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Interior Design Using Autodesk® Revit® 2020

Introduction to Building Information Modeling for Interior Designers

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UNIQUE CODE INSIDE

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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® allows much of this to be managed within the BIM database. This chapter will cover the basics and be applied to 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** settings
    - o Descriptive Information
    - o Product Information
    - o Annotation Information
- **Graphics** settings
    - o Shading
    - o Surface Pattern and color
    - o Cut Pattern and color
- **Appearance** asset
    - o Photo-realistic render appearance
        - ▪ Texture
        - ▪ Reflectivity
        - ▪ Transparency
        - ▪ Self-Illumination
        - ▪ Etc.
- **Physical** asset
    - o Structural engineering data
        - ▪ Concrete
        - ▪ Steel
        - ▪ Aluminum
        - ▪ Wood
- **Thermal** asset
    - o Energy modeling data
        - ▪ Thermal Conductivity
   - ▪ Specific Heat
        - ▪ Etc.

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:
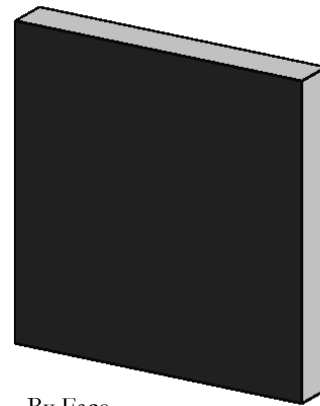- *By Category*
- *By Element*
- *By Face*

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 has a light color with a brick pattern *By Element*. The last wall has a solid darker color painted on a single face (*By Face*).
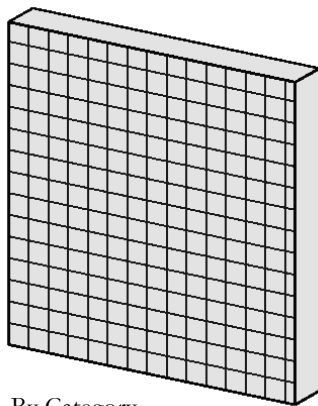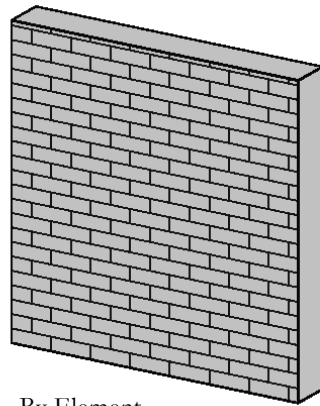
| By Category | By Element | By Face |

By Category

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

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, controls how elements 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 precedence over *Object Styles*. For example, the pedestal sink shown to the right has a "Sink – Porcelain" and a "Sink – Faucet" 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.
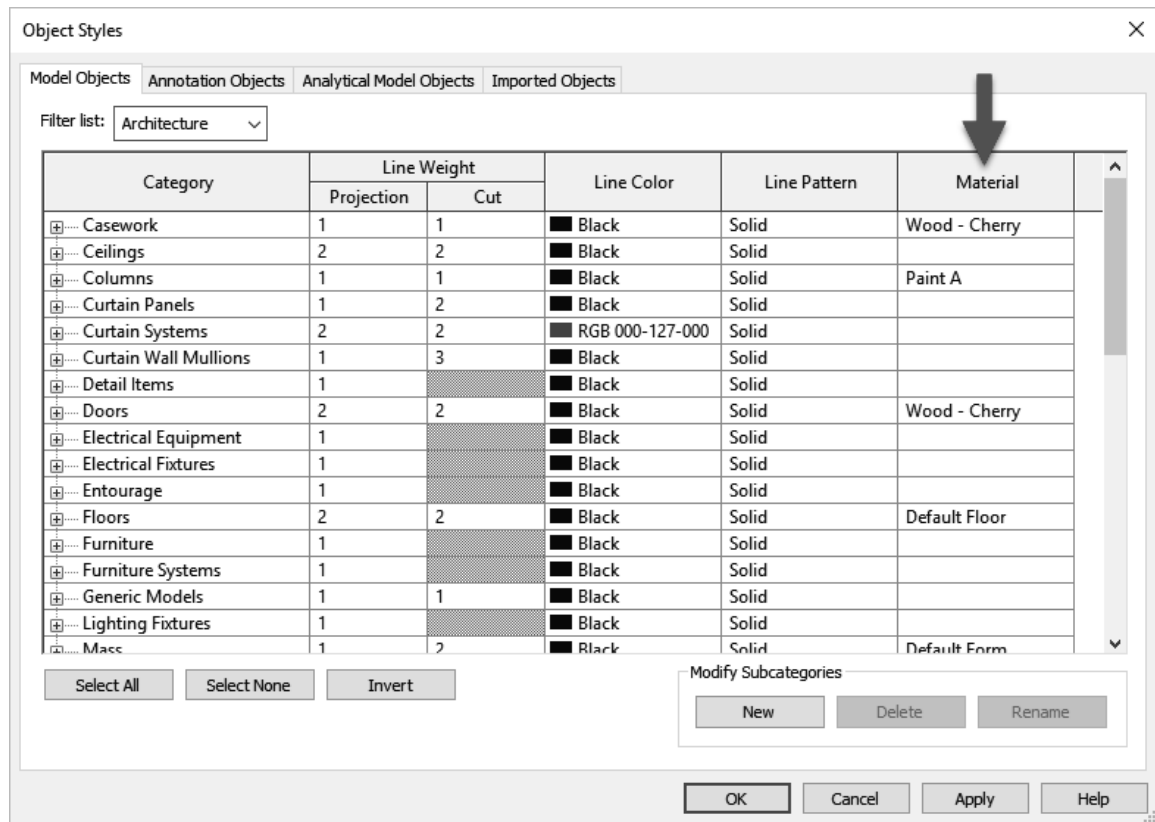

FIGURE 4-1.1 Object Styles dialog

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:

- o **Picking a Material**
  When a *Material* is selected directly, it is basically hard-wired and cannot be changed in the project.

