

Interior Design Using Autodesk Revit Architecture 2012

Introduction to Building Information Modeling for Interior Designers

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Lesson 4

Revit Materials:

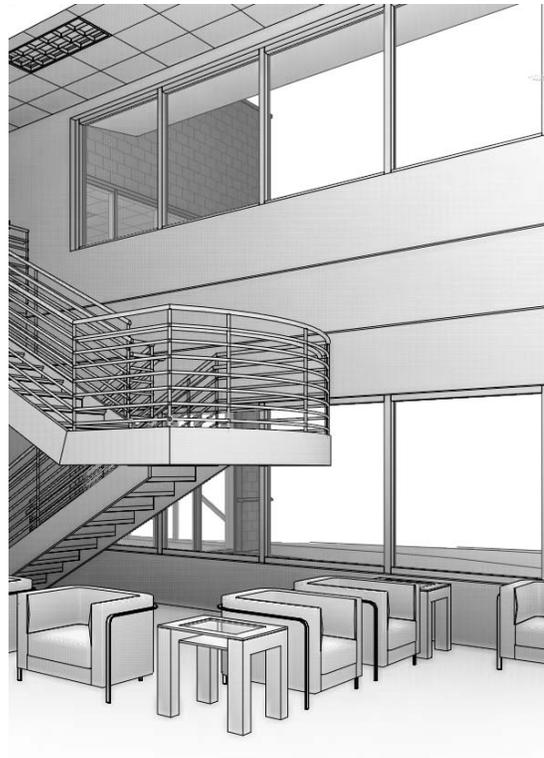
Organizing and documenting materials is an important task for the interior design professional. This involves developing material collections/systems for spaces, understanding products being specified (and material options available for them), building code constraints (e.g. flame spread ratings), cost, availability and much more. Autodesk® Revit® Architecture allows much of this to be managed within the BIM database. This chapter will cover the basics, and make application on our law office project.

Exercise 4-1:

Introduction to Using Materials in Revit

In Revit, a *Material* is more than just something you can touch or hold in your hand. It is a “container” which helps to keep track of the following:

- Identity
 - Descriptive Information
 - Product Information
 - Annotation Information
- Graphics
 - Shading
 - Surface Pattern and color
 - Cut Pattern and color
- Appearance
 - Photo-realistic render appearance
 - Texture
 - Reflectivity
 - Transparency
 - Self-Illumination
 - Etc.
- Structure
 - Structural engineering data
 - Concrete
 - Steel
 - Aluminum
 - Wood



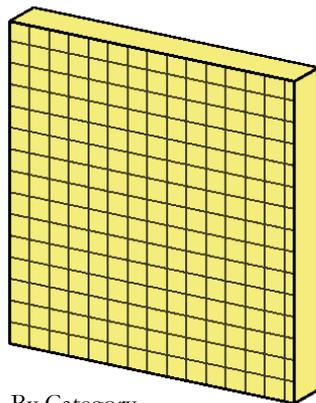
In Revit, a single named item called a *Material* holds all of this information. We will discuss each of the items listed above in more detail, but first let’s talk about how a *Material* is used.

FYI: anytime a Revit term or tool is mentioned in this book it is title-case and italicized. This helps the reader to distinguish a software term, such as **Material**, from a design industry term such as **material**.

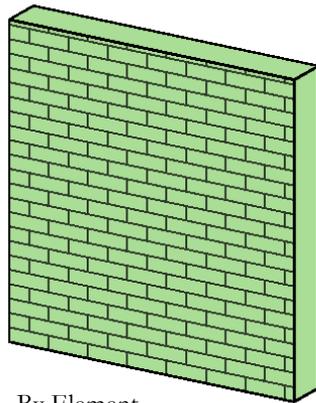
There are three primary ways in which a *Material* is used (or applied) in a model:

- By Category
- By Element
- By Face

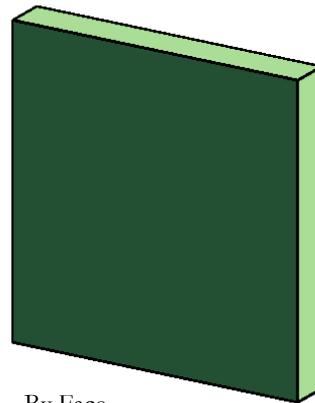
Each of these will be discussed in detail in a moment, but first notice the three walls below. The left wall segment has a light color and 4” tile pattern applied *By Category*. The middle wall, a light color with a brick pattern *By Element* and the last wall has a solid darker color painted on a single face (*By Face*).



By Category



By Element



By Face

By Category

When a 3D element does not have a specific *Material* applied, the project-wide **Object Style** is used. To access this dialog: **Manage** → **Settings** → **Object Style**.



In Figure 4-1.1, notice the various categories listed: Furniture, Casework, Doors, Etc. These are hard-wired categories Revit uses to organize elements, control visibility, and in the case of this discussion, control how things look. Each category may be assigned a default *Material*. When a 3D element has its *Material* parameter set to **<By Category>**, the *Object Style Material* is used.

It is often not too important to set the *Material* here because each 3D element often has a *Material* assigned to it, which takes precedent over *Object Styles*. For example, the pedestal sink shown to the right has a “Sink – Porcelain” and a “Sink – Facet” material assigned directly to the various 3D elements contained within the *Family* (i.e. component). Therefore the Plumbing Fixture *Material* in *Object Styles* is ignored.



It might be best to set the *Object Styles* materials to an unusual color to draw attention to any element which does not have a specific *Material* selected in your project.

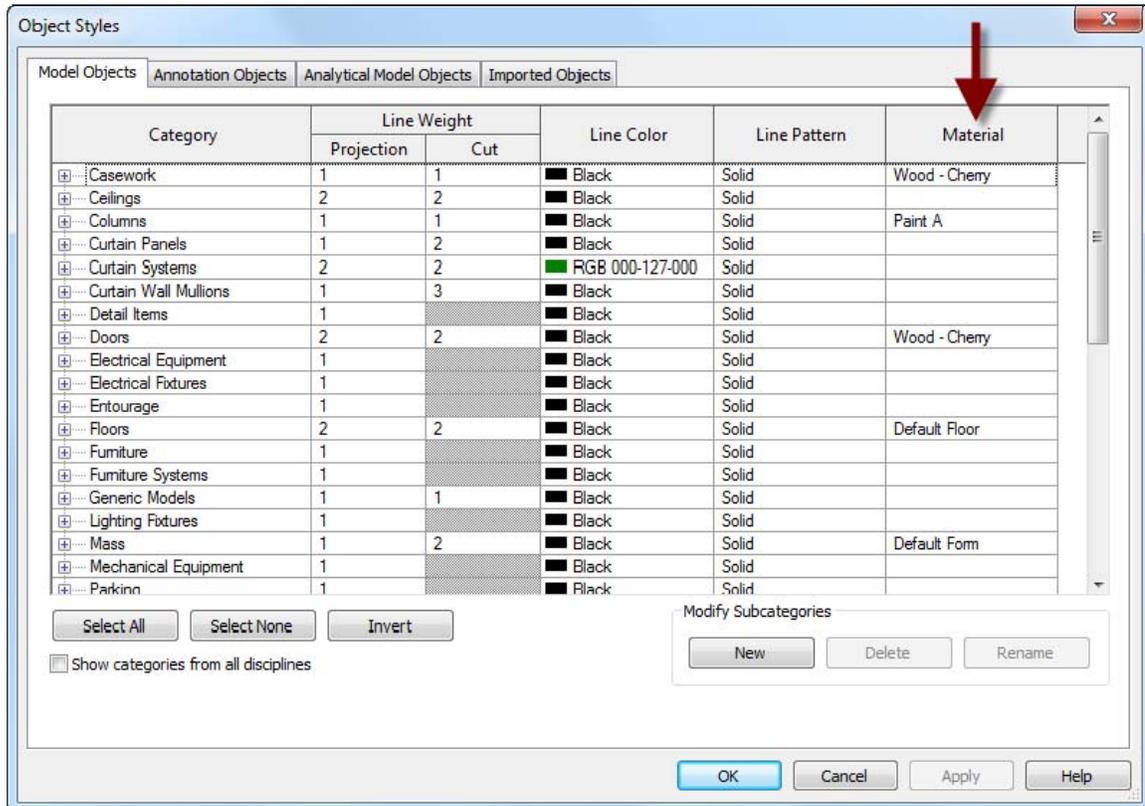


FIGURE 4-1.1 Object Styles dialog

By Element

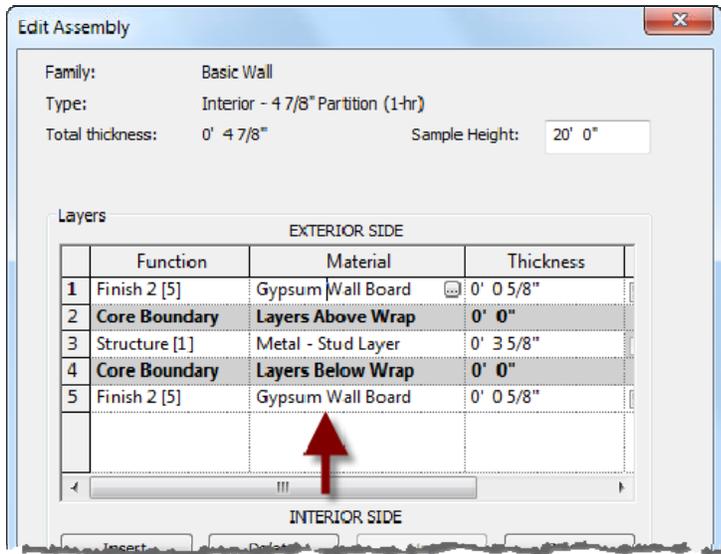
The most common way a *Material* is applied to something is *By Element*. This is true for *System Families* and *Loadable Families*. Note the following:

- **System Families** (walls, ceilings, floors, etc.):
these elements cannot exist outside of a project, therefore the *Material* adjustment option is built into the dialog box which is used to develop the assembly; the *Edit Assembly* dialog box – an example is shown on the next page.
- **Loadable Families** (furniture, casework, specialty equipment, doors, etc.):
these are *Families* which are developed in the *Family Editor* environment. Every 3D element in a *Family* has a *Material* parameter. When the item is first created, the *Material* parameter is set to **By Category**. This parameter is usually changed in one of two ways:
 - **Picking a Material**
When a *Material* is selected directly it is basically “hardwired” and cannot be changed in the project.

- **Mapping to a Material Parameter**

When a *Material Parameter* is employed, the *Material* can easily be changed in the project; this can be an *Instance* or *Type* parameter.

We will expand on this to help clarify the concept. Some of this information might be difficult to understand when one first begins using Revit. However, it is best to quickly read through this information now and then plan on referring back here to help fill in the gaps as needed.



The **Edit Assembly** dialog shown to the left (Figure 4-1.2) highlights how the *Material* selection is built in to the workflow for developing an assembly (i.e. *System Family*); a wall in this case. This is all done directly in the project environment.

The *Edit Assembly* dialog is similar for the other *System Families* such as Floor, Roof and Ceiling.

FIGURE 4-1.2 Edit Assembly dialog

Next we will look at a simple chair family (Figure 4-1.3) which comes with the Revit Architecture software. We will see how three *Materials* have been utilized in this *Family*, but only two are selectable in the project.

The *Family* is: **Chair-Tablet Arm.rfa**, and can be found here: C:\ProgramData\Autodesk\RAC 2012\Libraries\US Imperial\Furniture

If you load this chair into a project, we can observe a few things about it (you may try this in Revit while reading, but is not required). First, if the chair is selected, you can click the **Edit Type** button, on the *Properties Palette*, to view the *Type Properties*.

Notice the two *Material Parameters*: **Seat/Back Material** and **Tablet Material** (Figure 4-1.4). These can both be changed to another *Material* by clicking in the *Value* field and selecting the small button that appears to the right. This opens the *Materials* dialog, from which another *Material* can be selected (or created).



FIGURE 4-1.3 Chair-Tablet Arm family

FYI: By changing a *Type Parameter*, every chair of this type within the project will be instantly updated.

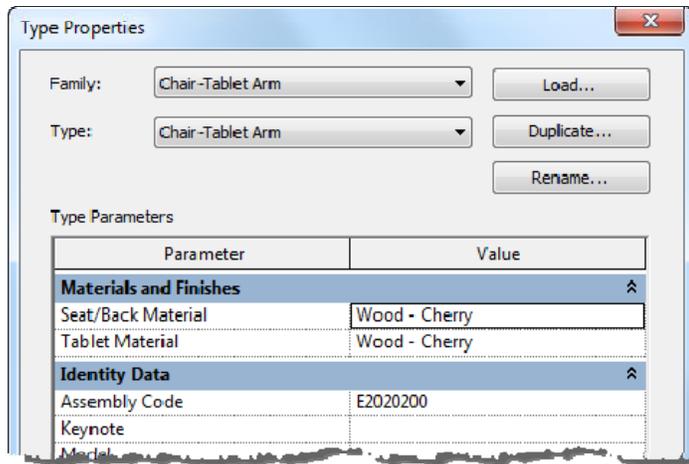


FIGURE 4-1.4 Type properties for tablet arm chair

So, unlike the seat/back rest and tablet surface, the chair legs and back support *Materials* are not directly changeable in the project. There is a specific *Material* in use, and it appears in the *Material* dialog, but the *Material* used for the legs/back rest cannot be changed in the project – only in the family editor.

By Face

The third way in which a *Material* is typically applied is using the **Paint** tool, which adds a *Material* to a single face. This feature has some limitations in the context of a pure BIM project.

The **Paint** tool is used on *System Families*, such as Walls, Floors, Ceilings, etc. The following description of how the tool is used is meant to be superficial and does not need to be done in a Revit file at this time. The *Paint* tool is selected on the *Modify* tab, a *Material* is selected from a dialog that appears, and then individual faces are selected.

The image to the right (Figure 4-1.5), shows a wall with three of the six faces visible from this vantage point. Thus, using the *Paint* tool you can only change the surface *Material* of three faces. You would need to change the view of the wall to override the other faces.

When a surface is painted, Revit paints the entire face, not just the portion visible in

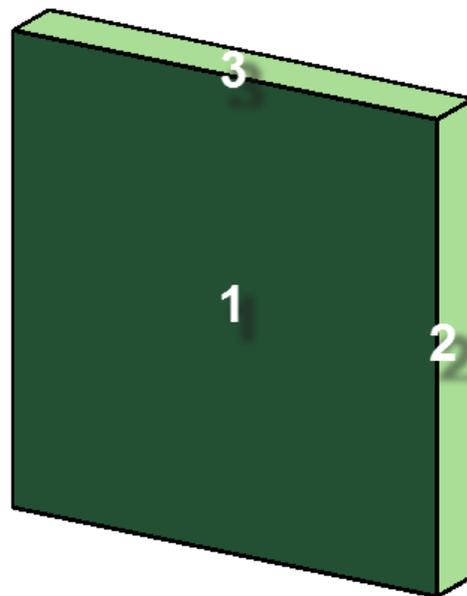


FIGURE 4-1.5 Three faces of wall visible in this view

the current view. For example, an interior elevation might be of a wall common to a corridor (or hallway). Revit will paint the entire side of the corridor wall, not just the portion visible in the specific room you are in (Figure 4-1.6).



