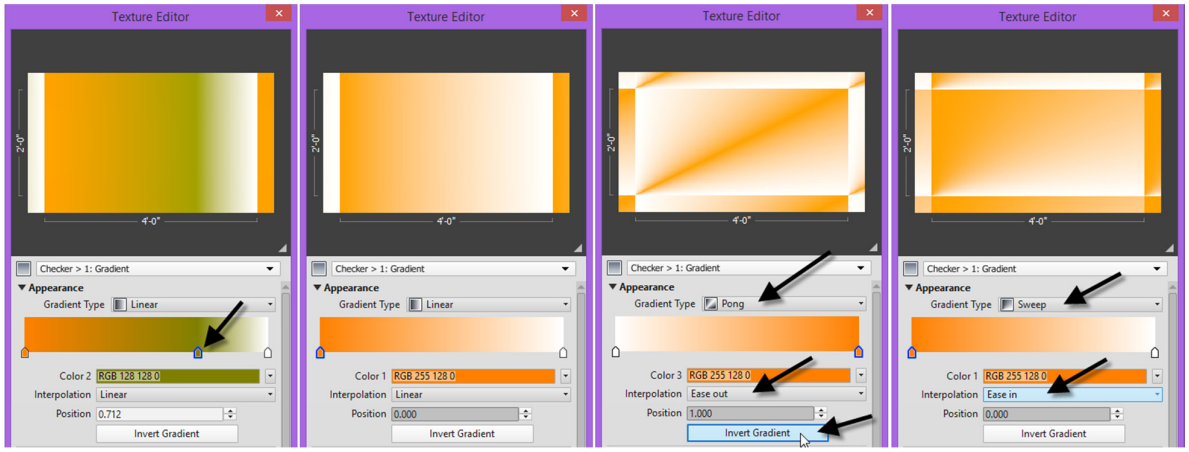


Figure 15—The possibilities with gradients are nearly limitless

4. Once you are satisfied with your experimentation, click the OK button in the "Material Browser" and then save the file.

Adding More Nested Textures

There is so much more we can do with nested textures, both procedural and bitmap. We are going to look at bitmaps below, but let's do one more example with procedurals.

CATCH UP! If you get behind, you can open the file completed to this point named: ***05_Nested Textures_02.rvt***.

If necessary, reopen the "Material Browser," select Checkerboard Tile and then click the Appearance tab.

1. Click the dropdown next to Color 2 and then choose: **Marble** and then click Apply.

The results will not be that spectacular. But try varying some of the settings.

2. It will take some trial and error, but make adjustments to the colors, Vein Spacing, Vein Width and rotations (see Figure 16).

You can try adjusting the offsets too, but I find that this makes the seams at the tiling very noticeable. So I would recommend against it.

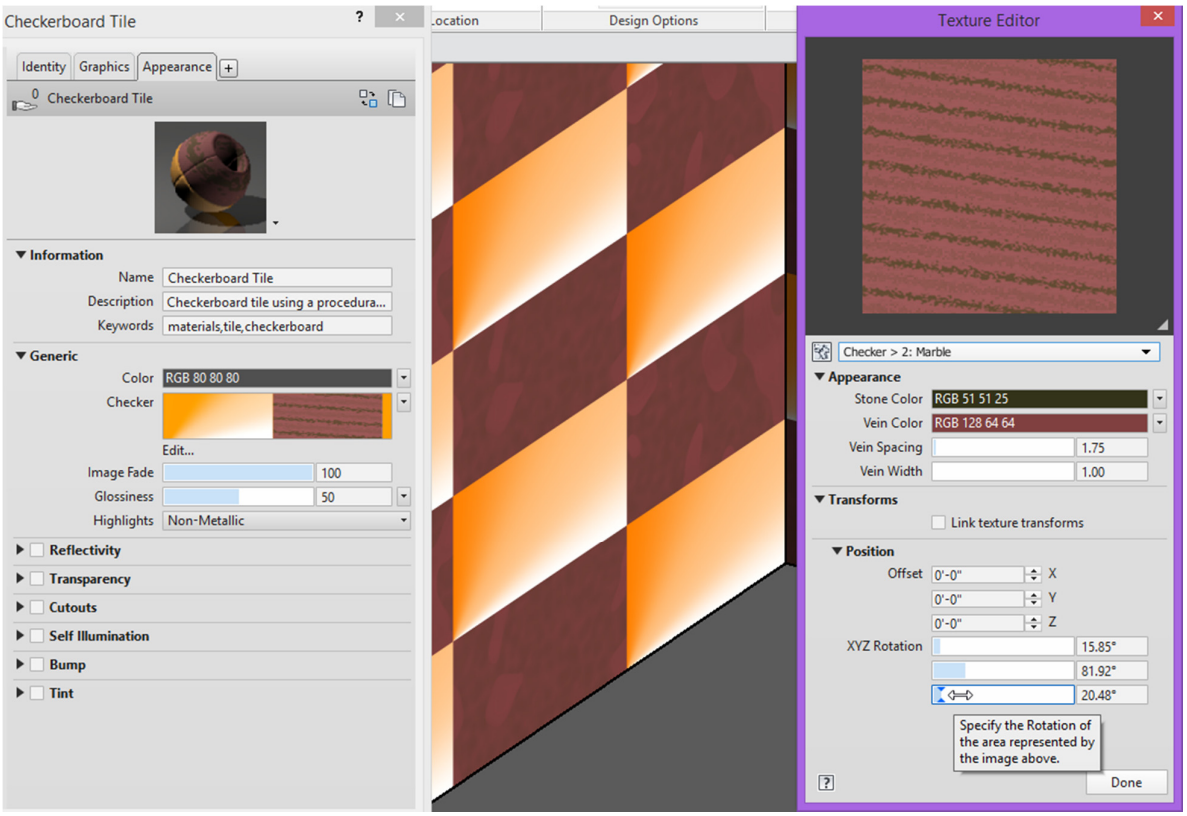


Figure 16—Vary some of the rotation settings, colors and vein settings to get better results

3. Click OK to dismiss the "Material Browser" dialog.
4. Select the remaining white wall in the model, edit its Type Properties and edit the material assigned to the structural layer.
5. Checkerboard Tile will be selected automatically.

⇨ Right-click Checkerboard Tile and choose: **Duplicate**. Name it: ***Checkerboard Tile Option 2***.

Remember that the appearance asset is still the same as the original. So any changes to this material would affect the original as well.