- o **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.
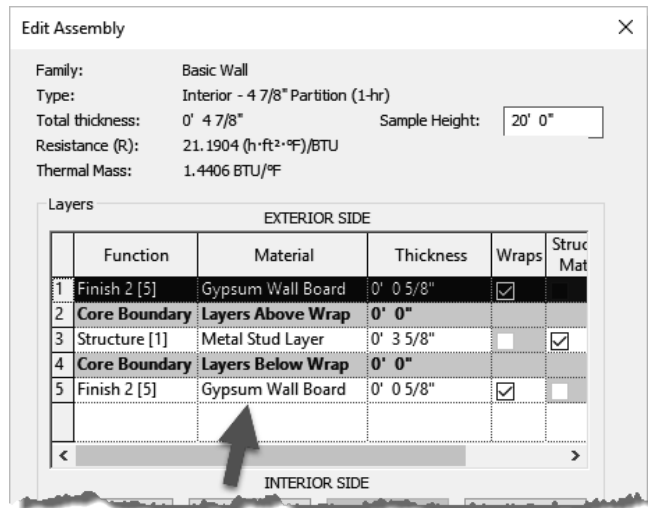

FIGURE 4-1.2 Edit Assembly dialog

The **Edit Assembly** dialog, shown to the left (Figure 4-1.2), highlights how the *Material* selection is built into 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.

Next we will look at a simple chair family (Figure 4-1.3) which comes with the Revit 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\RVT 2020\ Libraries\US Imperial\Furniture\Seating

If we load this chair into a project, we can observe a few things about it. You may try this in Revit while reading, but it 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*.

FIGURE 4-1.3 Chair-Tablet Arm family

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.

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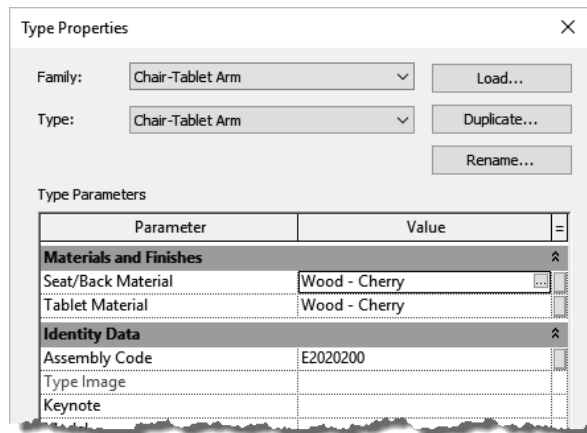

FIGURE 4-1.4 Type Properties for tablet arm chair

However, 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 by 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 these three faces. You would need to change the view of the wall to override the other faces.

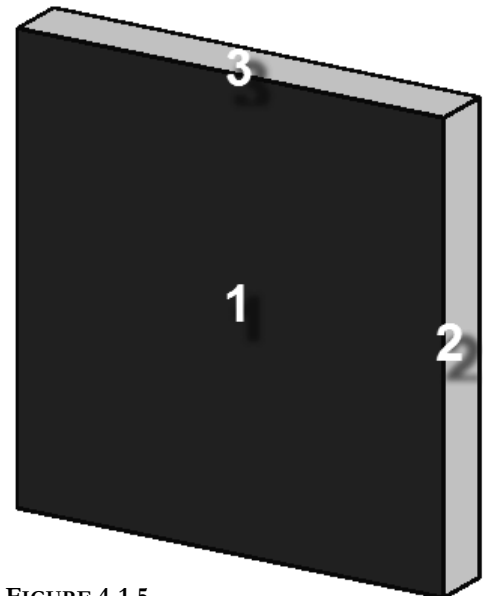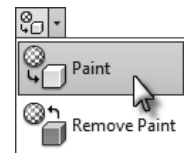When a surface is painted, Revit paints the entire face, not just the portion visible in the current