FIGURE 4-1.6A Original corridor wall

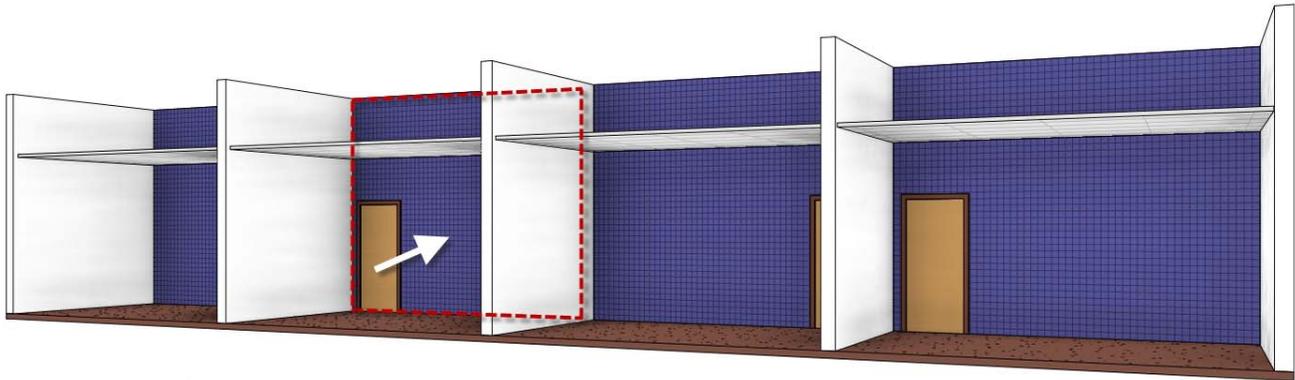


FIGURE 4-1.6B Entire wall receives the painted material, not just a single room

Revit does provide a way to constrain the area, or extents, of a *Material* to be painted on a face. This is accomplished using the **Split Face** tool (found adjacent to the *Paint* tool on the *Modify* tab). When the *Split Face* tool is selected, you select a surface and then Revit enters sketch mode; here you draw lines, which are constrained to the plane of the surface. These lines must define an enclosed area.

The image below (Figure 4-1.7) shows the *Split Face* tool used to define the entire wall in room number one (between the demising walls and up to the ceiling). The *Split Face* was also used to define the wainscot finish in room number 2. Note that the same corridor wall has two separately defined areas using the *Split Face* tool.

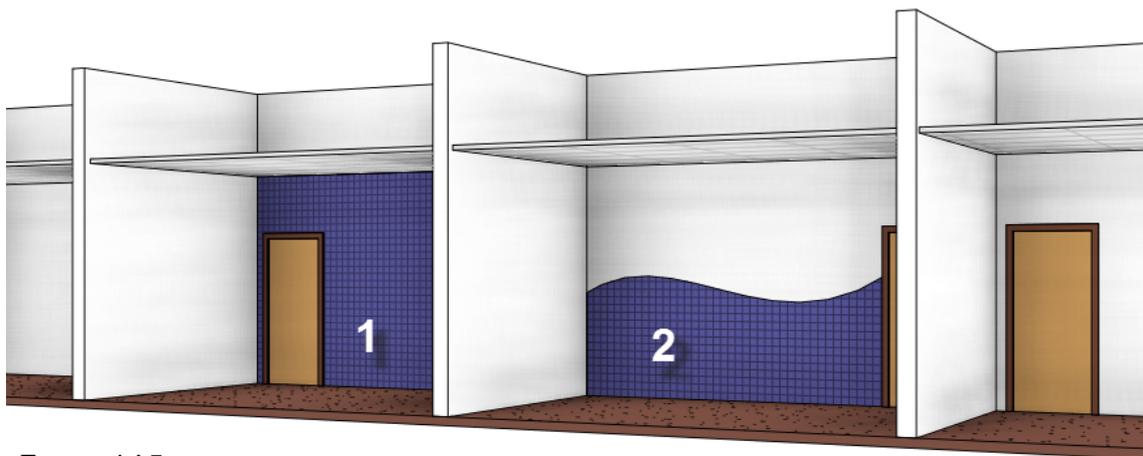


FIGURE 4-1.7 Split Face tool used to constrain painted areas

This chapter will take a closer look at the Revit *Material* itself. Here you will gain a better understanding of what information, both textual and graphical, is contained within any given *Material*.

Exercise 4-2: A Detailed Look at Revit Materials

As mentioned in the previous section, a *Material* in Revit is a “container” which holds information about the various materials used in the project. Some of the information contained in a *Material* is used prior to construction for visualization and documentation and some can be used during Construction Administration and after for Facilities Management.

To explore the *Materials* in a project (most of which come from the project template), click the **Materials** button on the *Manage* tab.



Materials

You will see the Materials dialog shown below (Figure 4-2.1).

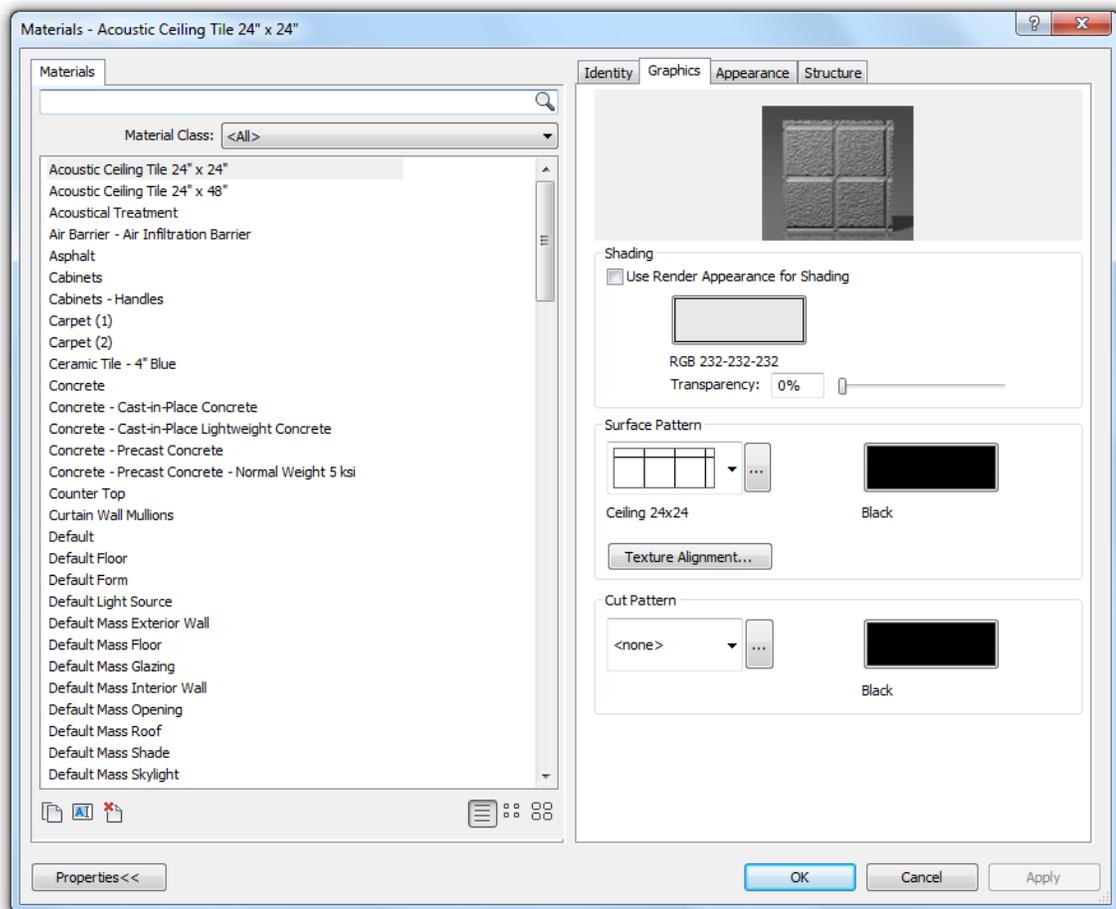


FIGURE 4-2.1 Material dialog

We will now take a close look at the various aspects of the *Material* dialog. It is a good idea to review this information closely now and refer back when needed. Having a good understanding of this fundamental feature will benefit the interior designer substantially. It is not necessary to follow along yet; if you do, it is recommended you do not save. The next chapter will have several steps which will be done in a project to apply what is presented in this chapter.

In the *Materials* dialog (Figure 4-2.1), notice the list of *Materials* on the left side of the screen.

This list can be sorted in two ways:

- Material class
- Search words

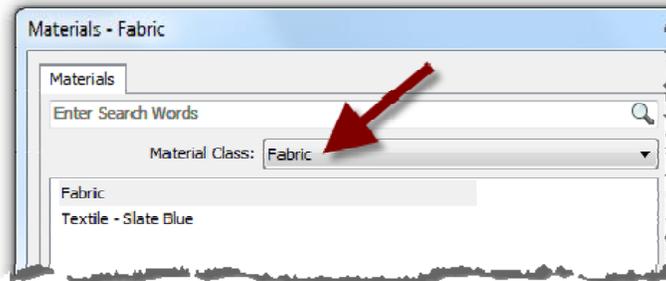


FIGURE 4-2.2 Sort by Material Class

Selecting from the **Material Class** (MC) drop-down list, above the list of *Materials*, narrows the list down to just *Materials* which have been assigned to that MC. In Figure 4-2.2 the MC is set to “Fabric,” which narrowed the *Materials* list down to just two items. More on the MC list in a moment.

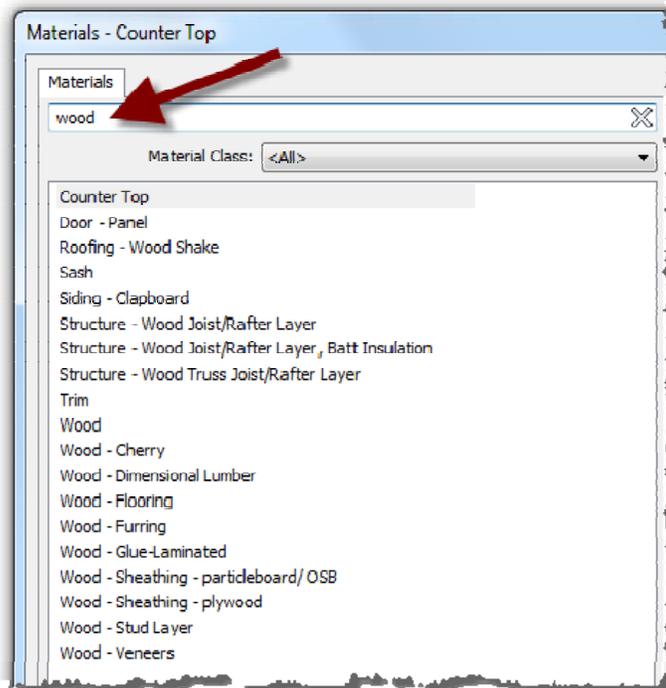


FIGURE 4-2.3 Sort by word search

Word search allows you to enter a term by which the *Materials* list is filtered. The image to the right (Figure 4-2.3) filters the *Materials* list down to anything containing the word “wood” – from any *Material Class*.

A combination of the two can be used to further filter the list down, and quickly get to the information you need.

To wrap up the discussion on the list of *Materials*, the small icons in the lower left allow you to **Create**, **Rename** and **Delete** *Materials*. Further to the right are three more icons which control how the *Materials* are presented; **List**, **Small Icons** and **Large Icons**.

Now that you understand the mechanics of the *Material* list itself, you will take a look at the information contained within each *Material*. This information is viewed on the right half of the *Material* dialog, and the **information seen is based on which Material is selected on the left**.

- **Identity tab**

With the first *Material* selected from the list on the left, Acoustic Ceiling Tile 24" x 24", notice the options available on the *Identity* tab (Fig. 4-2.4).

- Filter Criteria
This is the *Material Class* list previously discussed. One may select from this list or type in a new MC name.
- Descriptive Information
This is an area to expound upon the material name to help the design team understand what this material is, or is used for.
- Product Information
Who makes this material, for how much and where can I find more information? You can enter this information here. For example, you might have a *Material* which represents a specific fabric, which is applied to a Haworth or Steelcase furniture *Family*. The parameters for the furniture *Family* will list the furniture manufacturer – Haworth or Steelcase in this example. But the *Material* applied within the furniture *Family* is tracking the fabric information.
- Annotation Information
It is possible to add *smart* text with optional arrows (this is called a *Tag*) in a drawing view to report information about a specific *Material*. If the information changes, the *Tag* will update automatically. You will learn more about keynoting later in this book.

FIGURE 4-2.4 Material dialog; Identity tab

- **Graphics tab**

The information found on the *Graphics* tab primarily relates to how the various *Materials* appear on screen and how they print on paper (or in a PDF). This closely relates to the development of the Construction Document (CD) deliverables. The image to the right (Figure 4-2.5) still relates to the *ACT Material*.

- Shading

This is the solid color used on-screen when the **Visual Style** is set to *Shaded* or *Consistent Colors*.

The **Transparency** setting is used to make certain object see-through. This applies to all of the *Visual Styles*. The most common application of this feature is on glass.

The color set for *Shading* has nothing to do with the color used in photo-realistic renderings. This color can be derived from the information specified for renderings by checking the *Use Render Appearance for Shading* option.

- Surface Pattern and Color

When a *Surface Pattern* is selected, Revit will display this pattern anytime an object's surface is visible in a view. For example, if the *ACT Material* is applied to a ceiling element, the 24" x 24" pattern will be applied to it in the ceiling plan view and any 3D views. See the next page for an example.

- Cut Pattern and Color

When a *Cut Pattern* is selected, Revit will display this pattern within the boundary of an object, when that object is being cut within the view. Objects will typically be cut in section and detail views. A floor plan has a horizontal cut plain at about 3'-6" above the level. So most elements which pass through this cut plane have the *Cut Pattern* shown. The most common example would be walls. See the next page for an example.