6. On the Appearance tab, click the Duplicate icon at the top to copy the asset. Rename it if you like.
7. At this point, if you want to see everything in the view, you can OK to dismiss all dialogs, save the file and zoom the window so you have a good view. Then reopen the "Material Browser" and click the Appearance tab.

Let's leave the top level map set to a checker pattern, but change out the nested maps.

8. Click on the Checker swatch to edit it.
9. Next to the Gradient swatch, click the dropdown and choose: **Tiles**.

With the Tiles procedural, you can create brick and tile patterns. Since we are nesting this one, we want to think about the size we have available. The main pattern is an 8'-0" x 4'-0" rectangle. So we need to decide how many tiles we can

fit in this space. It defaults to a stack bond 4 tiles by 4 tiles. Let's say we wanted to keep it 4x4 but have it fill one rectangle of the checkerboard.

10. Beneath Tile Appearance, click the color swatch and choose a Tile Color. You can do the same for Grout Appearance if you like.

11. Scroll down and change the Scale settings to: ***4'-0"*** wide x ***2'-0"*** high and then click Apply.

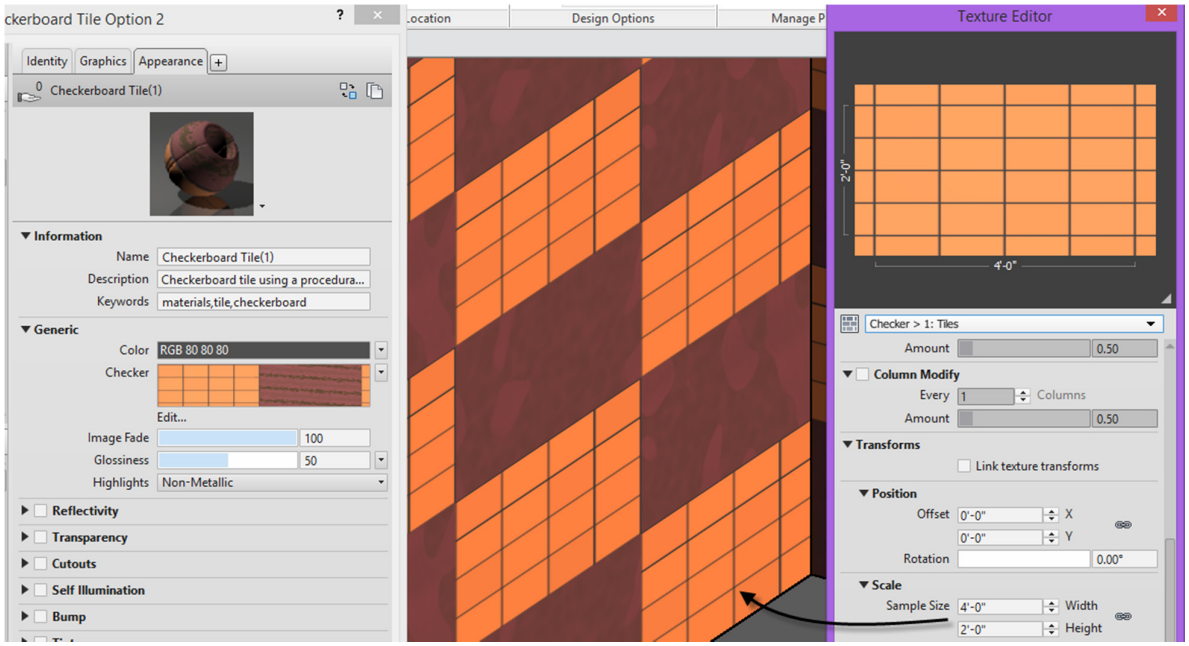


Figure 17—Adjust the nested pattern to fit the available space

You can adjust the number of tiles in each direction and the scales to get different patterns. Let's assume that we wanted to use standard (US) sized bricks. This would mean that in our 4'-0" width, we can fit (6) 8" bricks across by (9) 2 2/3" tall bricks.

12. At the top, change the Tile Count to: ***6*** per row and: ***9*** per column. Apply to see the change.

Well what about the bond? If you open the Type dropdown, you will see that we have several bond type to choose from (see Figure 18).

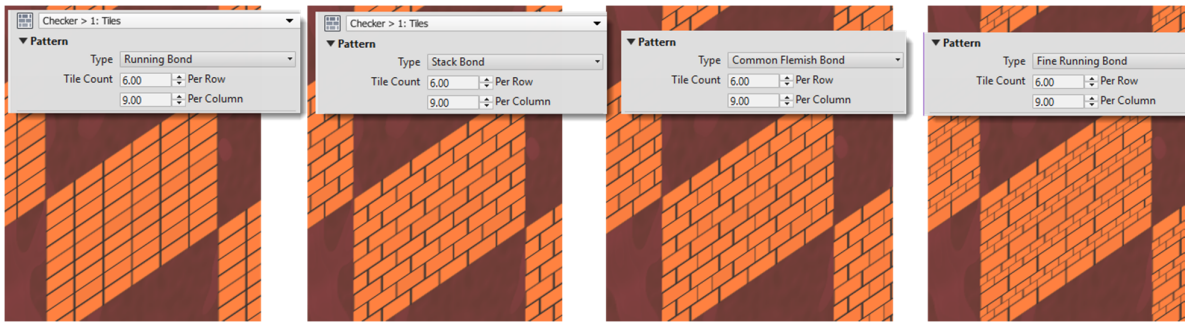


Figure 18—Try various bond patterns

Depending on the type you choose, the various settings below will activate. For example, when choosing either the Fine Running or Fine Stack Bonds, this will activate the Row and Column Modify settings. If you pause your mouse over any of these settings a detailed tooltip appears to explain their function. So please feel free to experiment further.
But here is the really interesting thing about nested textures. You can nest more than one level deep! Let's try it.

13. Set the bond type back to: Stack Bond.
14. For the Tile Color, click the dropdown next to the color swatch and choose: **Waves**.

⇨ For Color 1, choose something other than black.

⇨ For the Grout Appearance, increase both the Horiz and Vert Gap Width settings to: ***1"*** each.

⇨ Click on the dropdown next to the color swatch and then choose: **Noise**.

So we are now nested three levels deep. Let's move back up to the top of the tree and make one last change. Using the dropdown just below the preview image at the top, you can jump to any level of the tree you want. Let's change the Marble to something else.