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

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 4-1.6A & 16B).
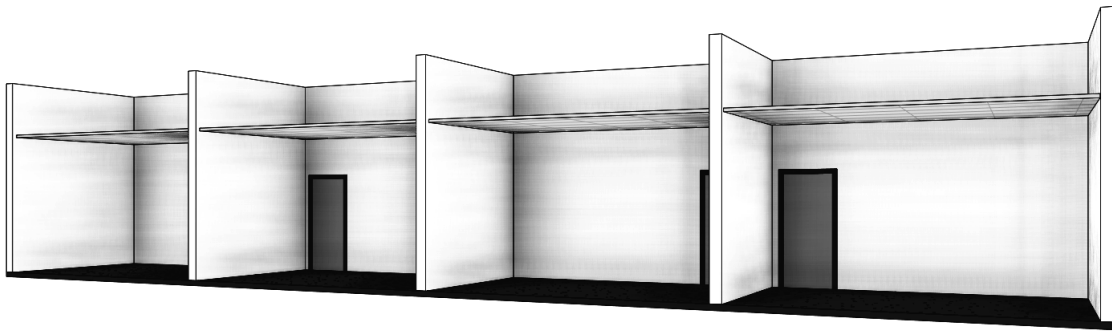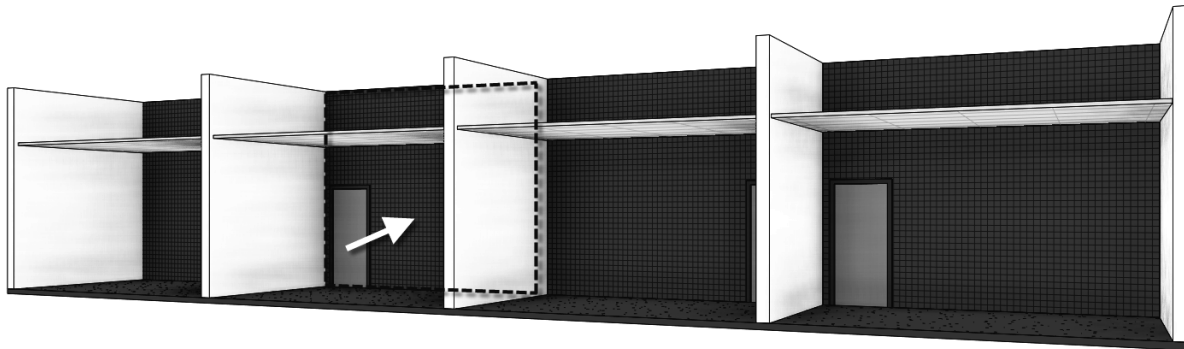

FIGURE 4-1.6A Original corridor wall

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.
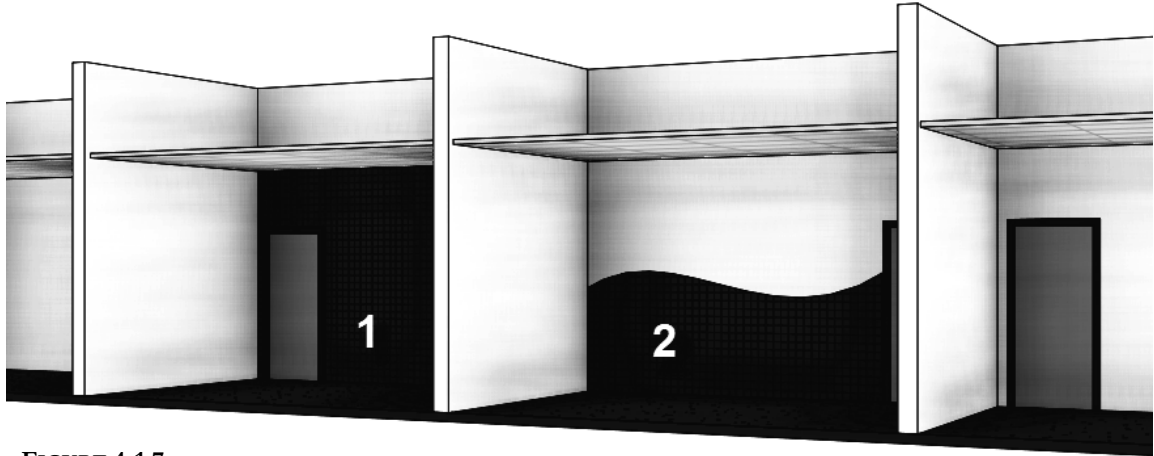

FIGURE 4-1.7
Split Face tool used to constrain painted areas

In the image below, the *Split Face* and *Paint* tools were used to define an area for the accent band and wall base (Figure 4-1.8). Everything in this image is created by the reader, which consists of Shaw flooring, Toto plumbing fixtures, and Dal Tile.

FIGURE 4-1.8 Toilet room created by reader later in this textbook

This section 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.