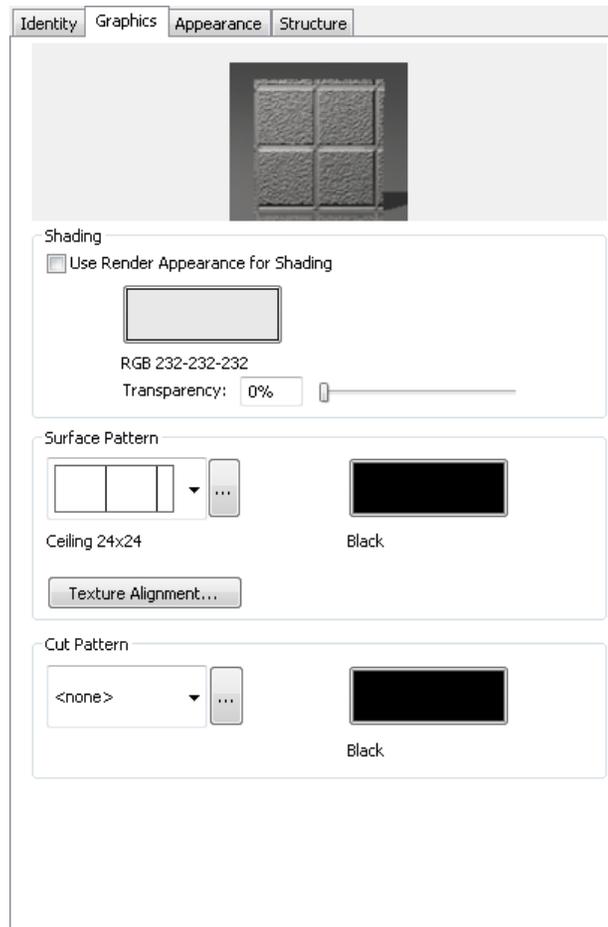
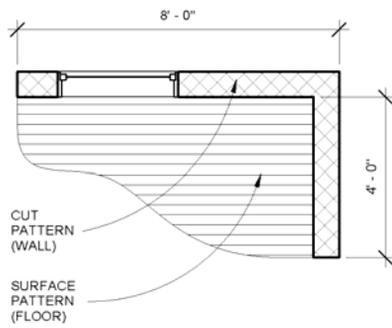


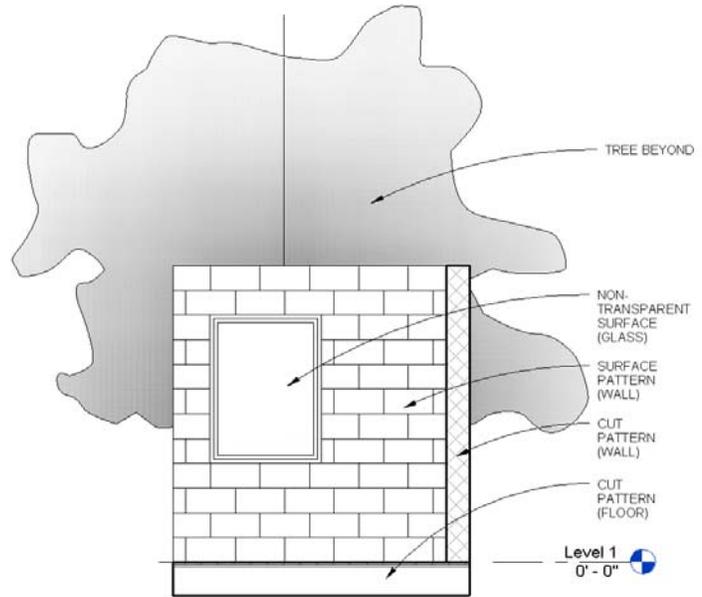
FIGURE 4-2.5 Material dialog; Graphics tab

Overview of how Surface and Cut patterns are used in a Revit model:

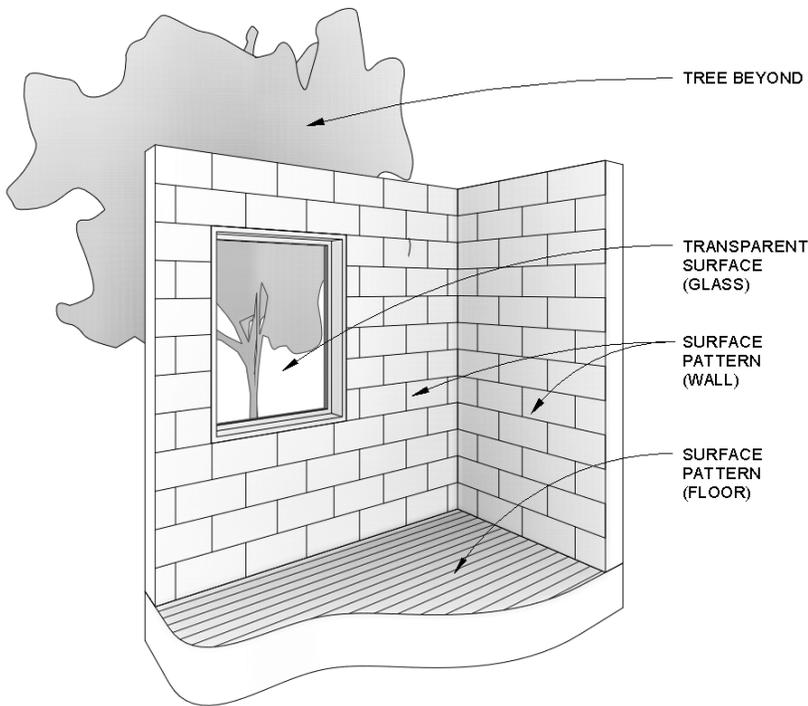


PLAN VIEW

The three views shown on this page are used to illustrate how surface and cut patterns, as defined within a Material, are applied to model elements. See the next page for more detailed notes on these images.



ELEVATION / SECTION VIEW



3D VIEW (ISO & PERSPECTIVE)

FLOOR PLAN EXAMPLE:

Looking at the previous page, the floor plan example shows a *Cut Pattern* within the walls and a *Surface Pattern* on the floor. The 8'-0" tall walls extend up through the 3'-6" cut Plane. Therefore, for the *Material* applied to the wall the *Cut Pattern* specified is shown. The floor exists entirely below the 3'-6" cut plain, so we are seeing its surface; therefore the material's *Surface Pattern* is applied. Refer back to Exercise 1-1 (Views discussion starting on pg. 1-8) for an overview on how the *Cut Plane* interacts with the model.

ELEVATION/SECTION EXAMPLE:

In this example, the floor and the wall on the right are in section – see the section line in Figure 4-2.6. The wall with the window is not being cut, rather is seen in elevation (or projection). Note, the two walls are the same type (i.e. 8" Masonry), and use the same *Material*. Therefore, the wall's *Material: Cut Pattern* is shown in the portion of wall in section and it's *Material: Surface Pattern* is shown for the wall in elevation/projection. The floor is made up of multiple layers, and the larger part which represents the structure does not have a *Cut Pattern* selected in the *Material* being used (it is set to <none>). Thus, the floor does not have a *Fill Pattern* shown when in section. Final note, even though the glass has a transparent material, it does not show up transparent in elevation and section views; only 3D views as you will see in the next example. This is because we typically don't want extra "clutter" showing up within the windows and doors. As you can see, no part of the tree appears within the window.

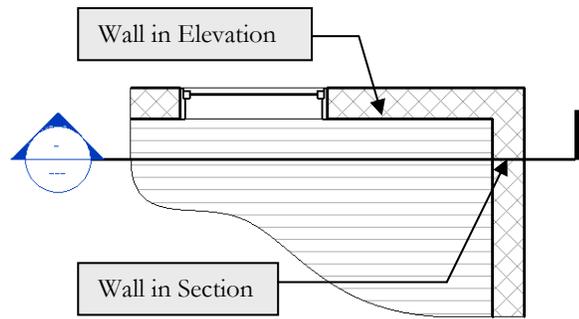


FIGURE 4-2.6 Section cut through building

3D VIEW EXAMPLE:

In this view everything is in elevation/projection, so the surface pattern is used for the applied *Material*. Note: the walls and floor appear to be cut, but that is just the way they were modeled for this example. In 3D views, the transparency is applied to the element so the tree is visible through the window.

Here are a few more points about patterns used in Materials:

- Surface and Cut Patterns Optional:**
 Keep in mind that *Surface* and *Cut patterns* are optional. In large commercial projects it is often undesirable to see a floor pattern as the drawing gets too cluttered with notes, dimensions and tags. In building sections the ceiling is not really thick enough for a pattern to show so the model is more efficient when these extra lines are not being generated in a given view.
- Pattern Scale:**
 This topic will be covered in more detail later, but worth pointing out at this juncture. There are two types of *Fill Patterns* in Revit: **Model** and **Drafting**. *Model* patterns typically represent actual materials such as ceiling tile, concrete block (CMU) and brick to name a few. *Drafting* patterns symbolically represent a material, thus the

density of the pattern changes with the **View Scale** to help improve clarity (in a similar way that text and dimensions adjust with the view's scale). The example below (Figure 4-2.7) shows the same 12" concrete wall in section. Notice how the density of the *Drafting Pattern* changes when the *View Scale* is adjusted.

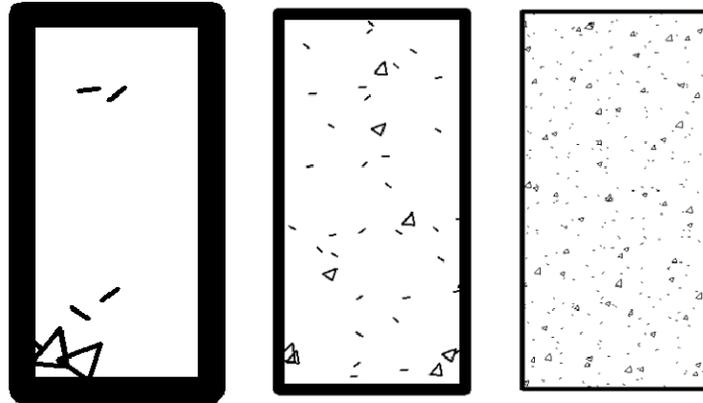


FIGURE 4-2.7 Drafting patterns automatically adjust size with view scale

- **Appearance tab**
The settings on this tab only come into play in one of two ways:
 - 1) *Visual Style* is set to **Realistic** for the current view, *or*
 - 2) when doing a **Rendering**.
 Otherwise, the way an element appears in Revit is controlled by the settings on the *Graphics* tab (unless otherwise overridden).
 - Photo-realistic render appearance
Different types of materials have unique options. For example, paint has an *Application* setting where you can select Roller, Brush, or Spray.

In the *Generic* area you specify the raster image file (i.e. texture) used to

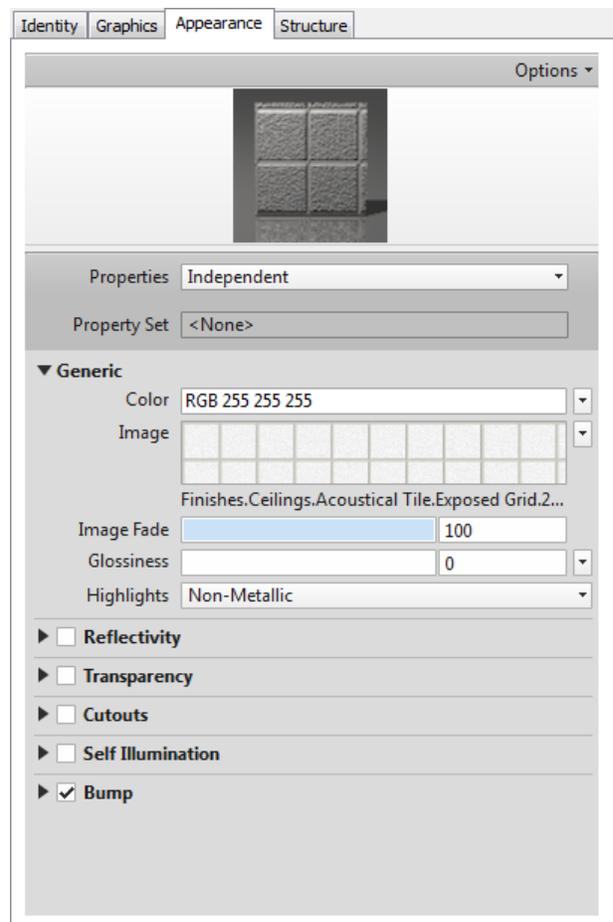


FIGURE 4-2.8 Material Dialog: Appearance Tag

fill/cover a surface during a rendering. This can be an actual photo of a material or a simulation. The main thing is the image needs to be *tileable*. This means when the image is copied over and up, to fill a surface, the edges of the image will not be apparent. See the two examples below (Figures 4-2.9 and 4-2.10).

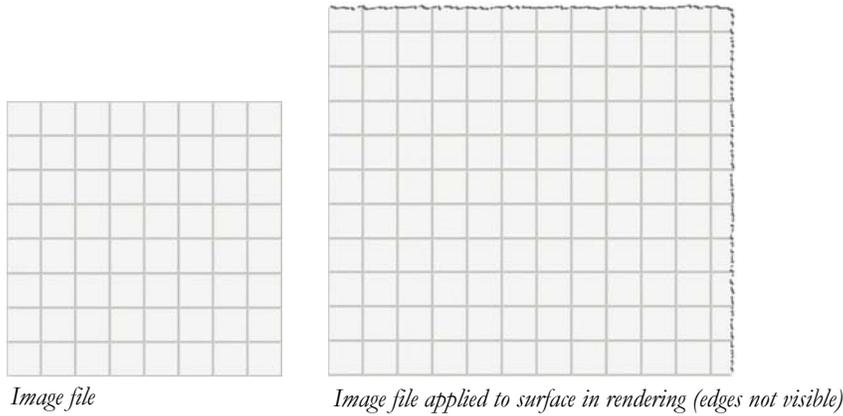


FIGURE 4-2.9 Tileable image, ideal for rendering

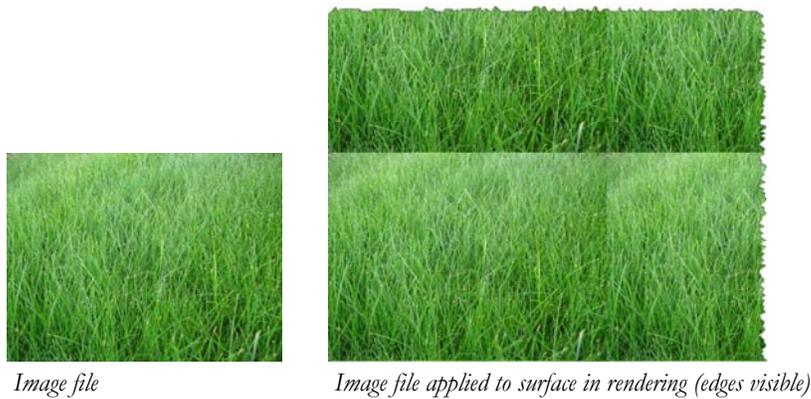


FIGURE 4-2.10 Non-Tileable image, bad for rendering

Clicking on the texture preview opens another dialog where you can adjust how the image is applied to the surface and align it with the *Fill Pattern* (Figure 4-2.11). In the Texture Editor, if a setting does not have a check in the box, it is not considered in the appearance. Many of the settings are self-explanatory and can be quickly tested by adjusting the values to see how it impacts the preview and/or rendering.

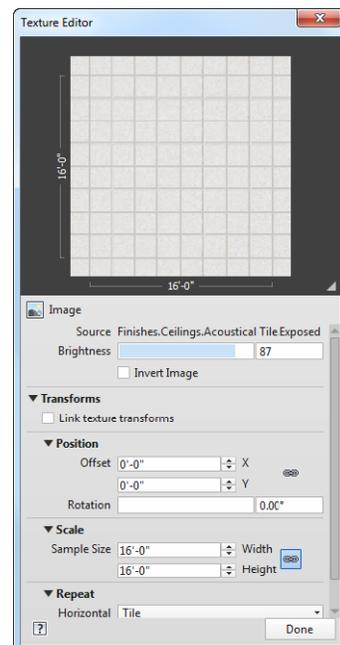


FIGURE 4-2.11
Texture Editor Dialog

- **Structure tab**

The *Structural* tab is primarily used by the structural engineer to manage the structural properties for concrete, steel, aluminum and wood. This information can be used in structural analysis. When this information is not applicable, the *Properties* parameter should be set to **None**.

- Structural engineering data
 - Concrete
 - Steel
 - Aluminum
 - Wood

Parameter	Value
Properties	
Property Set Name	By Property Set
Class	Concrete
Subclass	Standard
Behavior	Isotropic
Description	Default Concrete f'c=3.5 ksi
Young modulus X	3372.00 ksi
Young modulus Y	3372.00 ksi
Young modulus Z	3372.00 ksi
Poisson ratio X	0.167000
Poisson ratio Y	0.167000
Poisson ratio Z	0.167000
Shear modulus X	1445.00 ksi
Shear modulus Y	1445.00 ksi
Shear modulus Z	1445.00 ksi
Thermal expansion coefficient X	0.00000556 1/°F
Thermal expansion coefficient Y	0.00000556 1/°F
Thermal expansion coefficient Z	0.00000556 1/°F
Unit weight	150.28 lb/ft ³
Damping ratio	0.150000
Concrete compression	3.50 ksi
Lightweight	<input type="checkbox"/>
Shear strength modification	0.000000

FIGURE 4-2.12 Material Dialog: Structure tab

- **Appearance Property Sets tab**

This tab only appears when the *Appearance* tab is selected. It is used to manage the *Appearances* which are already loaded in the project (*Project Property Sets*) and the external library of appearances (*Autodesk Appearance Library*) which may be loaded as needed. Again, an *Appearance* is a texture plus information about that material being represented.