15. Beneath the preview at the top, click the dropdown and then choose: **Checker** from the navigation list to return to the top level.
16. Click the dropdown next to Marble and choose: **Image**.

A browse window will open where you can select an image file.

⇨ In the *Textures* folder, choose: *RTC Logo.png* and then click Open.

⇨ Beneath Scale, click the link icon to unlink, set the Width to: ***4'-0"***, set the Height to: ***2'-0"*** and then click OK to see the results.

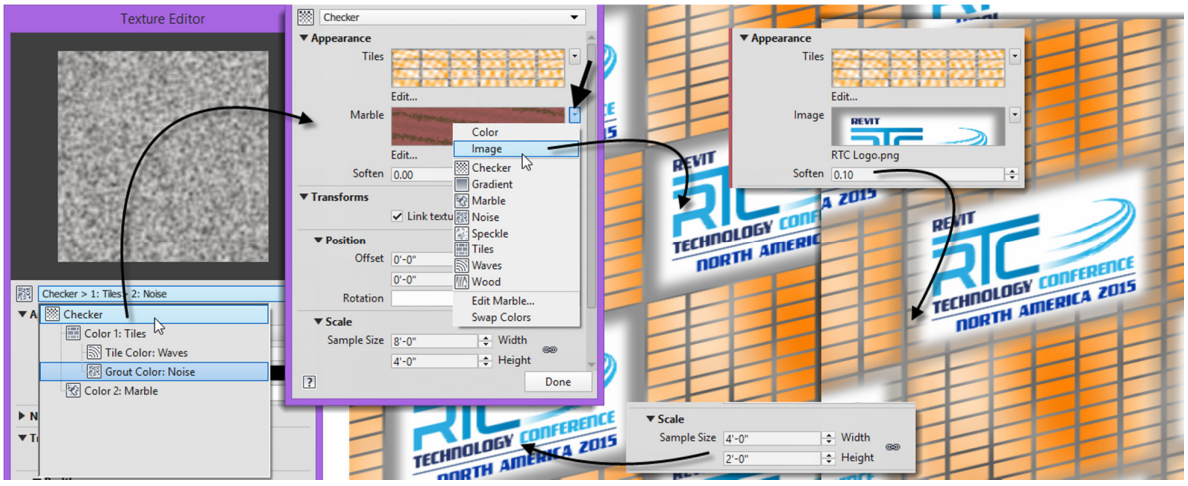


Figure 19—Replace the marble texture with a bitmap image

On the right side of the figure, one last modification is shown. Try setting the Soften value to: ***0.1***. This will soften the edge between the tiles of the top level

checkboard and have the logo blend into the tile pattern beyond. All of the examples we have explored so far are just the tip of the iceberg. There are so many more possibilities. You are encouraged to explore further.

If you would like to learn more about each of the procedural maps, visit this link in the Autodesk help:
http://help.autodesk.com/view/RVT/2016/ENU/?guid=GUID-B07D217E-3F11-43E6-B37A-5B5F0FAC9D38

Creating Materials with Images

While many of the previous examples offer some compelling ways to create custom materials, by far the most common way to create custom images is by using a tiled image file. The concept is quite simple. Instead of using a solid color or a procedural texture, we load an external bitmap image instead. Revit supports all of the most popular file formats like: JPG, PNG, TIG, GIF and many more. You can access images from nearly any source: files provided with Revit, downloaded from the Internet or even taken with your own camera. In the next couple exercises, we will look at a few examples of using image files to create custom materials.

Working with Seamless Textures

When you use an image file on a material, it will be tiled along the surface in much the same way as the procedural textures explored above. This means that you will typically want the image to be "seamless." A seamless image will have no noticeable seams when it is repeated. Some images are more successful than other at this and even in the best images if you look hard enough you can often spot the seam. So the biggest challenge is finding good images that adequately conceal all seams and look like a believable continuous material. So what better place to start than with an image by the master of tessellation: M.C. Escher.

CATCH UP! If you get behind, you can open the file completed to this point named: ***06_ Seamless Texture.rvt***.

1. Open the "Material Browser," and at the bottom left corner, click the new icon and choose: **New Default Material**.
2. At the bottom of the dialog, click the New icon and choose: **Create New Material**.

⇨ Rename the new material and call it: ***Escher Pattern***.

3. Click the Identity tab and from the Class drop-down, choose: **RTC**. Input a Description and Keywords.
4. Click the Graphics tab and check the "Use Render Appearance" checkbox.

5. On the Appearance tab, edit the Information:

⇨ Change the Name to: ***Escher Pattern***. Input a Description and Keywords.

6. In the Generic grouping, click the drop-down next to the Image item. Choose: **Image** from the list (you can also click in the empty white swatch instead).

⇨ In the *Textures* folder, choose: *Lizards.png* and then click Open.

⇨ Click on the image swatch and then in the "Texture Editor" check the "Link texture transforms" checkbox.

7. Click OK in the "Material Editor" to finish.

8. On the Modify tab, on the Geometry panel, click the Paint tool.

⇨ Paint the new Escher material onto one of the top surfaces of one of the floors in the model (see Figure 20).