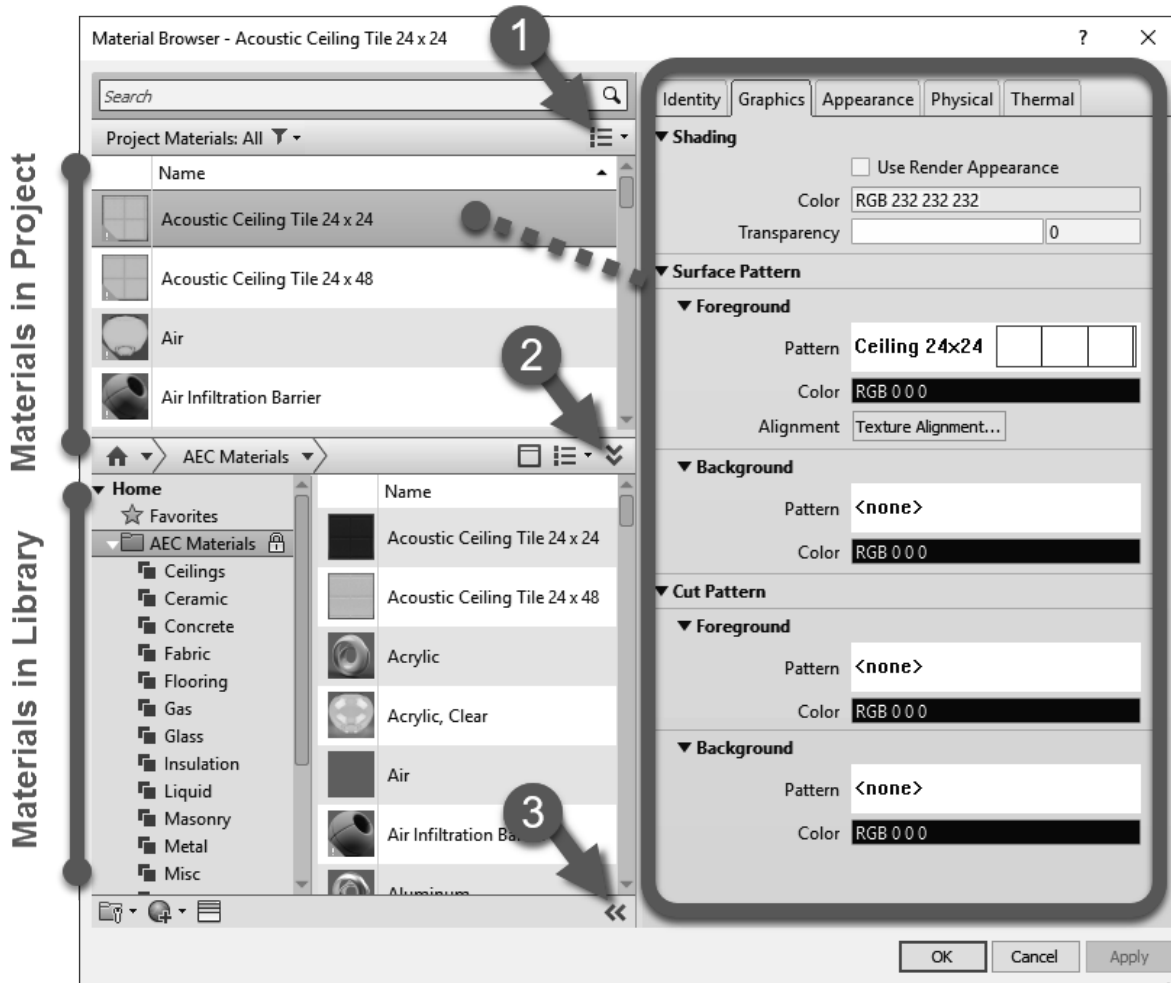You will see the *Materials* dialog shown below (Figure 4-2.1).

FIGURE 4-2.1 Materials dialog

ARROW #1: Clicking the drop-down list, pointed out with the #1 arrow in Figure 4-2.1, allows you to switch the material list to just be text rather than a preview (see also Figure 4-2.2). This adjustment allows you to see more items in the limited space.

ARROW #2: Clicking this icon will toggle the visibility of the external materials library. The advantage of not having the external library visible is that you can see more of the materials in your project.

ARROW #3: If the Material Browser dialog is not fully expanded you need to click the icon pointed out with the #3 arrow to see the selected material's properties.

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 exercise will have several steps which will be done in a project to apply what is presented in this section.

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

This list can be sorted in three ways:
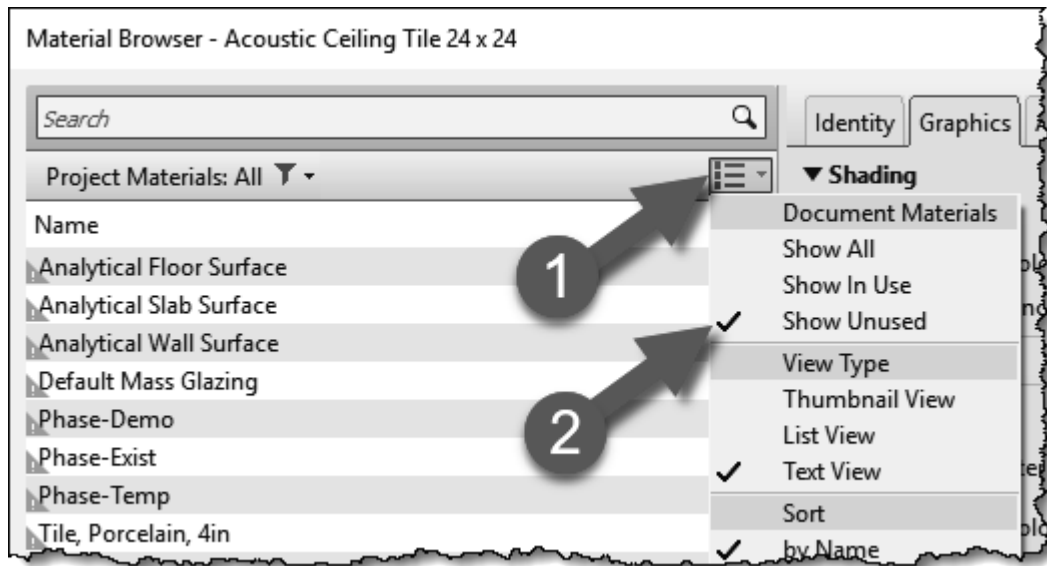- Material usage state
- Search words
- Classification

FIGURE 4-2.2 Sort by Material usage state

Selecting by the drop-down list (#1, Figure 4-2.2) allows you to narrow the list down to just *Materials* used in the project, or not used. The default is *Show All*, so both used and not used appear in the list; you would normally want to see both.

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 any *Material* or *Category* containing the word "wood."

A combination of the two can be used to further filter the list down, and quickly get to the information you need. Notice in Figure 4-2.4A, the list is sorted by the word "tile" and for unused materials in the current project.

FIGURE 4-2.3 Sort by word search

It is also possible to sort the materials by a parameter called **Class**. Clicking the drop-down arrow pointed out in Figure 4-2.4B gives you the list to choose from. All of the Autodesk materials have a value entered for *Class* (e.g. Glass, Paint, Wood). When creating a material, you can select from a *Class* value previously entered in the project or enter a value of your own.