- Project Property Sets
This is the upper third of the *Appearance Property Sets* tab. Whenever an item is selected from this area, it is instantly applied to the current *Material* (the Acoustic Ceiling Tile in this example). The current *Material* is identified in the title bar of the *Material* dialog. Right-clicking the preview provides delete, rename and a few other options.

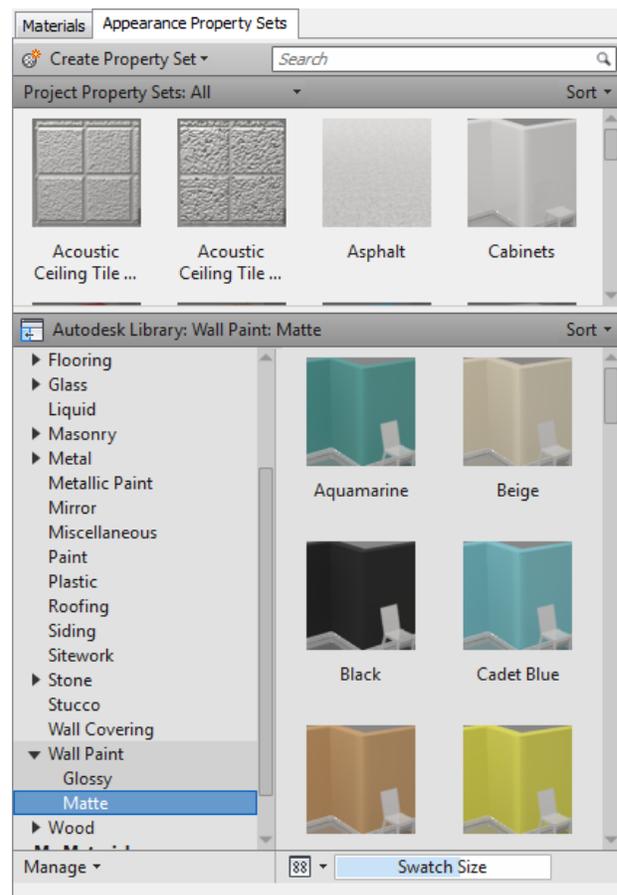


FIGURE 4-2.13 Material Dialog: Appearance Property Sets

- Autodesk Appearance Library
This area provides a decent library of appearances which may be used in your project. Clicking from this area automatically loads the *Appearance* into your model and also applies it to the current *Material*. It is also possible to create your own *Material Library* for your favorite and custom *Appearances*. This custom library can be stored locally or shared on a server, and then accessed from multiple Revit projects.
- Search
The textbox at the top allows you to quickly search the project and external libraries for something specific such as “wood” – similar to what we can do on the *Graphics* tab.

It can be difficult to navigate the preview images within the context of the initial dialog size. Clicking the **Properties**<< button in the lower left and stretching the dialog size can help a lot! The image below shows an example of this (Figure 4-2.14). Notice the large number of Fabric appearances shown in the Autodesk Library section below. This makes comparing and contrasting selections easier before loading them into your project.

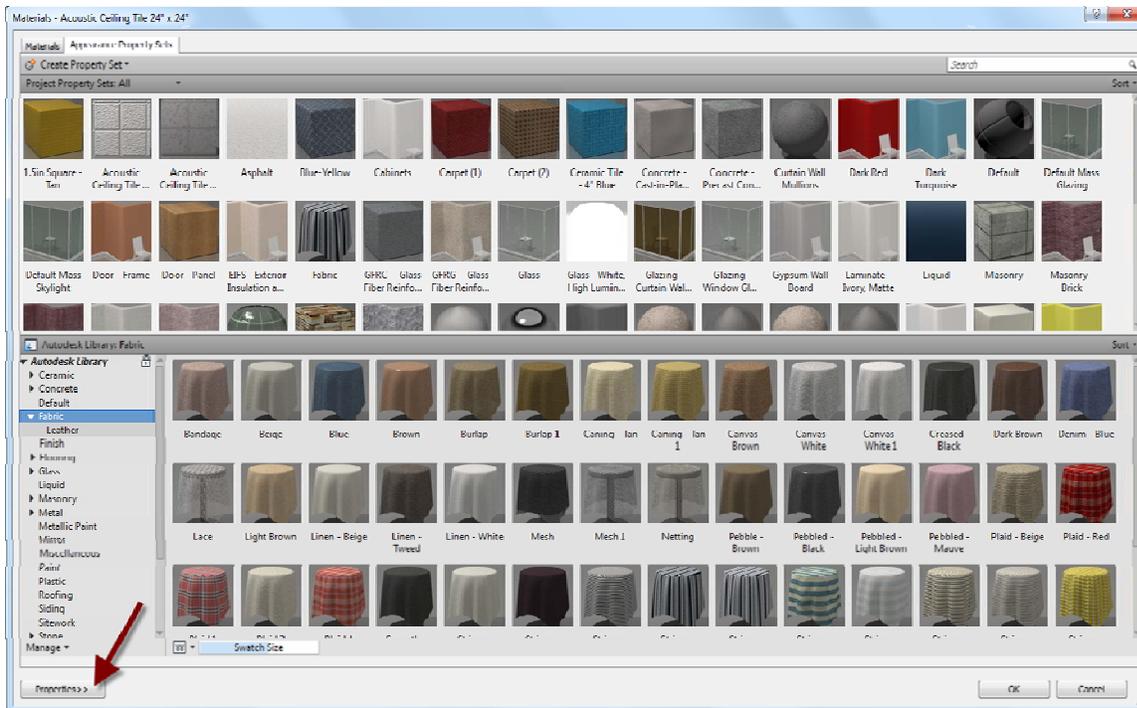


FIGURE 4-2.14 Material Dialog: Appearance Property Sets tab expanded and Properties pane collapsed

It should be pointed out that no part of a Material is visible in a view set to Wireframe (i.e. the Visual Style setting for a given view).

This has been a fairly thorough overview of *Materials* in Revit. In the next exercise you will apply some of these concepts to help reinforce the ideas put forth here.

Exercise 4-3:

Revit Materials Concepts Applied

This section will apply many of the concepts covered thus far. You will open the architectural starter project provided on the DVD and work in a copy of it. Be sure to backup this file as it is the file you will work on throughout this book.

Before we open Revit, we will cover a few technical points related to materials. Many materials are noted in drawings using abbreviations. The abbreviations used may vary slightly from firm to firm. A few standards exist and are generally good to follow, however, as long as the abbreviations used are defined within the Contract Documents (drawings or project manual) it is “legal” to use whatever you want. Below is an example of an Interior Design group’s abbreviations list (Figure 4-3.1). Keep in mind that other disciplines might have their own abbreviations list, which would be located in another section of the project. Using duplicate abbreviations between disciplines should be avoided. For example, CC means Cubical Curtain in the list below, so the Civil design group should not use CC to mean Concrete Curb on their drawings if at all possible.

ABBREVIATIONS

ACP	ACOUSTIC CEILING PANEL	EQ	EQUAL	LCW	LINEAR WOOD CEILING	SQ FT	SQUARE FEET (FOOT)
ACT	ACOUSTIC CEILING TILE	EXP	EXPANSION / EXPOSED	MET	METAL	SS	STAINLESS STEEL
ADJ	ADJACENT	EX	EXISTING	MTL	METAL	SSURF	SOLID SURFACE
AF	ATHLETIC FLOORING	EXIST	EXISTING	MISC	MISCELLANEOUS	ST	STAIN
AFF	ABOVE FINISHED FLOOR	FAF	FLUID APPLIED FLOORING	NA	NOT APPLICABLE	STL	STEEL
ALUM	ALUMINUM	FB	FABRIC	NIC	NOT IN CONTRACT	STN	STONE
AP	ACOUSTIC PANAL	FIN	FINISH	PERF	PERFORATED	SV	SHEET VINYL
AWT	ACOUSTIC WALL TREATMENT	FPR	FIBERGLASS REINFORCED PANEL	PHP	PHENOLIC PANEL	TH	THRESHOLD
BMU	BURNISHED MASONRY UNIT	GB	GRAB BAR	PLAS	PLASTER	TS	TRANSITION STRIP
BR	BUMPER RAIL	GL	GLASS	PLAM	PLASTIC LAMINATE	TYP	TYPICAL
CAB	CABINET	GRT	GROUT	PP	POLYMER PANEL	TZ	TERRAZZO
CC	CUBICAL CURTAIN	GT	GLASS TILE	PREFIN	PREFINISHED	TXT	TEXTILE
CJ	CONTROL JOINT	GYP	GYPSUM WALL BOARD	PRT	PORCELAIN TILE	UNFIN	UNFINISHED
CT	CERAMIC TILE	GWB	GYPSUM WALL BOARD	PT	PAINT	UNO	UNLESS NOTED OTHERWISE
CG	CORNER GUARD	HM	HOLLOW METAL	QT	QUARRY TILE	VCT	VINYL COMPOSITION TILE
CONC	CONCRETE	HPC	HIGH PERFORMANCE COATING	QS	QUARTZ SURFACING	VIF	VERIFY IN FIELD
CPT	CARPET (BROADLOOM/TILE)	HPL	HIGH PRESSURE LAMINATE	RB	RESILIENT BASE	WCV	WALL COVERING
CR	CRASH RAIL	HR	HAND RAIL	RES	EPOXY RESIN	WD	WOOD
EJ	EXPANSION JOINT	HT	HEIGHT	RF	RESILIENT FLOORING	WP	WALL PROTECTION
EM	ENTRY MAT	LF	LINEAR FEET (FOOT)	SCONC	SEALED CONCRETE	WT	WINDOW TREATMENT
EP	EPOXY	LN	LINOLEUM	SCT	SPECIALTY CEILING TILE		

FIGURE 4-3.1 Abbreviation list for interior design drawings

Generally speaking, generic terms should be used rather than trademarked manufacturer terms. For example, drawings noting the construction of an interior wall or soffit should say “GYPSUM BOARD” rather than something manufacturer-specific such as DRYWALL or SHEETROCK. This helps to avoid confusion during bidding and construction, especially on publicly funded projects which require competitive bidding. That is, two or more manufacturers must be specified, not just the designer’s favorite choice (for better or worse).

Having said that, sometimes the drawings list a specific product to be used as the benchmark for other manufacturers (or approved equals). Next you will be creating a number of *Materials* in Revit and entering some of the descriptive data about them.

Creating Materials

Open **Revit Architecture**.

You will select a starter file from the DVD that came with this textbook.

1. Select **Open** from the *Quick Access Toolbar*.
2. Browse to the **Law Office.rvt** model located on the DVD.
3. Select **Manage tab** → **Settings panel** → **Materials**.

In the *Materials* dialog, you cannot actually create a new *Material* from scratch; rather you *Duplicate* an existing one. The easiest thing to do is first select a similar *Material* to the one you wish to create. In this case you are about to create a new *Material* to represent carpet, so you will be instructed to select an existing carpet material (existing in that it is already in the project, not in the sense of it already being installed in the actual building)

4. In the *Materials* list, select **Carpet (1)** as shown in Figure 4-3.2 below.
5. With *Carpet (1)* selected, click the **Duplicate** button in the lower left (Fig.4-3.2).

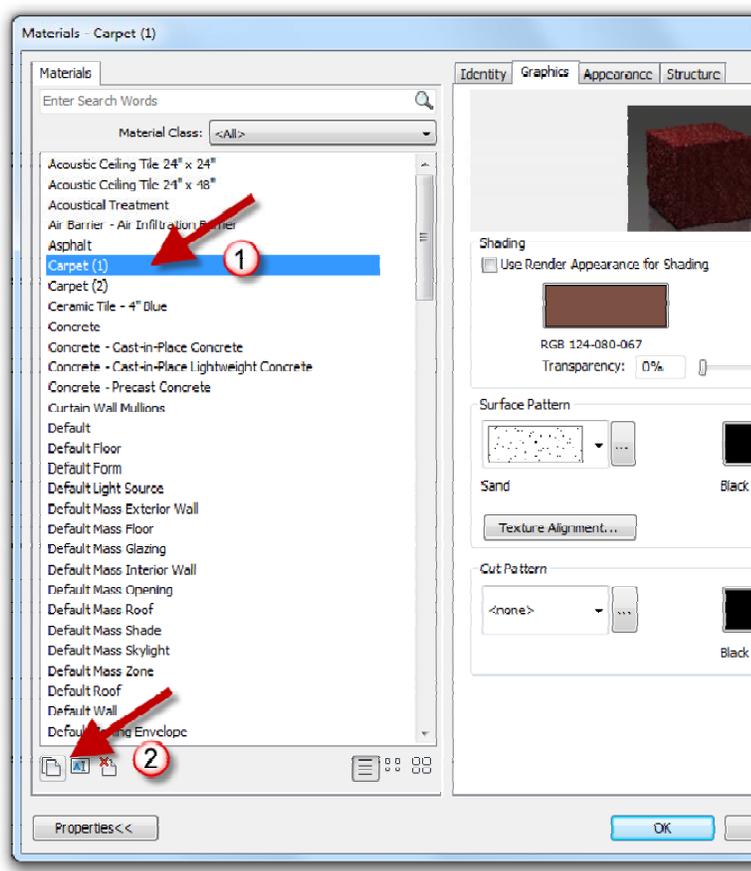


FIGURE 4-3.2 Duplicating a material

6. Type **CPT1** and click **OK**.
7. Switch to the **Identity** tab for the new *Material* – CPT1; information shown will be entered in step 13.

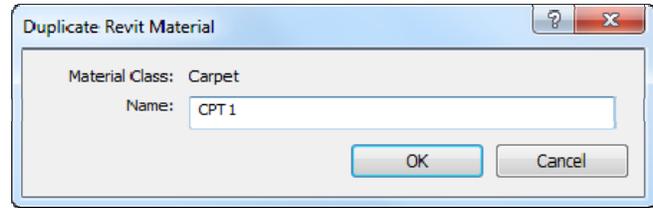


FIGURE 4-3.2 Duplicating a material

Next you will go online and find the information needed to complete the *Material* definition for CPT1. Finding information such as this at the beginning of a project is not usually necessary. This could be information already saved in your Revit template file – if this is a specific product you regularly use in your designs.

Please refer to the following list for the next several steps. This list is similar to what one might find in a set of construction documents.