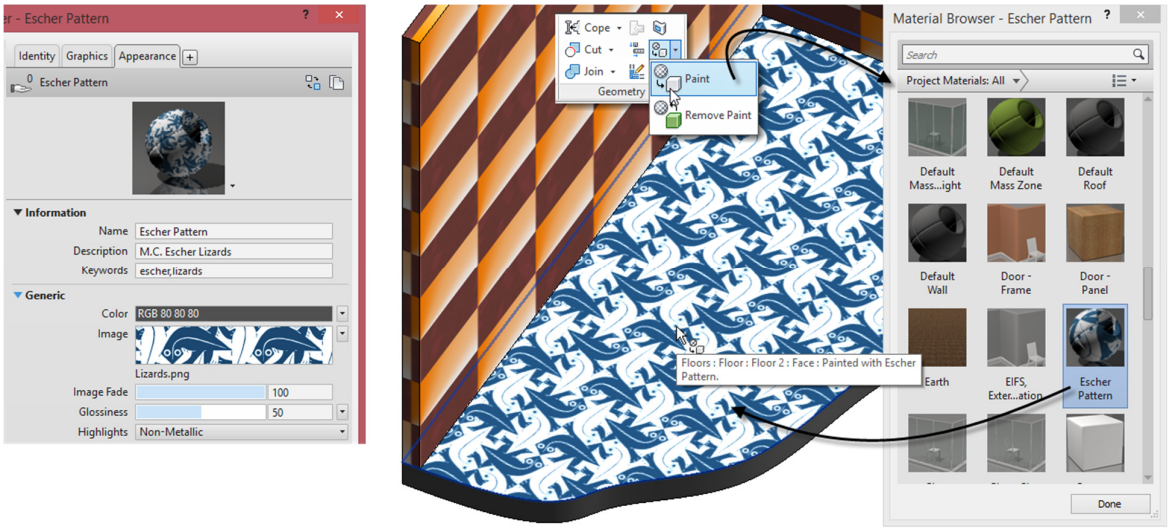


Figure 20—Apply the new material with the paint tool

Create a Seamless Texture

Now Escher was the master of seamless textures. I wonder how he would have liked Revit? Unless you can tap into your inner Escher, it can be tricky to make a texture seamless. Particularly because so many of them start from photographs. Believe it or not, making the photo seamless is the easy part. Taking a good photograph is much harder. I have provided a few samples with the dataset, but I must admit they are mediocre at best. I shot mine on my iPhone. The trouble is that you need to shoot the image head on and have VERY even lighting for it to give good results. If the lighting varies a little from one side of the image to the other, it will be hardly noticeable in your view finder and onscreen. But once you tile it on a surface, the banding across the image will jump right out at you! So, now that you are forewarned, let's go through the process.

The first thing you need is a photo. You can download it or take it on your digital camera. As I said, I took mine using my iPhone. Better cameras, and better photographers will give better results.
Next, you need an image editing program. I normally use Photoshop. But there are free alternatives out there and here in the lab we will use paint.net. If you would like to learn more, you can visit:
http://www.getpaint.net/download.html
We will also be using a plugin to help us make the seamless texture. Info for it is here:
http://forums.getpaint.net/index.php?/topic/4591-seamless-texture-maker-ymd100718/?hl=seamless
Both of these are installed here in the lab.

1. Launch paint.net.
2. From the *Textures* folder, open the file named: *Wood_Floor.jpg*.

When you first look at this photo, it looks pretty even in tone. But as we will see, the lighting varies quite a bit from top to bottom on the image (see Figure 21).

Figure 21—An image the looks fine can actually have large variation in lighting

I have provided a slightly retouched version of this image. Let's open that one instead.

3. From the Textures folder, open the file named: *Wood_Floor_Corrected.jpg*.

There is one other issue with this image. There are very pronounced seams between each board. That is part of the character of this flooring material. However, both of the boards at the right and left of the image are missing this seam. So let's crop the image to remove one board. We want to crop as close to the seam on the neighboring board as possible.

4. In the toolbox at the left, click the select rectangle tool, drag a box around the part of the image you want to keep.

⇨ From the Image menu, choose: **Crop to Selection**.

Now we'll run the plug-in effect to make the seamless texture.

5. From the Effects menu, choose: **Distort > Seamless Texture Maker** (see Figure 22).

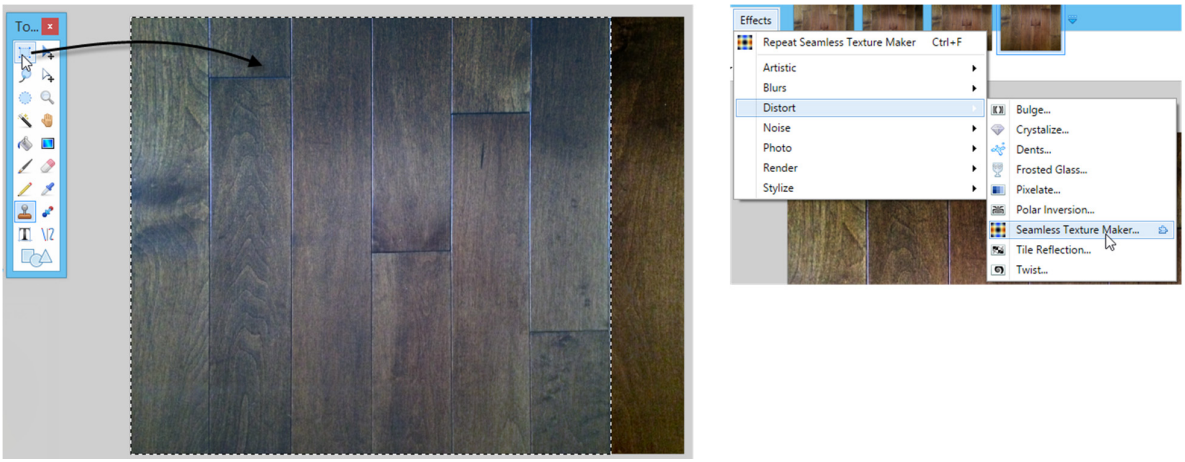
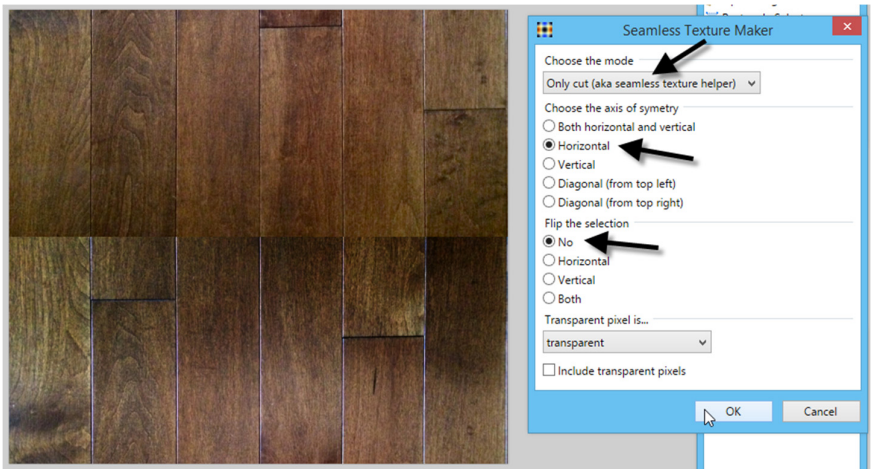


Figure 22—Crop the image and then run the Seamless Texture Maker plug-in

6. In the "Seamless Texture Maker" dialog, choose the: **Only cut** option from the menu.

⇨ For axis of symmetry, choose **Horizontal** and make sure Flip the selection is set to No (see Figure 22).