FIGURE 4-2.4A Sort by word search and material usage

To wrap up the discussion on the list of *Materials*, when you right-click on a Material name, you can *Duplicate*, *Rename* and *Delete* materials as seen in Figure 4-2.5. Also, at the bottom of the *Material Browser* dialog, a small icon allows one to create a new *Material* in addition to duplicating an existing one.
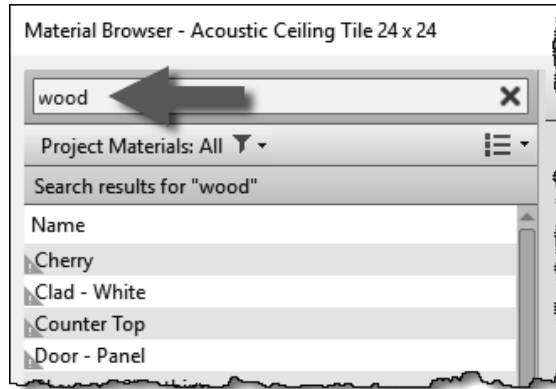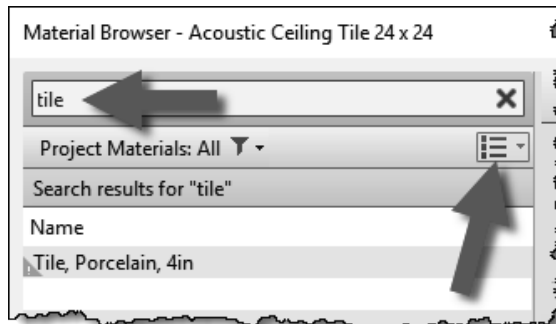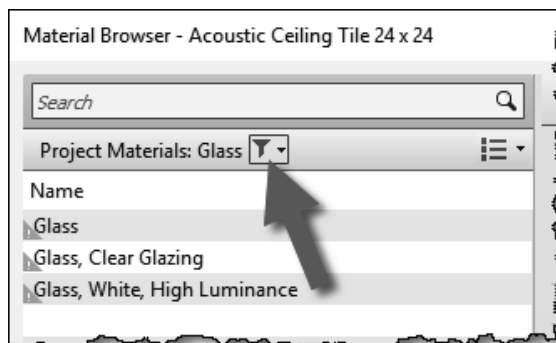

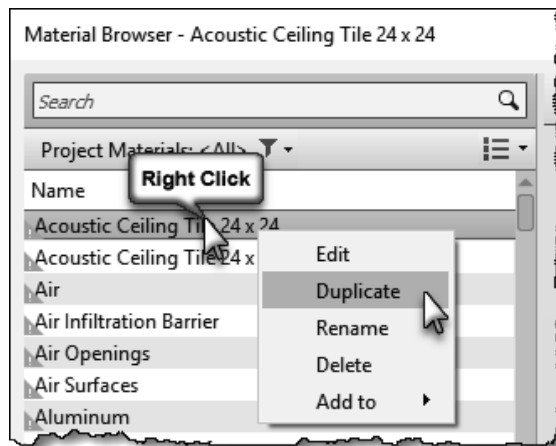**FIGURE 4-2.4B** Right-click options

FIGURE 4-2.5 Right-click options

Now that you understand the mechanics of the *Materials* list itself, you will take a look at the information contained within each *Material*. **The information seen on the right half of the *Material Browser* dialog, under the tabs, is based on which material is selected in the *Project Materials* list on the left**. If the material browser is not fully expanded, click the small icon in the lower right corner of the *Material Browser*; it looks like two arrows pointing to the right.

- **Identity tab**

    With the first *Material* selected in the *Project Materials* list on the left, **Acoustic Ceiling Tile 24" x 24"**, notice the *Identity* options available in (Figure 4-2.6).

    o 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.

    o 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.

    o Revit Annotation Information
       It is possible to add *Smart* text with optional arrows, which is called a *Tag* (see example on page 10-2), 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.
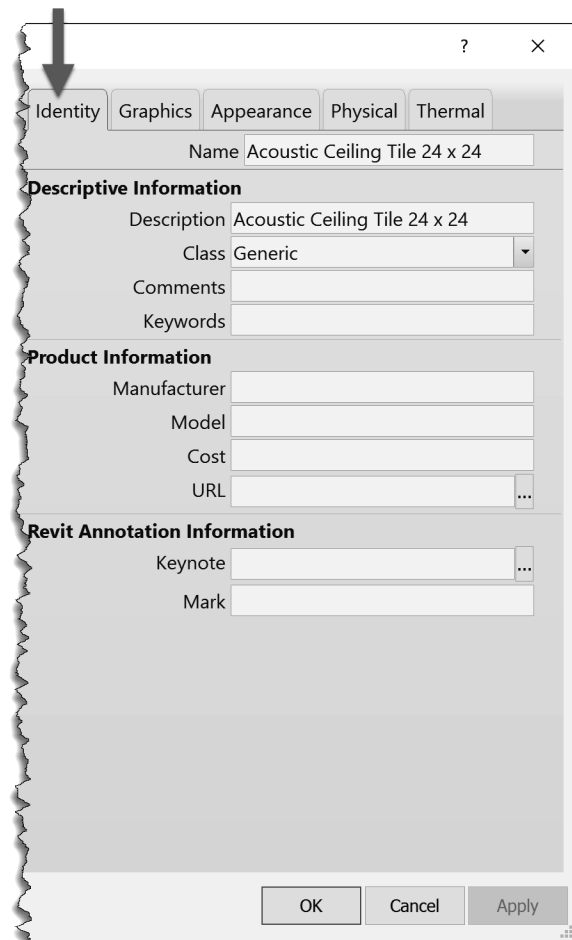
FIGURE 4-2.6 Material Browser; Identity tab

- **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 shown below still relates to the Acoustic Ceiling Tile (ACT) *Material* (Figure 4-2.7).

  o Shading
  This is the solid color used on-screen when the ***Visual Style*** is set to *Shaded* or *Consistent Colors* (see Page 2-15 for *Visual Styles* examples).