09 6800 - TILE CARPETING

CPT1 CARPET TILE 1

MFG: INTERFACE FLOR
 GROUP: POND COLLECTION
 STYLE: COLOGNE (12420)
 SIZE: 20"X20" NOMINAL (50 CM X 50 CM)
 COLOR: 6363 PEAT
 LOC: PUBLIC SPACES

CPT2 CARPET TILE 2

MFG: INTERFACE FLOR
 GROUP: POND COLLECTION
 STYLE: WEIMER (12421)
 SIZE: 20"X20" NOMINAL (50 CM X 50 CM)
 COLOR: 6688 PEAT
 LOC: OPEN OFFICE, PUBLIC ACCENT

CPT3 CARPET TILE 3

MFG: INTERFACE FLOR
 GROUP: POND COLLECTION
 STYLE: WEIMER (12421)
 SIZE: 20"X20" NOMINAL (50 CM X 50 CM)
 COLOR: 6968 ACORN
 LOC: ACCENT

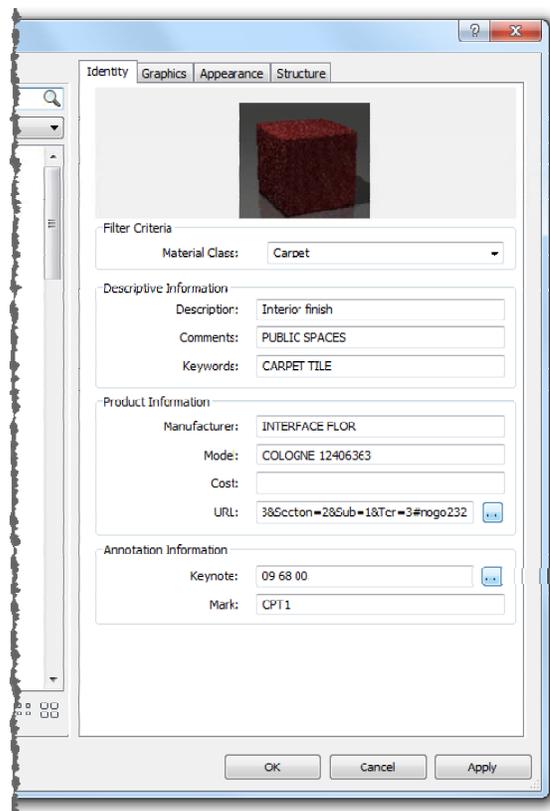


FIGURE 4-3.3 Editing CPT1 Identity data

First you will focus on the carpet material CPT1, which is manufactured by Interface Flor.

8. Open your web browser - browse to <http://www.interfaceflor.ca>
9. Hover over the **Products** link, and then click **Product Search** (Figure 4-3.4)
 FYI: the website design may change; follow along as best you can.

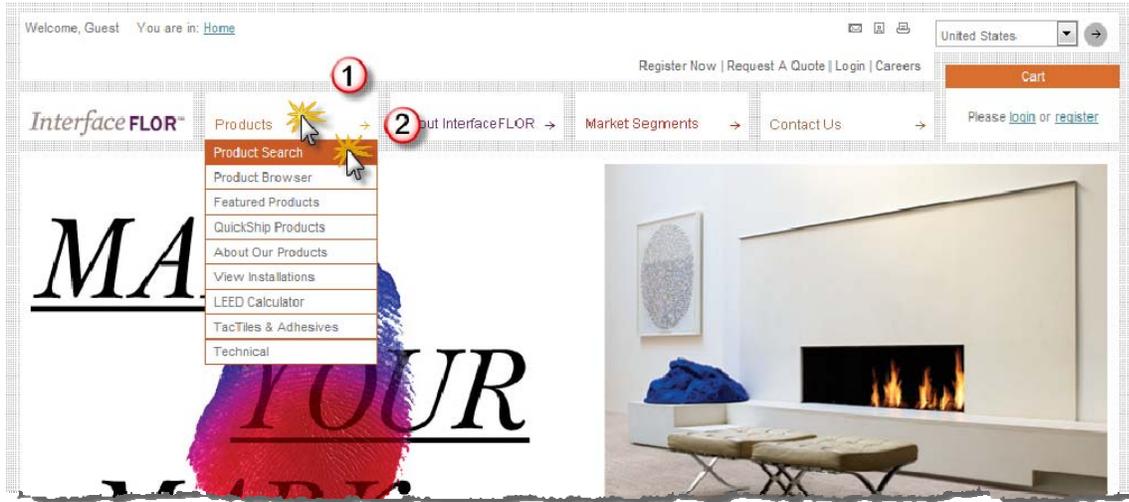


FIGURE 4-3.4 Interface Flor website

10. In the “Find by Product Name” section select **Cologne** from the list (Figure 4-3.5).
11. Click **Find Tile**.
12. Find color **6363 (Peat)** as shown in Figure 4-3.6; click **View Details**.



FIGURE 4-3.5 Find by Product Name option

You now have access to all the information you need to define the Revit *Material* (Figure 4-3.7).

13. In Revit, enter the information shown in Figure 4-3.3.
 - a. Copy/Paste the website address for the current product page to the URL field in Revit.
 - b. Click the small button to the right of the **Keynote** field and then select **09 68 00 Carpet** as shown in Figure 4-3.8). *Note: you will learn more about keynoting later in the book.*

As you can see on the webpage for this product, there is much more information available than Revit has built-in parameters for. That is why you are adding a web address (URL) to this information.



FIGURE 4-3.6 Produce preview data

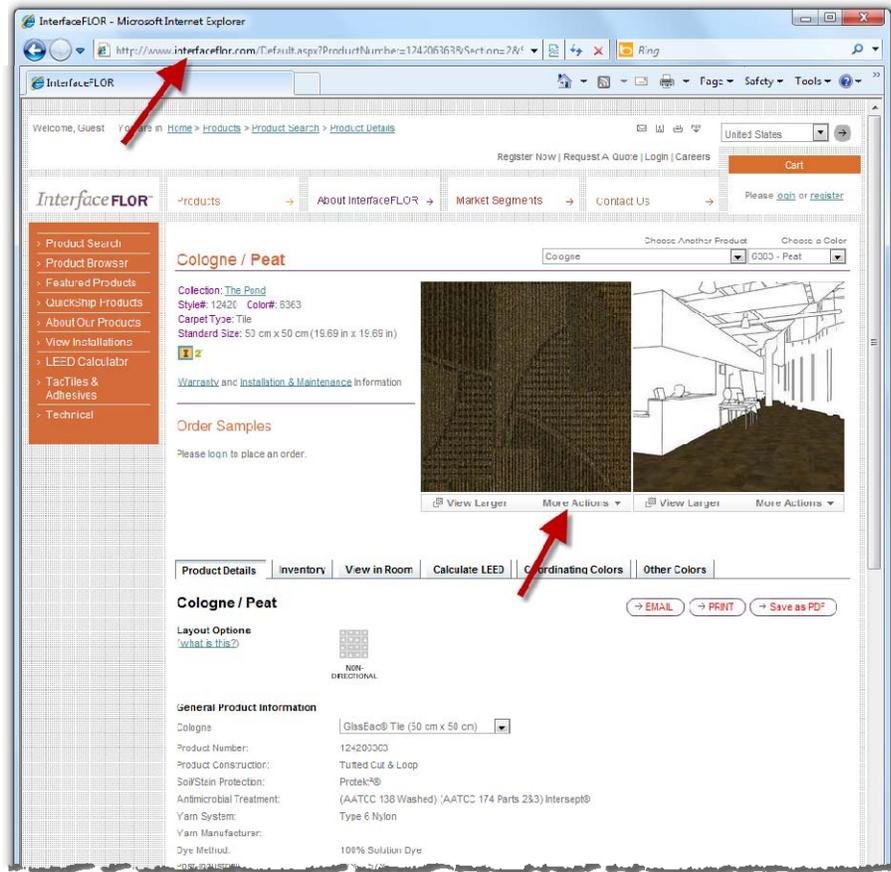


FIGURE 4-3.7 InterfaceFLOR website - specific product page

Next you will switch to the *Appearance* tab and make some adjustments, and then come back to the *Graphics* tab.

Notice, on the *Appearance* tab (Figure 4-3.9), that a JPG raster image is assigned to this material. You will download an image for the carpet mfr. website and then edit your *Material* to use this new image. Keep in mind that anyone who might work on the project needs access to the image file location. So, in an office environment, you would not want to save this file to you local hard drive.

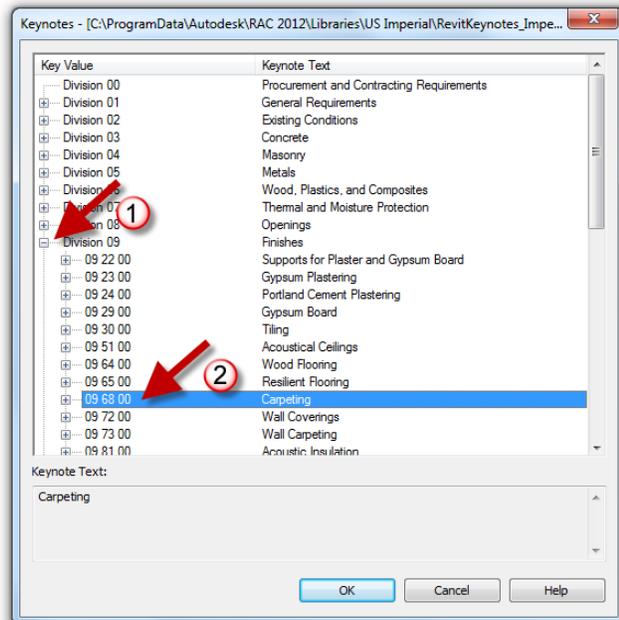


FIGURE 4-3.8 Keynotes selection dialog

14. Switch back to the InterfaceFlor website.
15. Under the preview image, click **More Actions** → **Save Image** (Figure 4-3.7).
16. Click Save.

Next you will specify a name and location for the raster image you are about to save. Pay close attention to the drive and folders in which the file is saved – you will need to point Revit to this location/file in a moment.

17. Browse to a location on your computer to save this image; name the image **InterfaceFlor_Carpet__124206363.jpg**.

You now have an image file which represents the specified carpet style available on your computer/network.

18. Back in Revit, on the *Appearance* tab, click on the file name pointed out in Figure 4-3.9.
19. Browse to the image file saved in step 17 above, select it and click **Open**.

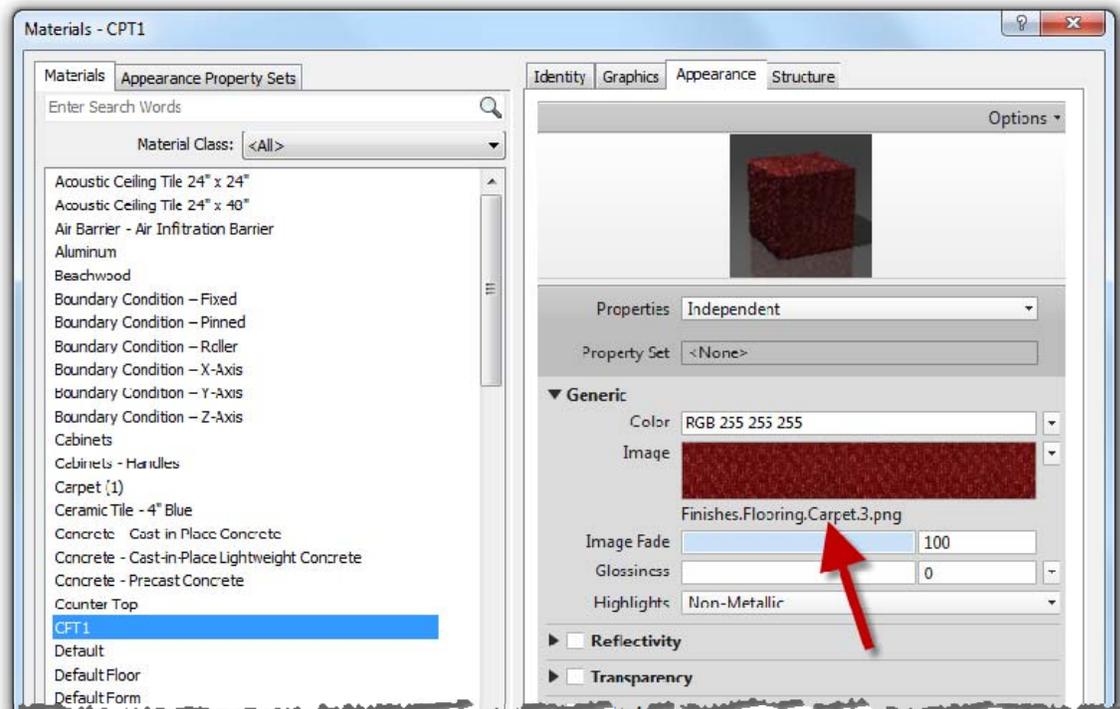


FIGURE 4-3.9 Keynotes selection dialog

Now, when doing a rendering or using the *Realistic* display style, this image will be mapped to any surface which has been assigned the CPT1 *Material*. However, right now the carpet tiles will not be the correct size. You will adjust this next.

20. To edit the image size: on the *Appearance* tab, click directly on the image swatch located above the image name (i.e. the link you clicked on to change the image). FYI: not the preview image at the top.

You are now in the *Texture Editor* dialog (Figure 4-3.10). Here you may adjust several settings related to the raster image.

At the moment, the edge dimensions are not equal, thus the image is being stretched. You will need to deactivate the “lock aspect ratio” feature so the two edge dimensions can be changed independently.

21. Click the chain icon pointed out in Figure 4-3.10.

Next you will adjust the *Scale* dimensions. Even though the project is setup for feet and inches, it is possible to enter metric values and Revit will automatically convert it. This is true anywhere you enter a length in Revit (other than the plain text command). You will try this next.

22. Highlight the value listed next to *Width* and type: **50cm**.
23. Make the same change for *Height*.
24. Click **Done**.
25. Uncheck **Bump** on the *Appearance* tab.

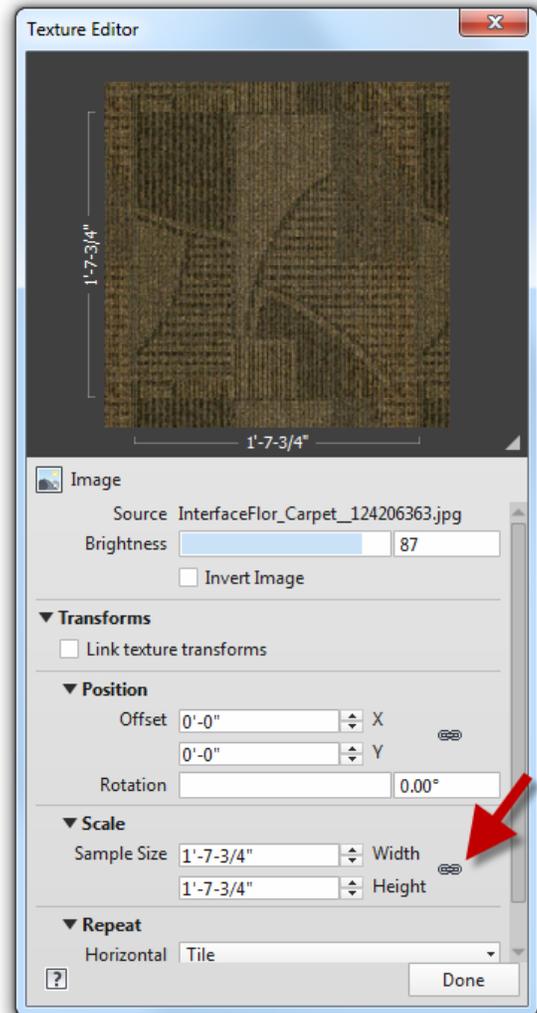


FIGURE 4-3.10 Texture Editor

The *Bump* mapping helps materials look more three-dimensional when rendered. However, the map is a grayscale image based on the main image file. This requires work on a copy of the image in another project such as Adobe Photoshop –which will not be done at this time.

26. Switch to the *Graphics* tab and check **Use Render Appearance for Shading**.

Notice how Revit automatically adjusts the color to match the color of the raster image. This shading color is what is used for *Shaded* and *Consistent Colors* Display Styles.