This will take the top half of the image and wrap it around and then place it beneath the bottom half of the image. We will now have a seam where the top edge would meet the bottom edge. If you did nothing else to this image, this seam would appear when tiling the image in your materials. (If you are using Photoshop, the equivalent command is the Offset filter). Using the clone tool, we need to paint this seam out as best we can. This is tedious work and can be difficult to get good result if you are not patient. I rarely spend as much time as I should on this task and the results show! So if you want good results, you need to put in the time. Fair warning!

7. Zoom in on the seam.

8. In the toolbox, click the Clone Stamp tool.

   Some options appear across the top (like the Options Bar in Revit).

⇨ Choose a Brush Width of about: ***45*** and the Hardness about: ***25%***.

Cloning works the same here as it does in Photoshop. You first click the area you want to sample and then you paint with that sample. The brush will follow along on the image creating copies of nearby pixels to paint over the hard edge seam we have. To set your sample CTRL + click in paint.net, ALT + click in Photoshop.

9. Hold down the CTRL and then click an area you want to sample. Near one of the board joins is probably best, just above or below the seam.

⇨ Move over the seam area and begin painting (see Figure 23).

Figure 23—Use the clone tool to paint out the seam

10. Resample as necessary as you move along to get better results.

⇨ When you are done, save the image and then close paint.net.

CATCH UP! If you get behind, you can open the file completed to this point named: ***Wood_Floor_Corrected_FIN.jpg***.

Create a Material using the Custom Texture

The process to use the image is exactly the same as the Escher image above. The only difference is choosing our editing image instead.

CATCH UP! If you get behind, you can open the file completed to this point named: ***07_Custom Image.rvt***.

1. Following the same steps as in the "Working with Seamless Texture" topic above, create a new material.
2. Assign the new seamless texture to it.
3. Set the Width to: ***19 1/2"*** and the Height to: ***17 1/2"***.
4. Assign it to one of the other floor elements in the model.

In realistic shading, we are seeing that the color variation in this image is a bit too great. There is a very noticeable repeat because one of the boards has a greenish tint to it. This is a common issue when creating seamless textures and it gets back to issue I mentioned above about taking a good photograph to begin with. Even the most talented Photoshop artist can only do so much with a

bad photo. So, now that you have the process, I leave the hard part to you: mastering the technique to get good results!
A really good source for brick textures online is: Acme Brick. Visit: http://www.brick.com/architect/tools.htm
There you can find a standalone tool: The Acme Brick Designer as well as plugins for Revit. At the moment the latest release is 2015, but I am sure they will have 2016 soon. This tool makes seamless brick textures that work very well in Revit materials. Check it out!

Creating a Material from Manufacturer's Content

While I was preparing for this session, (well really *just* after I finished…) I was contacted by a fellow speaker here at RTC: Phyllis Robbins. Phyllis is teaching a class called: Pen Down/Pen Up: Perfect Patterns on Saturday, Session 3.5 | 4:15 PM - 5:00 PM. In that session, she will explore how to create repeating patterns that you can use in your Revit projects. The patterns can be used for fill patterns or even assigned to materials. And that is the tie-in here. So far, I have discussed mostly the Appearance tab of the "Material Browser" but have not added any surface or cut patterns to the custom materials we have built. Well I won't be discussing how to build your own custom patterns. I will leave that to Phyllis, and I highly recommend that you attend her session. So getting back to reason for mentioning all this in the first place. Phyllis sent along an image file from a manufacturer called Patcraft that create some interesting composite flooring materials. She says some of the designers in her firm use these materials in their projects and was wondering if I would be covering rotating and aligning custom material texture maps with surface patterns. So always up for a good challenge, I decided to add another tutorial to the session here to explore exactly that and in fact I will use the same files that Phyllis shared with me. So with that introduction out of the way, let's explore creating a custom texture map and then aligning it with a custom surface pattern. Thanks to Phyllis for sharing the bitmap texture file and the custom Revit PAT file.
If you completed the exercise above in the "Create a Seamless Texture" topic, we will be using Paint.net here again. If you are doing this on your own system, you can use Paint.net (see above noted topic for instructions to download and install it) or you can use any image editing program you have such as Photoshop.

1. Launch paint.net.
2. From the *Textures* folder, open the file named: *Patcraft_Start.png*.

3. From the Layers menu, choose: **Rotate / Zoom**. In the Roll / Rotate area, in the first field, type: **-112.5** (negative) and then press TAB.

⇨ The image will rotate onscreen. Click OK to finish.

⇨ From the File menu, choose: **Save As**. Name the file: **Patcraft_Texture** and then click OK.

The repeat for this material will include one large grey stripe (the carpet) and several of the smaller VCT stripes.

4. Using the selection box, drag from the corner where the black VCT meets the carpet and diagonally up where the white VCT meets the carpet on the other side (see Figure 24).

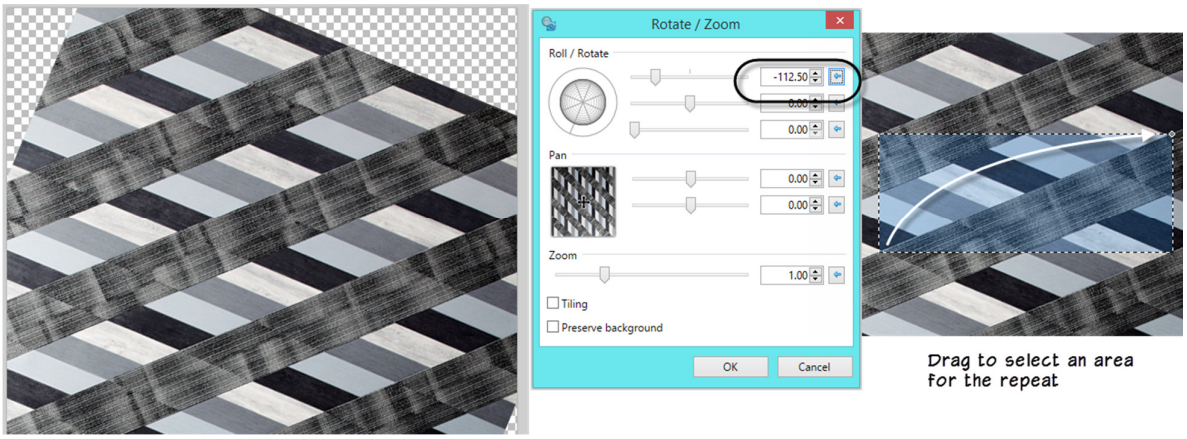


Figure 24—Rotate the image and select the rectangular repeat

5. From the Image menu, choose: **Crop to Selection**.

Now we'll run the plug-in effect to make the seamless texture.