  The ***Transparency*** setting is used to make certain objects 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* is not used in any way for photo-realistic renderings. This color can be derived from the information specified for renderings by checking the *Use Render Appearance* option; more on this soon.

  o 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

FIGURE 4-2.7 Material Browser; Graphics tab

  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.

  o Cut Pattern *(and Color)*
  When a *Cut Pattern* is selected, Revit will display this pattern within the boundary of an object, if 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 plane 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.

Both the *Surface* and *Cut* patterns have a **Foreground** and **Background** option. This allows two patterns to be used to further define special conditions.
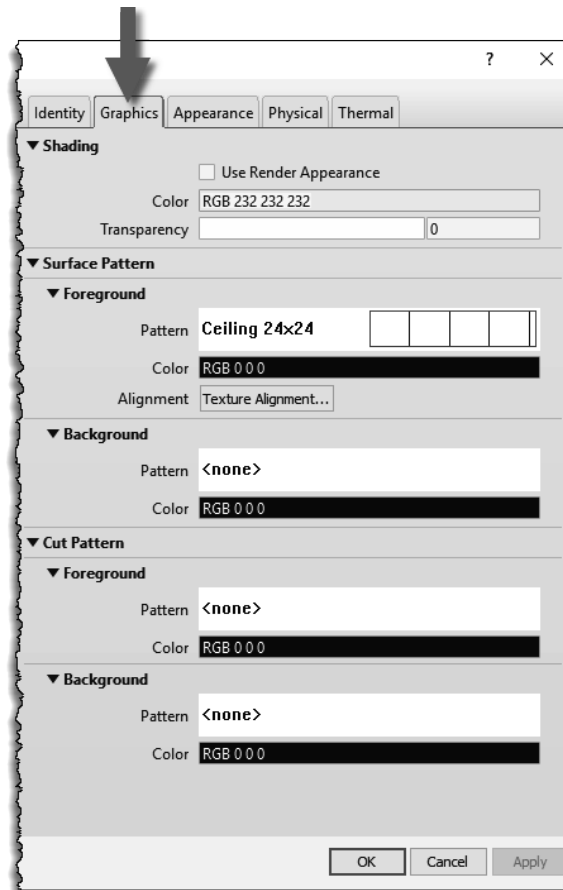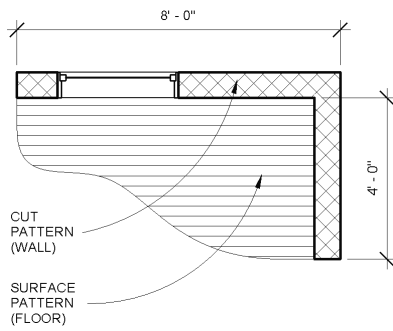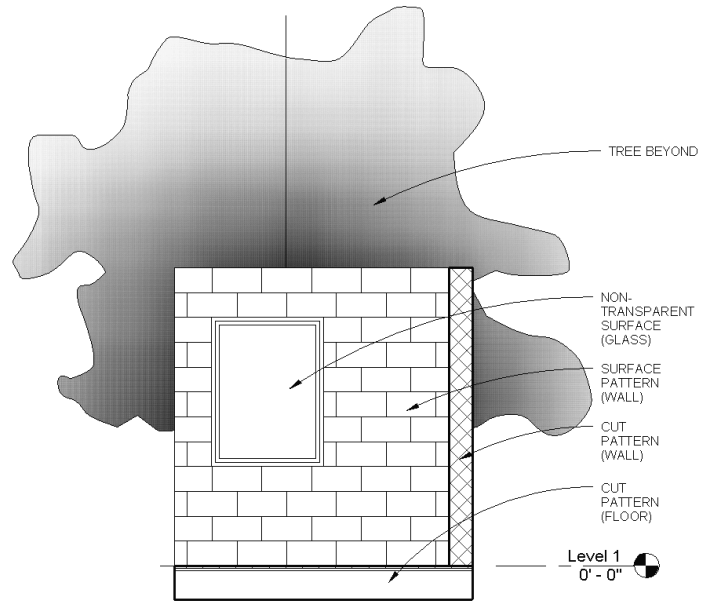
Overview of how Surface and Cut patterns are used in a Revit model:

8' - 0"
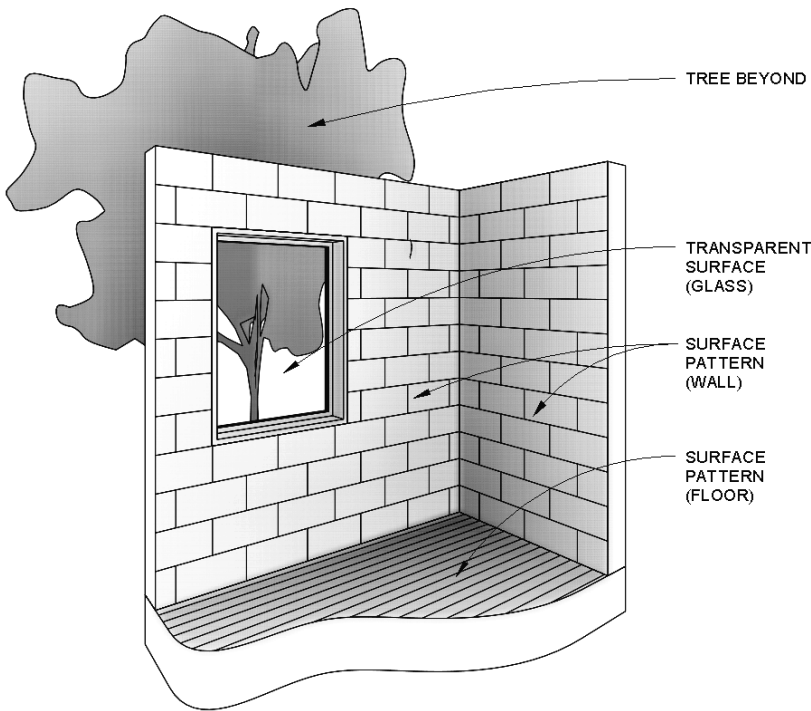
4' - 0"

CUT
PATTERN
(WALL)

SURFACE
PATTERN
(FLOOR)

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.

TREE BEYOND

NON-
TRANSPARENT
SURFACE
(GLASS)

SURFACE
PATTERN
(WALL)

CUT
PATTERN
(WALL)

CUT
PATTERN
(FLOOR)

Level 1
0' - 0"

ELEVATION / SECTION VIEW

TREE BEYOND

TRANSPARENT
SURFACE
(GLASS)

SURFACE
PATTERN
(WALL)

SURFACE
PATTERN
(FLOOR)

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 plane, 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 4-2.8). 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 its *Material: Surface Pattern* is shown for the wall in elevation/projection. The floor is made up of multiple layers, and

FIGURE 4-2.8 Section cut through building

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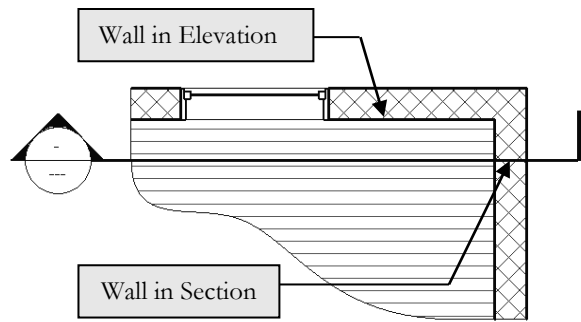
3D VIEW EXAMPLE:
In this view everything is in elevation/projection, so the surface pattern is used for the applied *Material*. Note: the walls and floor appear to be cut, but that is just the way they were modeled for this example. In 3D views, the transparency is applied to the element so the tree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

- **Pattern Scale:**
  This topic will be covered in more detail later but is 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 4-2.9) shows the same 12" concrete wall in section. Notice how the density of the *Drafting Pattern* changes when the *View Scale* is adjusted.

FYI: *Notice that the line weights also change when the View's **View Scale** changes. Larger scales have lighter line weights because they are viewed closer.*
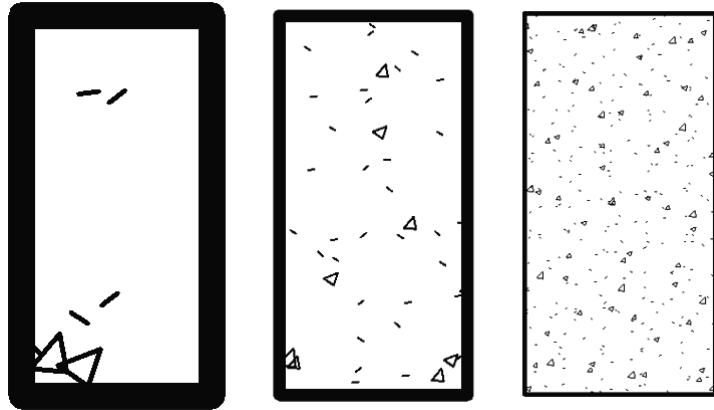

FIGURE 4-2.9 Drafting patterns automatically adjust size with view scale

- **Appearance Asset**
  The settings in this tab only come into play in one of two ways:

  1) *Visual Style* is set to ***Realistic*** or ***Ray Trace*** for the current view

  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.