You will leave the surface and cut patterns as they are for now. It should be pointed out that the image will not rotate as shown in the sample installation image on the website. To do this, one would have to use an image editing program to create the desired repeating pattern.

27. Using the steps just covered; create two more Materials for **CPT2** and **CPT3** as defined on page 4-19.
 - a. FYI: when you duplicate CPT1 you save some typing as all the values for the selected *Material* are also duplicated. However, you need to be careful and change everything so you don't leave incorrect information assigned to the new *Material*.

The process just covered will generally be the same for any carpet manufacturer (or any product manufacturer in general). The only challenge is some websites are easier to navigate than others, and raster images may not always be available – or of good quality (i.e. resolution and size).

Next you will take a look at creating several paint sample materials. This will involve locating the specific paint color's RGB color rather than a raster image. The RGB color can then be entered for shaded views as well as for rendered views.

Each paint manufacturer organizes their color information a little differently. We will take a look at the Sherwin-Williams website specifically. The other paint manufacturer's sites will be similar. Be sure to check out the various color tools provided, such as the smart phone and Adobe Photoshop options. Below is the list of colors you will be working with:

09 91 00 - PAINTING AND COATING

PT1 PAINT 1 (WALLS) COLOR: "BEIGE" MFG: SHERWIN-WILLIAMS SW0051 CLASSIC IVORY	R242 G226 B195
PT2 PAINT 2 (INTERIOR HM DOORS & FRAMES / STEEL) COLOR: "GRAY" MFG: SHERWIN-WILLIAMS SW7068 GRIZZLE GRAY	R99 G101 B98
PT3 PAINT 3 (CEILINGS & SOFFITS, EXPOSED STRUCTURE) COLOR: "WHITE" MFG: SHERWIN-WILLIAMS SW7007 CEILING BRIGHT WHITE	R233 G236 B232
PT4 PAINT 4 (ACCENT WALL COLOR) COLOR: "BROWN" MFG: SHERWIN-WILLIAMS SW6040 LESS BROWN	R120 G107 B100
PT5 PAINT 5 (TOILET ROOMS) COLOR: "BROWN" MFG: SHERWIN-WILLIAMS SW6093 FAMILIAR BEIGE	R203 G184 B162

28. Browse to the Sherwin-Williams website: <http://www.sherwin-williams.com>
29. Choose your region.
30. Select **USA → Professional & Commercial Coatings and Supplies**
31. Click the **Color Resources** link.

Next you will search for the model number for the first paint type; PT1.

32. In the search box, type **SW0051** and then press **Enter**.
33. Click on the preview swatch for **Classic Ivory** to see more information.

You should now see the information shown below (Figure 4-3.11). Notice the RGB Value listed; 242,266,195. This is the Red, Green and Blue colors which make up the Classic Ivory color. This information can be entered into the Revit material to create the proper color representation. Next you will create the PT1 *Material* in Revit.

The screenshot shows the Sherwin-Williams website interface. At the top, there is a navigation bar with the Sherwin-Williams logo, links for 'home', 'contact: us', and 'find a store', a dropdown menu set to 'Professional', and a search box. Below the navigation bar is a breadcrumb trail: 'Professional & Commercial Coatings & Supplies > Color Resources > Explore Color > Paint Colors by Family > SW0051 Classic Ivory'. The main content area features a large color swatch on the left. To its right, the product name 'SW0051 Classic Ivory' is displayed, followed by 'Interior'. Below this, the 'Color Collection: Colonial Revival' and 'Color Family: Whites' are listed. The 'RGB Value: R-242 | G-226 | B-195' is highlighted with a red arrow. Other details include 'Hexadecimal Value: #F2E2C3' and a link to 'All interior White paint colors'. On the right side, there are social media sharing buttons for 'Email', 'Tweet', and 'Recommend', along with a 'Sign Up to see what your friends recommend.' button. At the bottom, there are sections for 'COLOR RESOURCES' and 'Find a store near you:' with a search box and a phone number '1-800-4-SHERWIN'.

FIGURE 4-3.11 Sherwin Williams website

The paint material is a little more complicated than carpet in that the Revit *Material* will also represent the building material being painted. In Revit, the paint finish is applied to the face of the concrete block (CMU) or gypsum board (GWB). Therefore, you have to create a PT1

paint *Material* for both CMU and for GWB. This is due to the fact that each material has a different cut and surface pattern. This might make more sense after the next few steps.

34. Back in your Law Office Revit model, open the **Materials** dialog.
35. Set the *Material Class* filter to **Paint** (Figure 4-3.12).

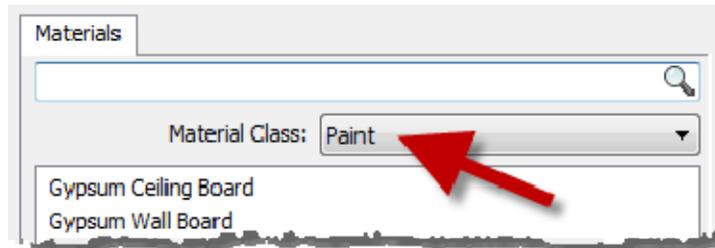


FIGURE 4-3.12 Materials dialog; Material Class filter

36. Select the *Material* **Gypsum Wall Board**.
37. Click **Duplicate**
38. Type **Gypsum Wall Board – PT1**.
39. Fill out the **Identity** tab using the information from the website as shown in Figure 4-3.13.
40. Switch to the **Appearance** tab (Figure 4-3.14).
41. Click on the **RGB color numbers** to adjust them.
42. Change the RGB numbers as follows (Figure 4-3.15):
 - a. R: 242
 - b. G: 226
 - c. B: 195

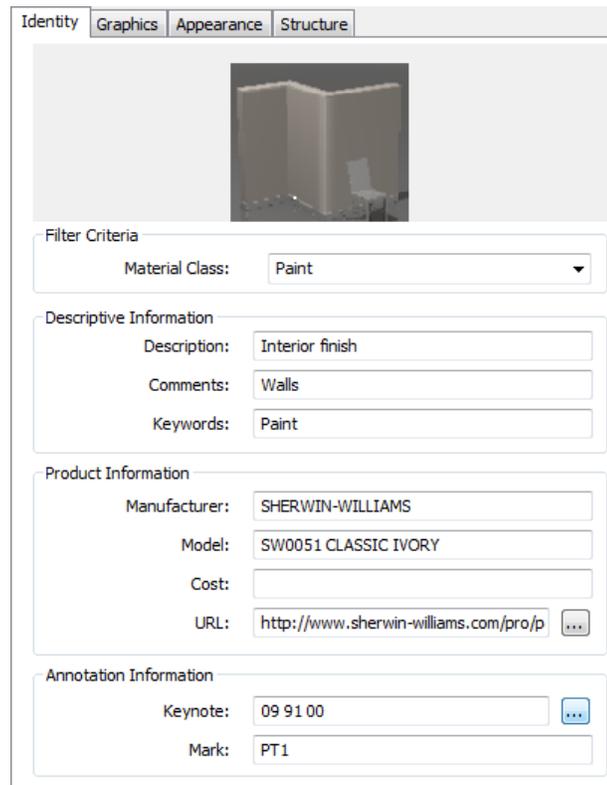
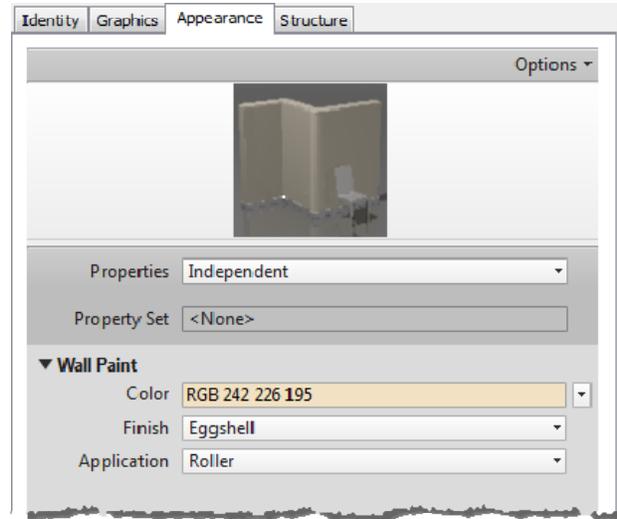


FIGURE 4-3.13 Materials dialog; Identity tab for PT1

As you recall, the RGB value came from the paint manufacturer’s website. The color swatch in Revit should look very similar to that shown on the website. Keep in mind that individual monitors and color printers can vary significantly in how they represent a color. It is always best to get a physical color sample before making final selections. But this will get you close!

43. Adjust the *Finish* option to **Eggshell**.
44. Leave the *Application* option set to **Roller**.

Notice how the *Appearance* options available vary from one material type to another. This allows you to control the real-world characteristics more accurately for a number of types or materials. This is more convenient than having all possible options when they don't really apply.



45. Switch to the **Graphics** tab.
46. Make sure the **Use render Appearance for Shading** is checked (Figure 4-3.16).

Notice how the RGB color matches the value you entered for the render *Appearance*. Again, the *Appearance* information is for *Realistic* mode and used when creating photo-realistic renderings. The *Shading* information is used in plan, elevation and 3D views when the *Visual Style* is set to *Shaded* or *Consistent colors*.

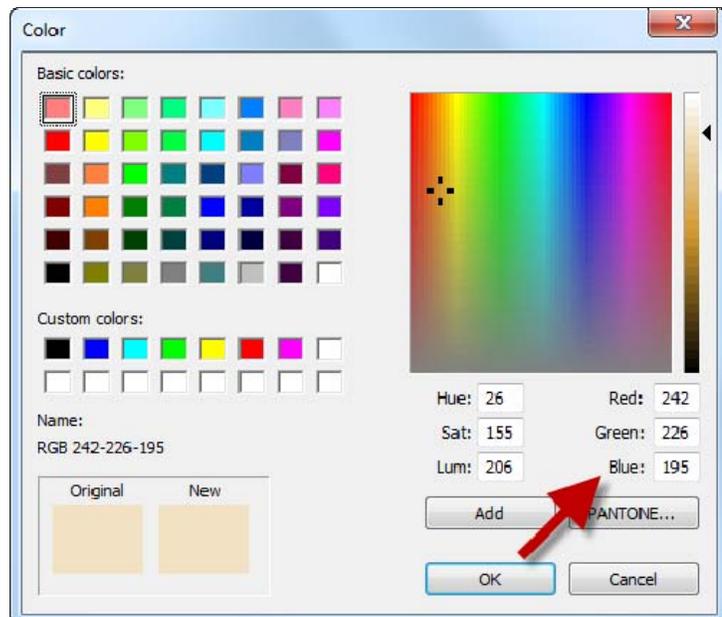


FIGURE 4-3.15 Materials dialog; Adjust appearance color

Next you will set the cut pattern to “none”. It is not typically necessary to hatch this material because it is not very thick (1/2” – 5/8” typically), so the pattern does not read well.

47. Set the *Cut Pattern* to **None** (Figure 4-3.17).
48. Remember to **Save** your project often to avoid losing work.
49. Repeating the steps just covered, create a material for PT2 through PT5 as shown on page 4-24.

09 30 00 - TILING

CT1 CERAMIC TILE 1 (SHOWER WALL TILE)

MFG: DAL TILE
 STYLE: MATTE WALL TILE
 SIZE: 4-1/4" X 4-1/4" NOMINAL
 COLOR: X735 ALMOND

CT2 CERAMIC TILE 2 (SHOWER CEILING TILE)

MFG: DAL TILE
 STYLE: SEMI-GLOSS WALL TILE
 SIZE: 4-1/4" X 4-1/4" NOMINAL
 COLOR: 0190 ARCTIC WHITE
 PATTERN: INSTALLED AT 45 DEGREES
 ON SHOWER CEILINGS
 GROUT: 44 BRIGHT WHITE

PRT1 PORCELAIN TILE 1 (FLOOR TILE)

MFG: DAL-TILE
 STYLE: CITY VIEW
 SIZE: 18" X 18" NOMINAL
 COLOR: CY04 DOWNTOWN NIGHT
 GROUT: TEC 927 LIGHT PEWTER

PRT2 PORCELAIN TILE 2 (WALL BASE TILE)

MFG: DAL-TILE
 STYLE: CITY VIEW
 SIZE: 6" X 12" NOMINAL COVE BASE
 COLOR: CY04 DOWNTOWN NIGHT
 GROUT: TEC 927 LIGHT PEWTER

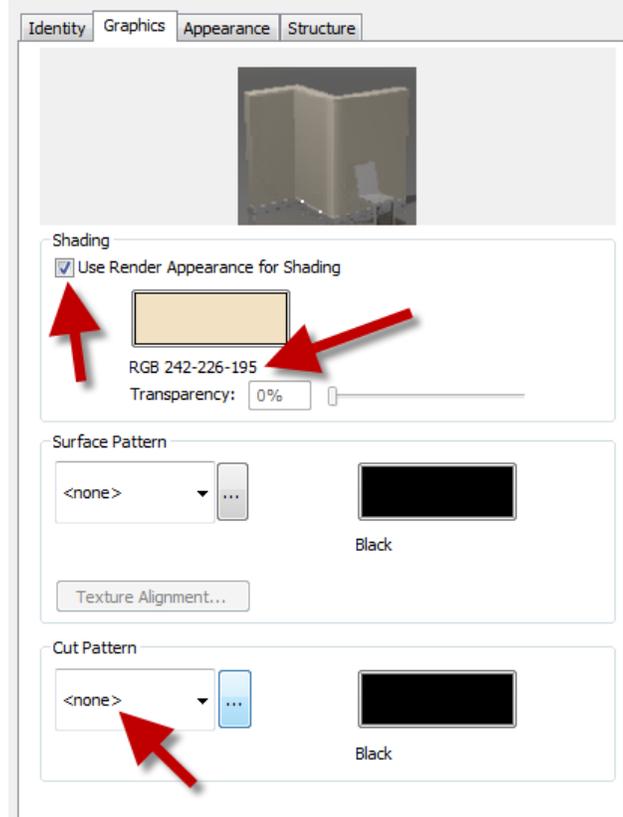


FIGURE 4-3.16 Materials dialog; Graphics tab

The third material you will create is tile; both ceramic and porcelain. This is similar to the previous examples, except you will set up a surface pattern for the size tile to be used and also deal with entering a color when the RGB color is not directly available. The materials you will create are listed above.

50. Open the **Materials** dialog in Revit.
51. Switch the *Material Class* to **Ceramic** (similar to Figure 4-3.12).

You should see two materials; “Ceramic Tile – 4” Blue” and “Porcelain – Ivory”. It does not make too much sense to have porcelain in the ceramic category, so you will make a new category called “Tile”.

First you will create a ceramic tile *Material* called CT1. Similar to the floor finish you created for carpet, you will not worry about the floor construction. The floor finishes will be applied differently than how the wall finishes are applied. The main reason for this is to show two ways in which materials may be applied – however, it is possible to use only one or the other. We will discuss this more in the chapters dealing with modeling.

52. Select **Ceramic Tile – 4” Blue** and click **Duplicate**.
53. Type **CT1** for the new *Material* name and then click **OK**.

54. With the new *Material* selected, switch to the **Identity** tab.
55. For *Material Class*, type **Tile** (click in the box and type rather than select from the drop-down list).

Next you will go to the Dal Tile website and search for the specific tile under consideration. You will find on this specific website that each tile does not have its own page. Thus, the URL will have to either point to the main website or the page for the series of the selected tile.