6. From the Effects menu, choose: **Distort > Seamless Texture Maker** (shown in Figure 22 above).

7. In the "Seamless Texture Maker" dialog, choose the: **Only cut** option from the menu.

8. For axis of symmetry, choose **Both horizontal and vertical** and make sure Flip the selection is set to: No (see Figure 25).

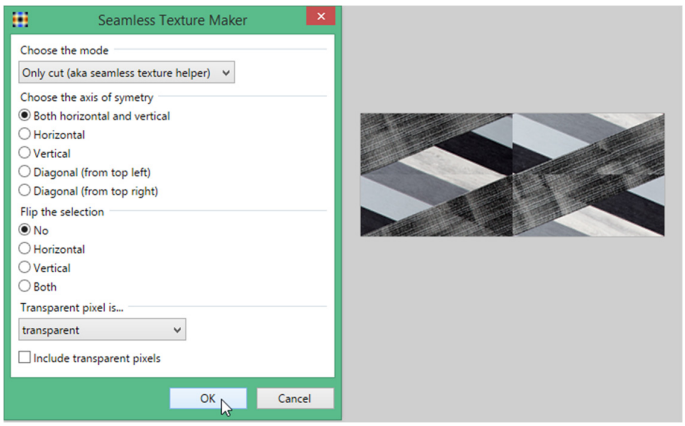


Figure 25—Use the Seamless Texture Maker to find the seams

9. Click OK and then from the File menu, choose: **Save As**. Name the file: **Patcraft_Texture01** and then click OK.

In the wood floor tutorial above, we used the clone tool. Here we will have better success copying sampled areas from the original image instead.

10. Re-open the file you saved above named: *Patcraft_Texture.png*.
11. Use the lasso tool and select a large portion of the black carpet stripe. (Select longer than we need).
12. Using the icons at the top, switch back to our cropped version of the image. From the Edit menu, choose: **Paste into New Layer**.

⇨ In the "Paste" dialog that appears, choose Keep canvas size. Drag the layer to position it (see Figure 26).

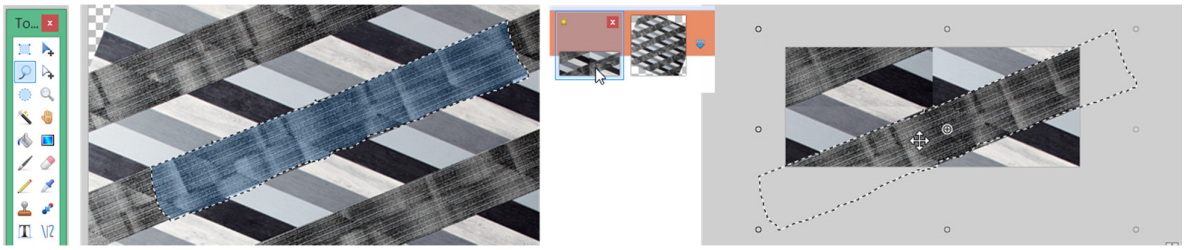


Figure 26—Copy and paste a portion of the old image into the new one

13. Repeat to copy and paste the VCT portion of the image.

You really need to try to make your selections and copy and pastes carefully. The key to a seamless texture, is that it must repeat with no noticeable seam. In this case you may need to select and delete any portion of the new layers that overlap the edges of the image. This will show the original layer through. If you don't do this, we will see the seam at the edges. You can test how well it is working by using the Seamless Texture Maker again.
I found it very difficult to do this well in Paint.net. Paint.net does not seem to have a way to do a feathered selection. This makes it difficult to blend the pasted layers with the originals underneath. So if you have Photoshop, you can likely do a much better job. I have provided two other versions of the texture for you to see the progression and to use in the final steps of this exercise:

CATCH UP! An intermediate version of this image is provided named: ***Patcraft_Intermediate.png***.

The final seamless version is called: ***Patcraft_Seamless.png***.

Create a Material using the Patcraft Texture

The process to use the image is exactly the same as the others above. However, in this example, we'll also add a surface pattern.

CATCH UP! If you get behind, you can open the file completed to this point named: ***08_Patcraft.rvt***.

To save some steps, this file already has a material created and all of the information and keywords are already input. We only need to add the texture and surface pattern. The material is already painted onto a floor element in the

file and there are two callout views of this floor element placed on a sheet for comparison. The file should open with the sheet view active.

14. Zoom in on the two viewports. Open the "Material Browser" and edit the Patcraft material.

⇨ On the Appearance tab, click the Image tile and browse to the: *Patcraft_Seamless.png* image file.

15. Unlink the scale and set the Width to: ***6'-11"*** and the Height to: ***4'-0"***.

⇨ Under Position, set the Rotation to: **90°**.

16. Click on the Graphics tab. Beneath Surface Pattern, click the tile next to Pattern (currently set to <none>).

⇨ In the "Fill Patterns" dialog, choose the Model radio button near the bottom and then click the New button at the right.

⇨ In the "Add Surface Pattern" dialog, choose the Custom radio button, for the Name, type: **Patcraft Mixed Material** and then click the Import button. Choose: *PatcraftMixedMaterials.pat* and then click Open.

⇨ Back in the "Add Surface Pattern" dialog, click OK.

17. Back on the Graphics tab, next to Alignment, click the Texture Alignment button.

⇨ Use the blue arrows to shift the texture until it aligns with the superimposed pattern of lines. Click OK when finished. Click OK again (see Figure 27).