56. Go to **www.daltile.com** using your web browser.
57. In the *Search Tiles* textbox, enter **X735**.
58. Click on the **View Entire Series** link below the *Matte* tile preview.
59. Use the current web page address for the *Material URL* in Revit.
60. Find the X735 tile sample.

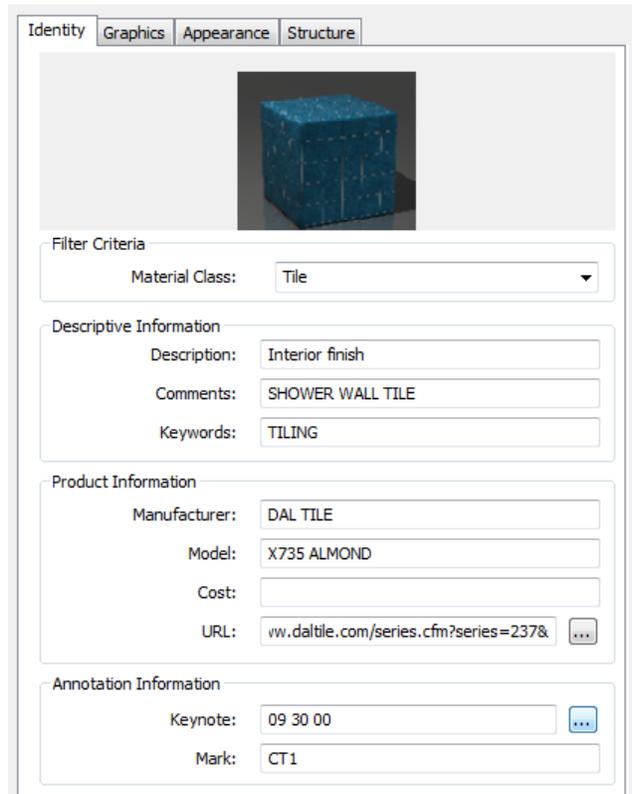


FIGURE 4-3.17 Materials dialog; Identity tab

Notice there is not a lot of information about the tile here. You have to go elsewhere to find the size of the tile. Also, the RGB color is not given. One technique to derive the RGB color is to right-click on the image on the website, select Save Picture As and then save the preview image to a file on your computer's hard drive. Next you could open this image in an image editing program such as Adobe Photoshop and use the Color Picker tool to list the RGB values of the image. You will be provided the RGB colors so you do not need to use another program at this time.

61. Finish entering the information on the *Identity* tab as shown in Figure 4-3.17.
62. Switch to the **Graphics** tab.
63. Make sure "Use Render Appearance for Shading" is **not** checked.
64. Click the color swatch to adjust the RGB color.

65. Set the RGB color to R=231, G=220, B=202 (similar to Figure 4-3.15)
66. Click the down-arrow next to the *Surface Pattern* preview and select **4.25" Tile**.
67. Set the *Cut Pattern* for the tile to **None** (Figure 4-3.18).

With these settings one could begin to design using the CT1 material. However, the *Appearance* tab does not have a proper image file selected to represent the selected tile. It is still set to the blue tile.

Because we don't have a representative image with a repeating grout pattern to download you have to either find one in Autodesk Library, modify a material, take a picture of the tile installed somewhere or find something online.

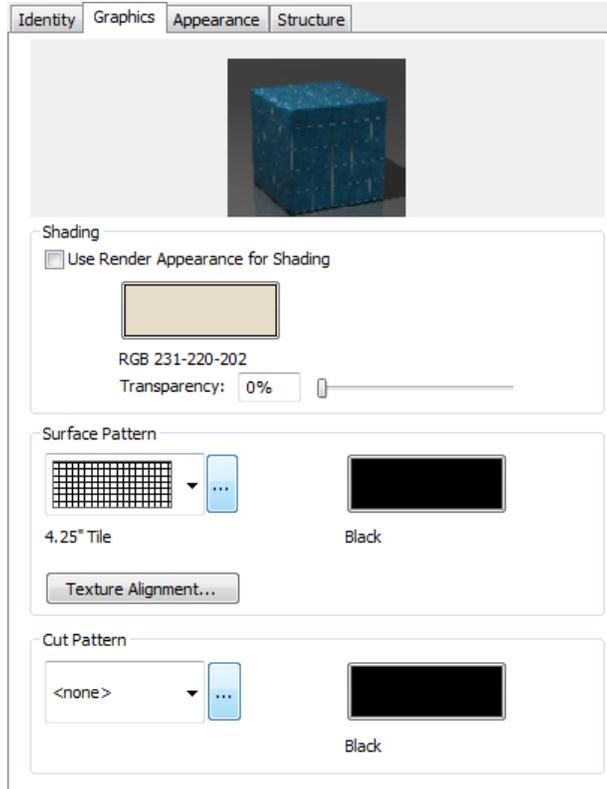


FIGURE 4-3.18 Materials dialog; Graphics tab

68. Switch to the **Appearance** tab.

Notice this material is currently using an image file to represent the tile. This would be similar to taking a photo of an installed tile and then cropping it so that it repeats nicely. In the next few steps you will take a look at another option for representing tile.

69. In the *Autodesk Library* section (on the *Appearance Property Sets* tab), expand **Ceramic** and select the sub-option **Tile** (Figure 4-3.19).
70. Select the preview for **4in Square – Light Blue** to load it into your project.

This new *Appearance* is now assigned to the currently selected *Material*, which should be CT1. Notice how the available settings on the *Appearance* tab are completely different now (Figure 4-3.19). Rather than a generic *Material* based on a raster image, Revit understands this *Material* to be ceramic.

71. Adjust the color to match the RGB settings in step 65 above.
72. Expand the **Relief Pattern** section to see its settings.

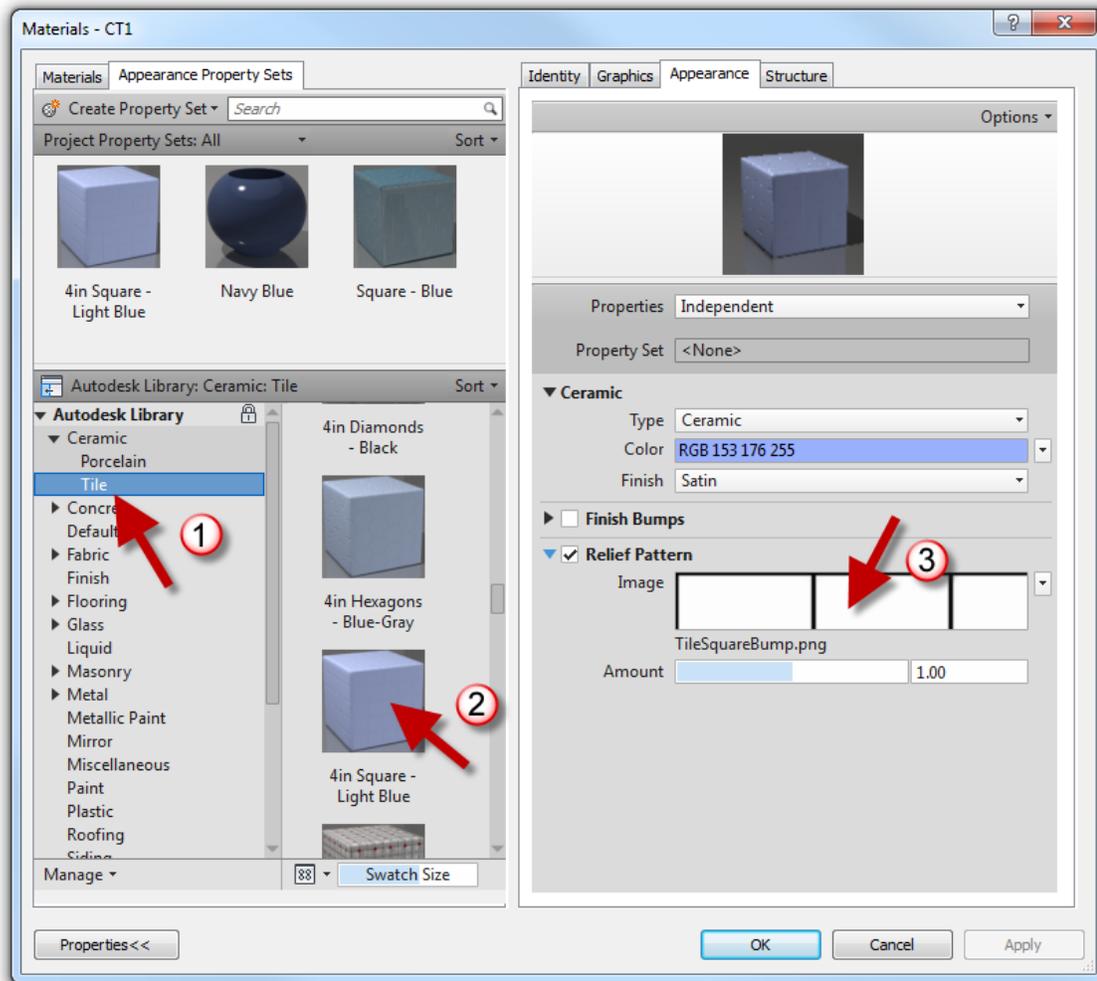


FIGURE 4-3.19 Materials dialog; Autodesk Library selection

A *Relief Pattern* would be like embossing a piece of paper. In the raster image being used (TileSquareBump.png as seen in Figure 4-3.19) the non-white areas are embossed on the otherwise infinite ceramic material. This *Relief Pattern* gives the general appearance of a tile pattern, but lacks the ability to specify a specific grout color. Next you will learn how to adjust the *Relief Pattern* so the tile is 4 1/4" rather than 4".

73. Click on the preview image for the *Relief Pattern* (pick #3 in Figure 4-3.19).

74. Adjust the *Sample Size* from 8" to 8 1/2" (4 1/4" times two tiles is 8 1/2").

Notice the other options, including the ability to rotate the pattern (Figure 4-3.20).

75. Click **Done**.

If you needed a staggered tile pattern you would need to use an image editing program to create a *Relief Pattern*.

76. Follow the previous steps to create **CT2** (see page 4-28). Notice the pattern is rotated 45 degrees.
 - a. Be sure to start by duplicating material CT1.
 - b. Use the following RGB values: R=244, G=240, B=237
 - c. Adjust the Relief Pattern's Position/Rotation to 45 degrees.
 - d. See the next steps to learn how to set the *Surface Pattern* to 45 degrees.

77. On the *Graphics* tab, click the "..." button next to *Surface Pattern*.

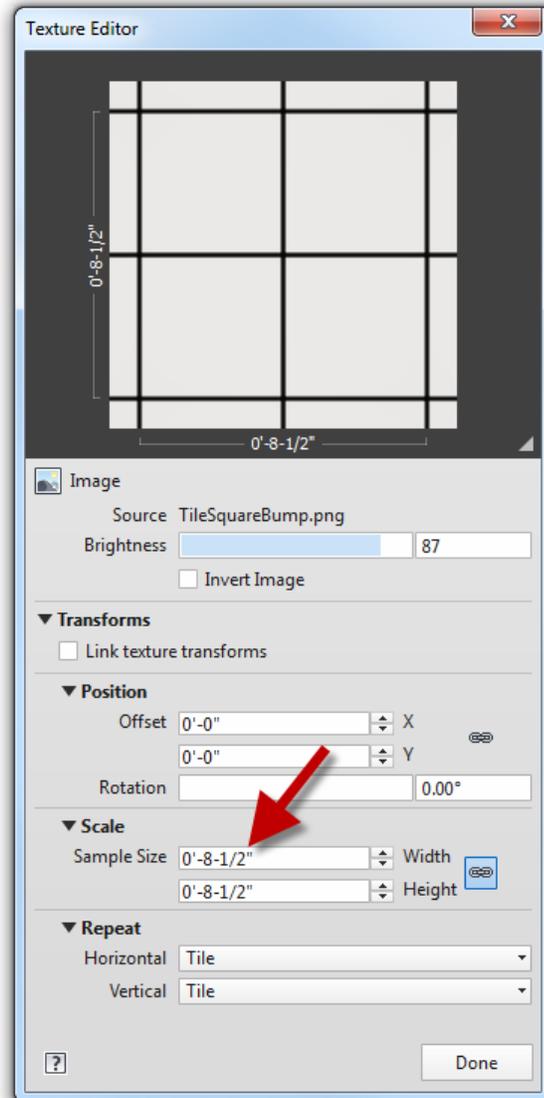


FIGURE 4-3.20 Relief Pattern texture editor

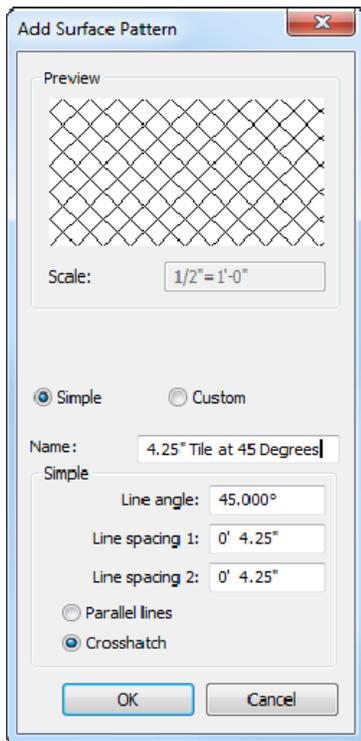


FIGURE 4-3.21 Add Surface Pattern dialog

78. Click the **New** button.
79. Adjust the settings to match Figure 4-3.21; enter the *Name* **4.25" Tile at 45 Degrees**
80. Click **OK** to create the new model pattern (remember, model patterns do not change scale with the view).

This new *Fill Pattern* is now available to any tool/feature which utilizes the fill patterns.

81. Click **OK** again to accept the new pattern for the material's *Surface Pattern*.
82. In the *Surface Pattern* area, click the **Texture Alignment** button.
83. Notice that the *Surface Pattern* and the render texture (i.e. appearance) both align. Try clicking the arrows, but click **Cancel** to close without making changes.
84. Click **OK** to close the *Materials* dialog.
85. Save your project.

Next you will create the last two tile materials.

86. In the *Materials* dialog, select CT1 and then **Duplicate** it; name the new material **PRT1**.
87. Adjust the **Identity** tab per the steps previously covered.
88. Switch to the **Graphics** tab.
89. Check **Use Render Appearance for Shading**.
90. Click the "..." button next to the *Surface Pattern* preview.
91. Click **New**.
92. Create a new pattern named **18" Tile** – adjust the settings to match Figure 4-3.22.
93. Click **OK** twice to get back to the *Material* dialog.

Next you will modify the *Appearance* tab. But first you might want to review the *Texture Alignment* to see how things do not currently align.

94. Switch to the **Appearance** tab.

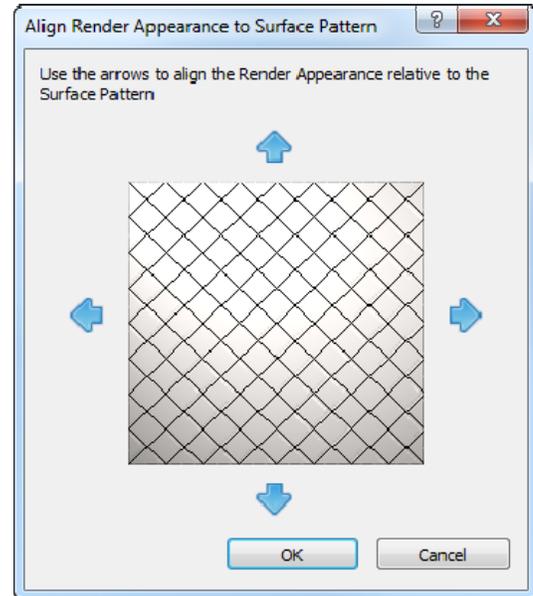


FIGURE 4-3.21 Texture Alignment dialog

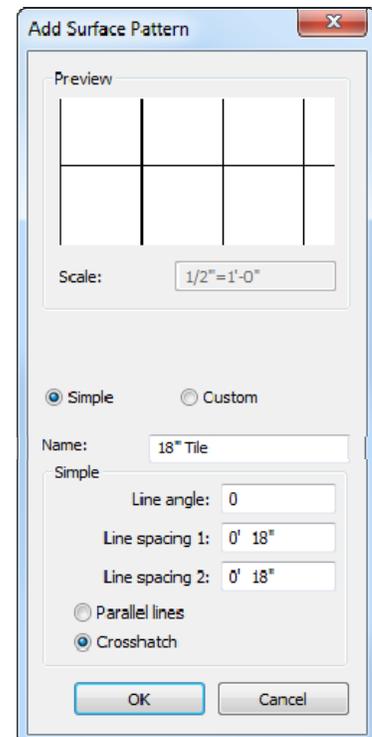


FIGURE 4-3.22 Add surface pattern

You will notice from the manufacturer's website that the selected porcelain tile is not a simple solid color. It has a natural irregular pattern to it. So you might not want to use the same appearance previously applied to CT1 and CT2. Next you will download an image from the Manufacturer's website.

95. Go to www.daltile.com and search for tile number CV04.
96. Select the small preview image to open a larger review image (Figure 4-3.23).
97. Right-click on the large preview image and select **Save Picture As** (or *Save Image As*).
98. Select a location for the image file to be saved on your computer.

The only problem with this image is it does not have a grout joint around the perimeter. This will not look great in a rendering. However, due to the irregular pattern a line will still be apparent. It is possible to use an image editing program, such as Adobe Photoshop, to add the joint; you would want half a joint so it tiled properly on a surface in the model. You will not be required to make these types of edits at this time.

Based on the *Material* you started PRT1 from, you cannot select an image file for the appearance. You will have to select a texture from the *Appearance Property Sets* tab. This will override the *Appearance* tab, but nothing else.

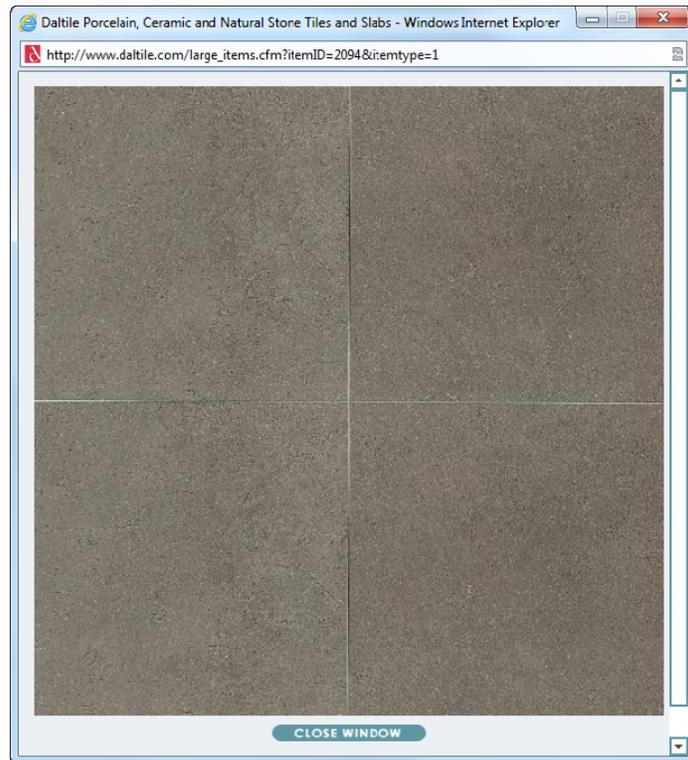


FIGURE 4-3.23 Large preview image from Dal Tile website

99. Back in Revit, from the *Appearance Property Sets* tab, select Flooring → Tile → Terra Cotta.

You now have a raster image file based appearance. You will change it to the image you just downloaded.

100. Click the image name below the larger image preview:
Finishes.Flooring.Tile.Square.Terra Cotta.jpg.

The *Texture Editor* should open automatically when the image file is changed, if not click on the preview image to open it.

101. In the *Texture Editor*, change the *Sample Size* to **3'-0" x 3'-0"**; this is for two 18" tiles in each direction (Figure 4-3.24).
102. Click **Done**.
103. Uncheck the **Bump** option as it is for the previous image.

Next you will duplicate PRT1 to create PRT2. Both are based on the same tile. One is for the floor and the other is meant to be used as wall base. The wall tile is 6"x12". This can be setup as 12"x12" as the tile will be cropped by the surface it is applied to in the model.

104. Duplicate PRT1 as **PRT2**.
105. Adjust the *Identity* tab.
 - a. *Comments*: PORCELAIN WALL BASE TILE
 - b. *Mark*: PRT2
 - c. Everything else is the same as PRT1.

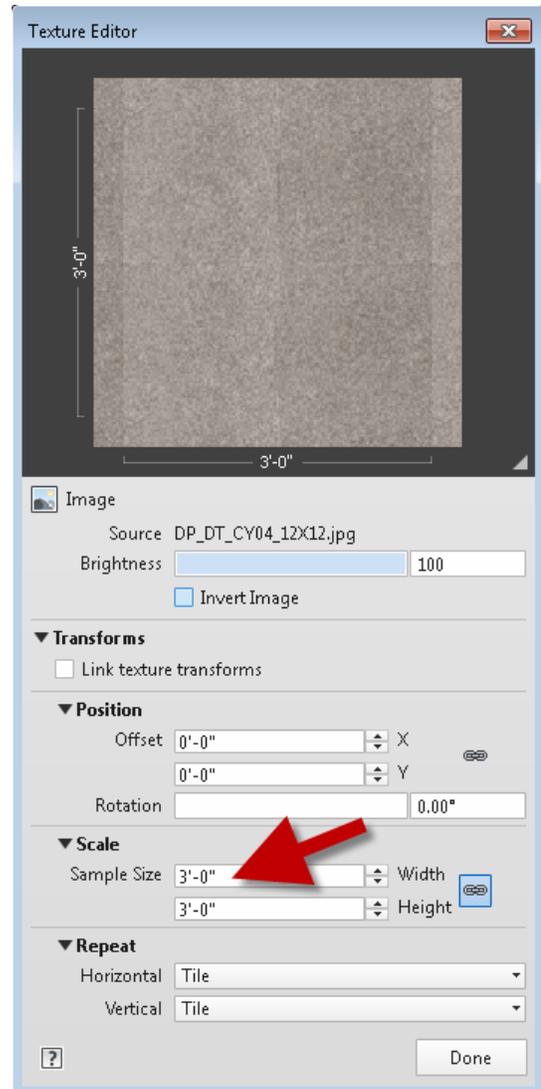


FIGURE 4-3.24 Adjusting texture size

106. On the *Graphics* tab, set the *Surface Pattern* to **12" Tile**.
107. On the *Appearance* tab, adjust the texture size to be **2'x2'**; this is for two 12" Tiles.
108. Close the *Material* dialog; be sure to click the **OK** button and not the red "X" in the upper right as this will cancel and discard your changes.
109. **Save** your project file. You will use this model in subsequent chapters.

This wraps up a fairly thorough overview of using and managing *Materials* in Revit. You should hang on to this book so you can refer back to this information as needed. Eventually you will know how to do these steps by memory as there are lots of materials on projects. Keep in mind that your favorite materials can be added to a custom template file so they are available immediately for all your projects.

Exercise 4-4: Revit Materials and Custom Parameters

This last section will look at an intermediate concept related to Revit materials. Often there is additional information you might wish to keep track of for a given material. Revit allows you to create custom parameters which are able to hold additional information about the material. It is not essential that you know how to do this now, but it is easy so why not give it a try!

You may have noticed some of the websites you visited in this chapter list data like **Post-Consumer Content**. You may also want to keep track of the distance in miles to the main source of the material. These metrics are used to rate the sustainability of a building and factor in to programs such as Leadership in Environmental and Energy Design (LEED).

1. In Revit, switch to the **Manage** tab on the *Ribbon*.
2. Select **Project Parameters**.
3. Click **Add**.
4. Enter the information as shown in Figure 4-4.1 below.

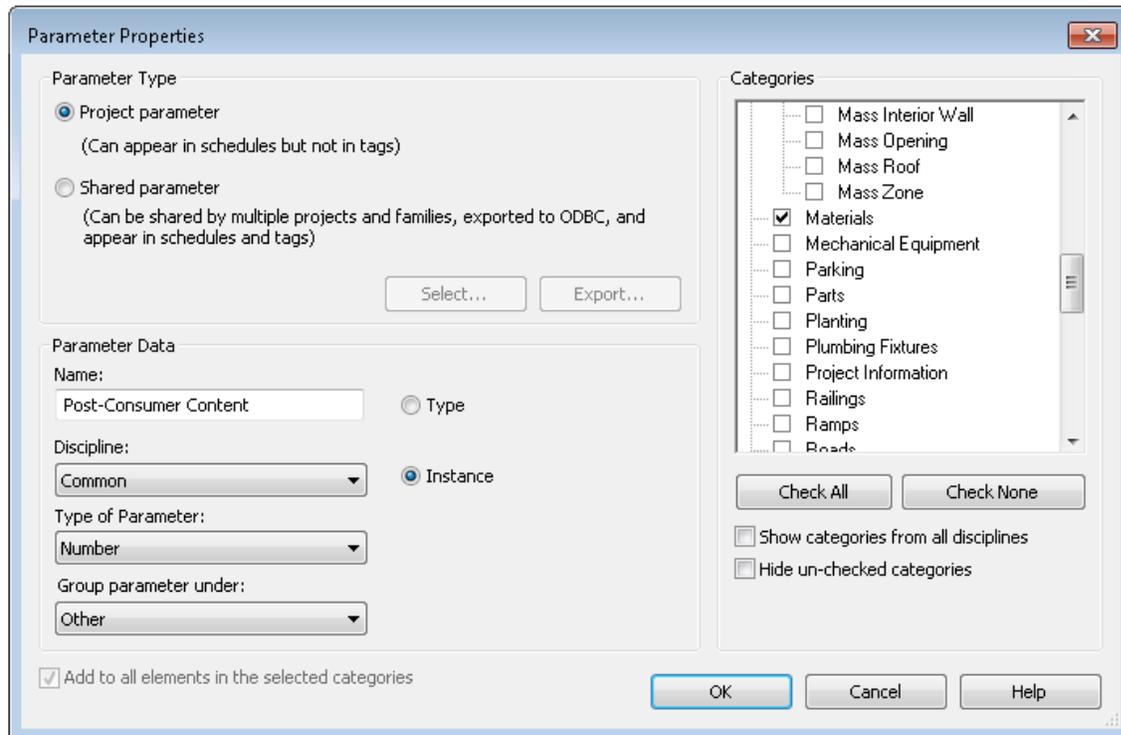


FIGURE 4-4.1 Creating a project parameter

5. Click **OK** to create the parameter.
6. Add another project parameter called **Source (miles)** with all other settings the same as the previous steps.
7. Click **OK**.
8. Click **OK** to close the *Project Parameters* dialog.
9. Open the **Material** dialog.

Notice the custom parameters appear on the *Identity* tab. You are able to add as many custom parameters as you need. The information can vary for each *Material*. This information can also appear in a schedule (you will learn more about this later in the book).

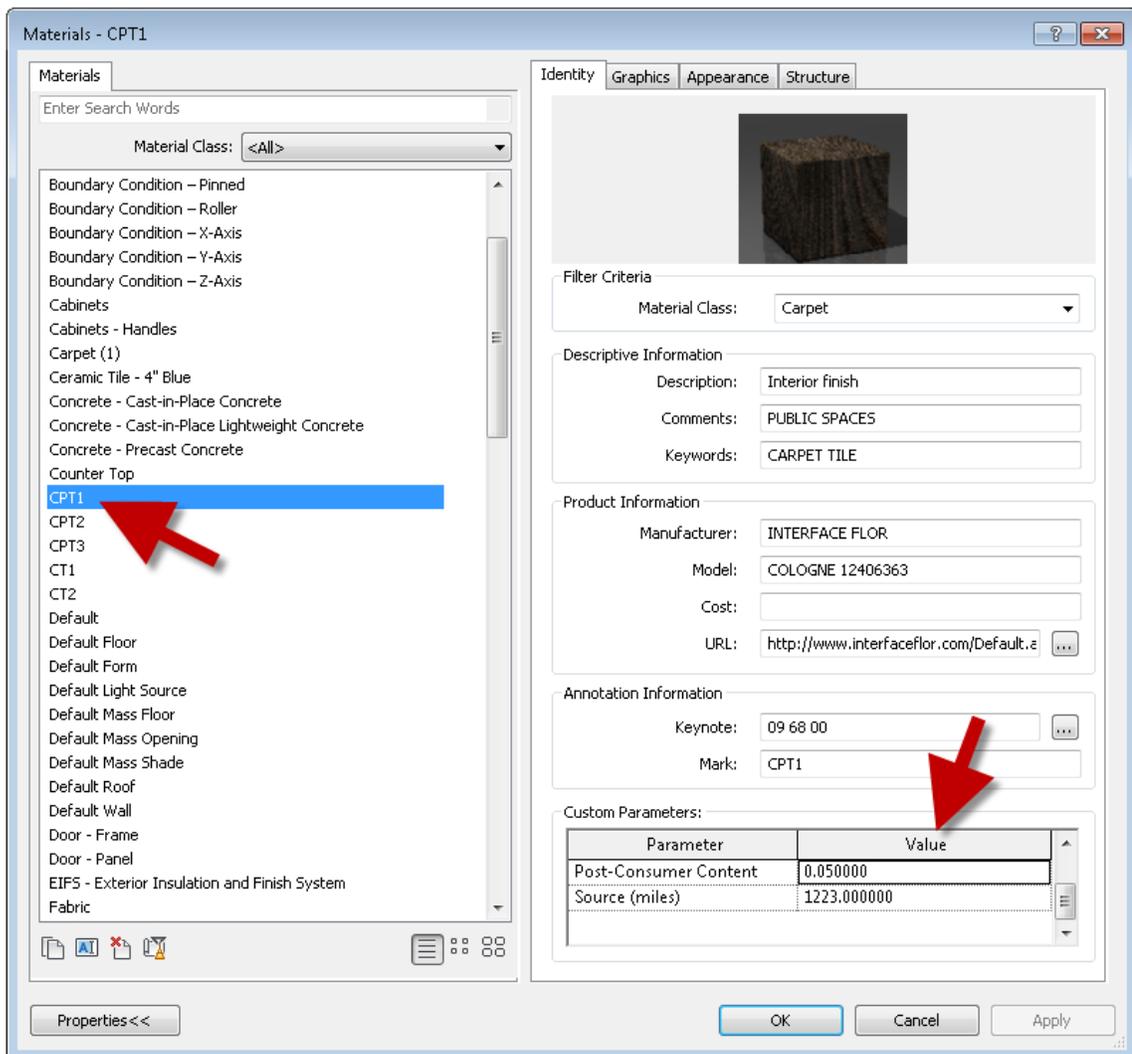


FIGURE 4-4.2 Custom parameters in the material dialog