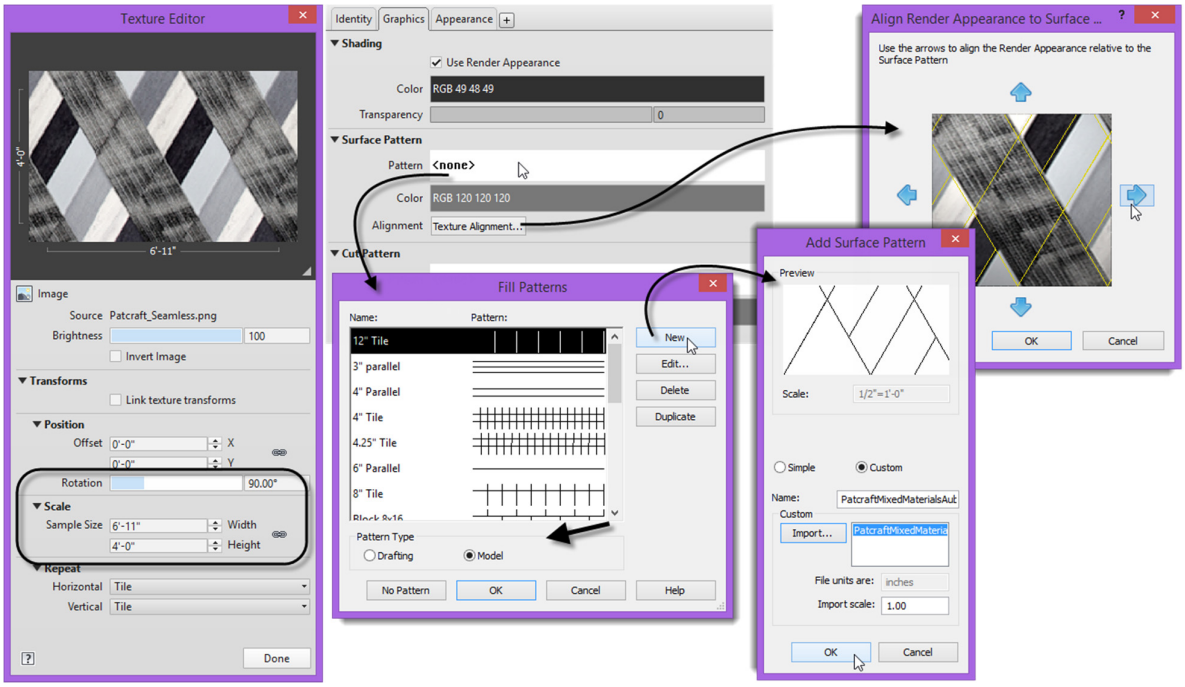


Figure 27—Add the custom texture and then create and align a custom surface pattern

Material Libraries

As our final topic in this session, let's discuss material libraries. In the past when we wanted to share materials with other users and projects, we relied on Transfer Project Standards and copy and paste. Now both of these methods still work just fine. But what I want to discuss here are Autodesk Material Library files (ADSKLIB).

These are small files that store materials. You can load them into any project or family and thereby share your standard and custom materials easily and directly within the "Material Browser." And as a bonus, the ADSKLIB format is supported by most Autodesk products. So you can create and share materials from Revit to AutoCAD to Navis and Showcase. Very cool.

Load a Material Library

To load a material library file, open the "Material Browser" dialog. At the bottom of the dialog, click the small folder icon and then choose: **Open Existing Library**. Browse to an existing library to open it. There are a couple built-in libraries already loaded. They have a lock icon next to them. Simply browse the folders in the libraries and when you find a material you want, hover your mouse over it and a small icon (up arrow) will appear. Click this add the material to the current project (see Figure 28). Use the same search field at the top of the dialog to search both the current document and the libraries.

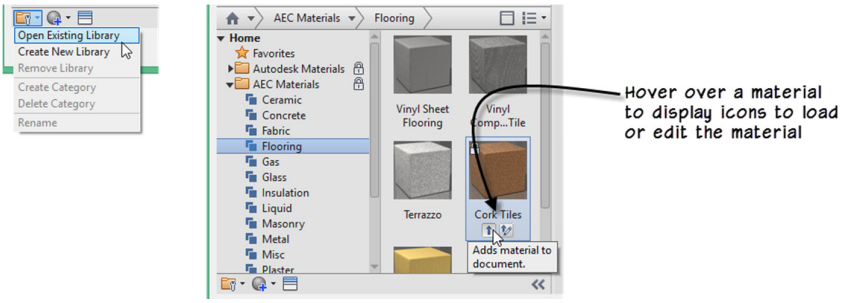


Figure 28—Load a library and import materials from it

Create a Material Library

Creating a material library is as easy as loading one. Use the same tool in the "Material Browser" and choose: **Create New Library**.

CATCH UP! If you get behind, you can open the file completed to this point named: ***09_Library.rvt***.

Let's start by adding a render path to our options. This will ensure that Revit can find our custom bitmap texture files. It is a good idea to store such textures on your server in a common location so that the path we add can be the same for all users. Then make sure to add the path to everyone's machine.

1. From the Application menu, choose: **Options**.
2. On the Rendering tab, click the add button. Here in the lab, browse to the *Textures* folder. In the office browse to the network location where your textures are stored.

   This will add a path to this location.
3. Click OK to save the path.

4. Open the "Material Browser" and then at the bottom, click the library icon and choose: **Create New Library**.
5. In the dialog that appears, type: ***RTC*** for the name and then click Save.

You will now have an empty library. For our example here we are creating it in our dataset folder. But back in the office, you should place it on a network server. It is a good idea to add some categories to it to help organize the materials within it.

6. Right-click on RTC and choose: **Create Category**.

⇨ Type a name such as: ***Tile*** and then press ENTER.

Notice that a small pencil icon will appear next to the library. This indicates that you have it locked for editing.

⇨ Add any other categories you might need.

7. At the top of the "Material Browser" from the filter dropdown, choose: **RTC**.

Recall above that we created a Class called: RTC. Filtering by this class is the easiest way to isolate our custom materials.

8. Right-click the first material and choose: **Add to > RTC > Paint**.

   You can repeat for each of the others choosing appropriate categories each time. Or you can drag the materials from the top to the appropriate category in the library (see Figure 29).

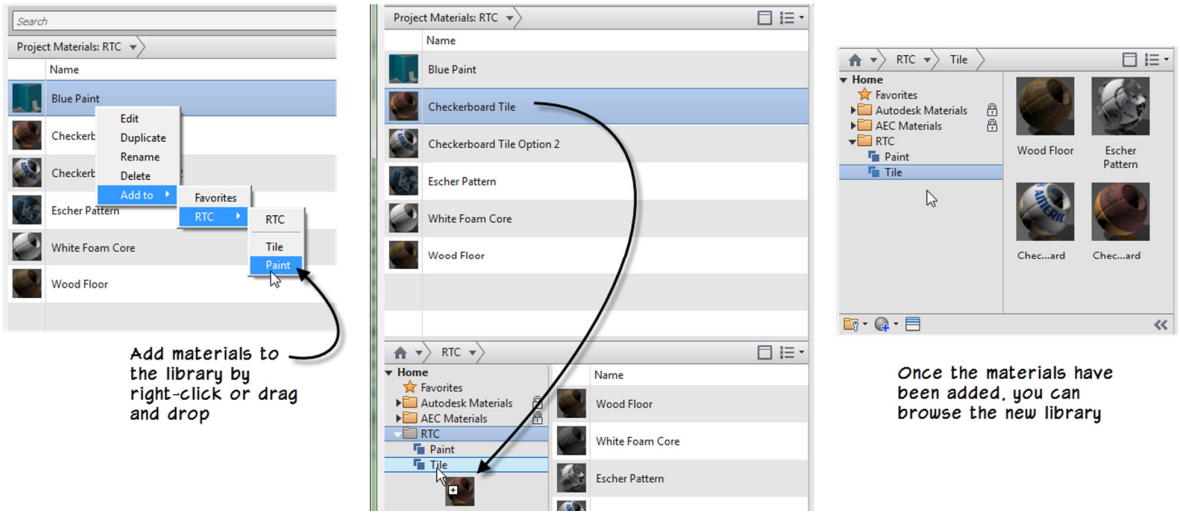


Figure 29—Add materials to the new library

You can update the library after creating it by drag and drop as well. Let's say you wanted to add a category for the wood materials.

9. Right-click the RTC library and choose: Create Category. Type: ***Wood***.

⇨ Click on the Tile category, drag the Wood Floor material from *Tile* and drop it on *Wood*.

The material will move to the new category.

When you are done editing the library, you can release it. This is sort of like saving. The library saves in real time. So changes are already saved. But no one else can edit the library right now because I am editing it. So by releasing it I make it available for others to edit. Keep in mind that anyone can load the library and use materials from it without needing to lock it for editing. You only need to lock it if you want to change the library in some way (see Figure 30).

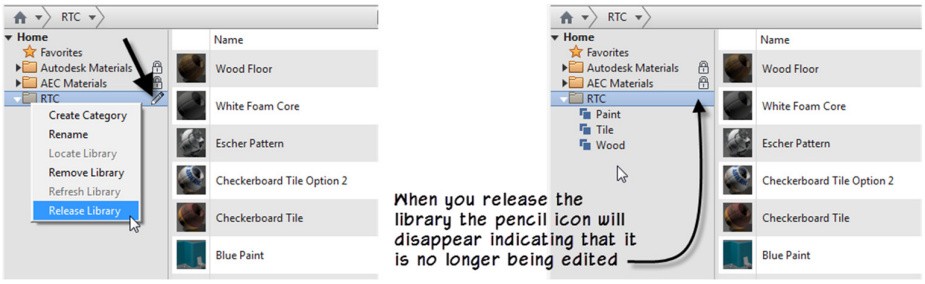


Figure 30—Release a library when you are finished editing it

Sharing Libraries

To share a library, the recipient just needs access to the ADSKLIB file. For internal sharing within your firm, make sure the ADSKLIB file and all required textures are on the network server in a common share. Then any user can load the library from there.

To share outside the firm, just send the ADSKLIB and any required textures to your recipient. They will need to set up a folder to store things in, add a path to the folder as shown above and then load the ADSKLIB file.

If you have a copy of another Autodesk product like AutoCAD, you can load the library in there and easily import the materials (see Figure 31). You might have to redirect the path to any bitmaps, but the process should be pretty easy.

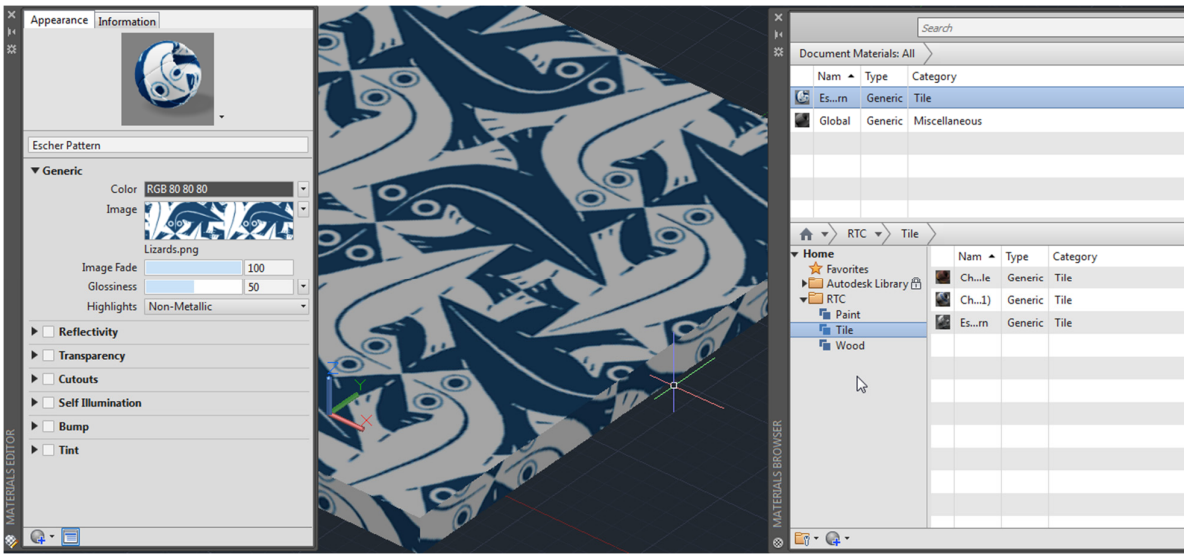
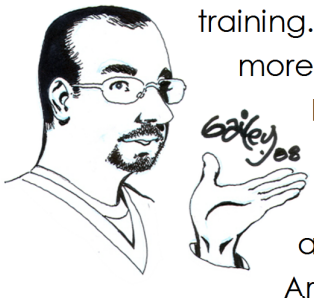


Figure 31—Our materials can be used in other Autodesk programs like AutoCAD

That is all we have time for. Thank you very much for attending.

Further Study



You can find more information and tutorials in my books and video training. Please visit my website at: www.paulaubin.com for more information on my books.

I also have Revit video training available at: www.lynda.com/paulaubin. I have several courses at lynda.com including: Revit Essential Training, Revit Family Editor and Revit Architecture Rendering, Advanced Modelling in Revit Architecture, Formulas and Curves and many more.

If you have any questions about this session or Revit in general, you can use the contact form at www.paulaubin.com to send me an email.

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Thank you for attending. Please fill out your evaluation.