  o Photo-realistic render appearance
    Different types of appearance assets have unique options. For example, paint has an *Application* setting where you can select *Roller*, *Brush*, or *Spray*; compare Figures 4-2.10 and Figure 4-2.11.
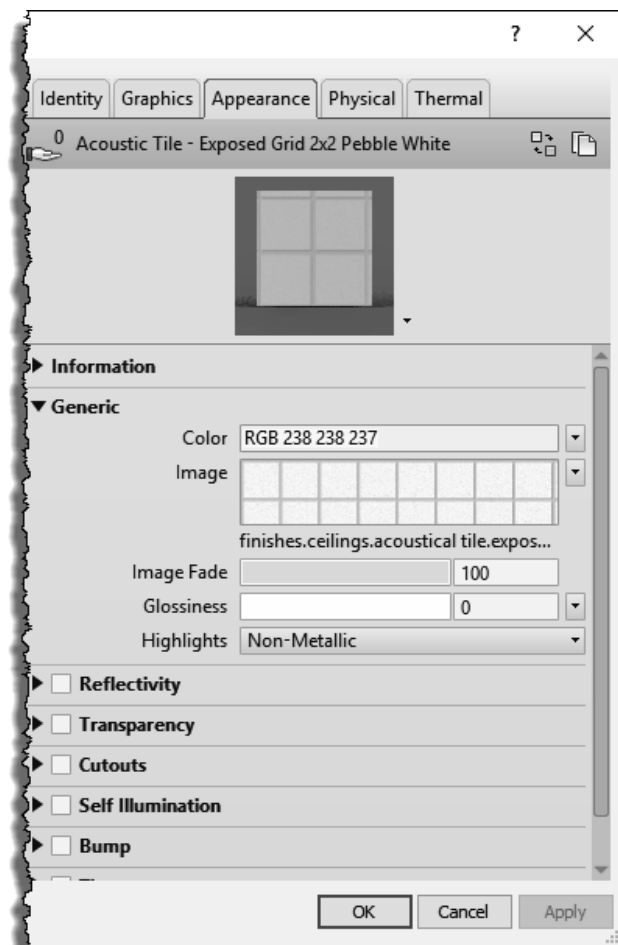

FIGURE 4-2.10 Material Browser: Appearance tab

When creating materials, it is important to use the correct asset-type. Notice in the image to the right (Figure 4-2.11a) that it specifically indicates "**Wall Paint**" and the previous image for the ACT indicated "**Generic**." The use of *Generic* should be used as little as possible. When Revit knows what the material is, e.g. it is not *Generic*, the renderings are more realistic. Revit's new 'advanced materials' will say "**Parameters**" as shown in Figure 4-2.11b; use these materials whenever possible for higher quality renderings.

With many *Appearance Assets* you can specify a raster image file (i.e., texture) to be used to fill or 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 4-2.12 and 4-2.13).
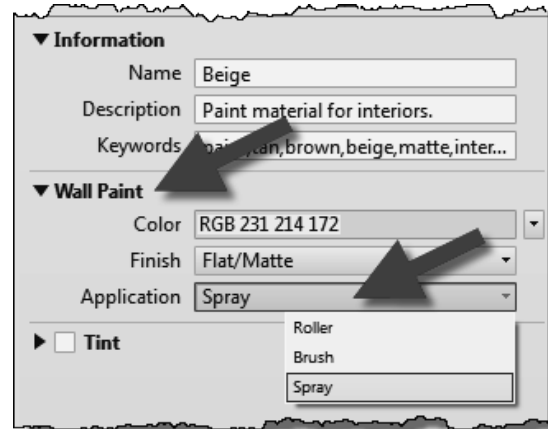

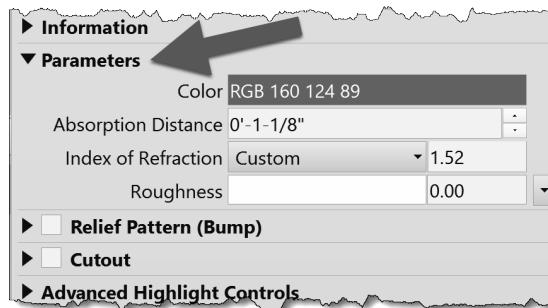**FIGURE 4-2.11A** Material Browser: Appearance tab

FIGURE 4-2.11B Material Browser: Appearance tab

FIGURE 4-2.12
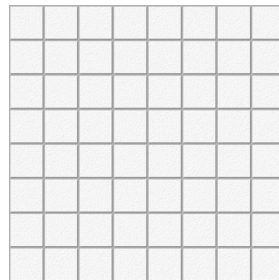Tileable image;
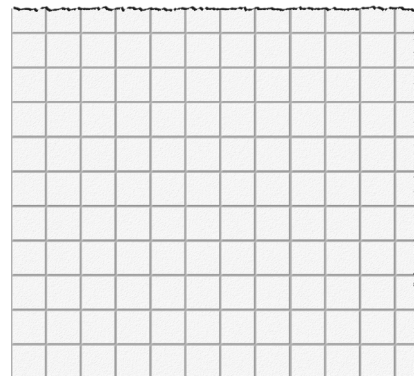ideal for rendering

Image file

Image file applied to surface in rendering (edges not visible)

FIGURE 4-2.13
Non-Tileable image;
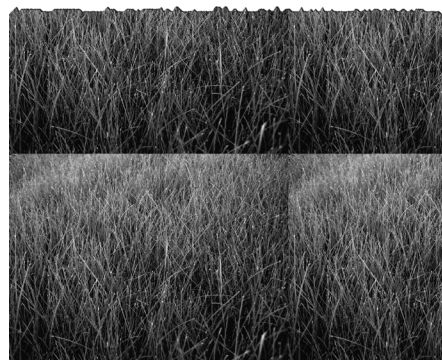bad for rendering

Image file

Image file applied to surface in rendering (edges visible)

When the image of the material is used by a given *Appearance Asset*, clicking on it opens another dialog box, the *Texture Editor*, where you can adjust how the image is applied to the surface and align it with the fill pattern (Figure 4-2.14). 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 rendering.

It is important to pay attention to the dimensions listed. Notice the 16'-0" by 16'-0" dimensions in the example. Dividing this dimension by the number of tiles visible in the image tells us each tile will be 2'-0", which is correct. However, if we download an image file from a manufacturer's website we will want to make sure to verify the number of tiles has not changed. If it did, we would have to adjust the scale values.
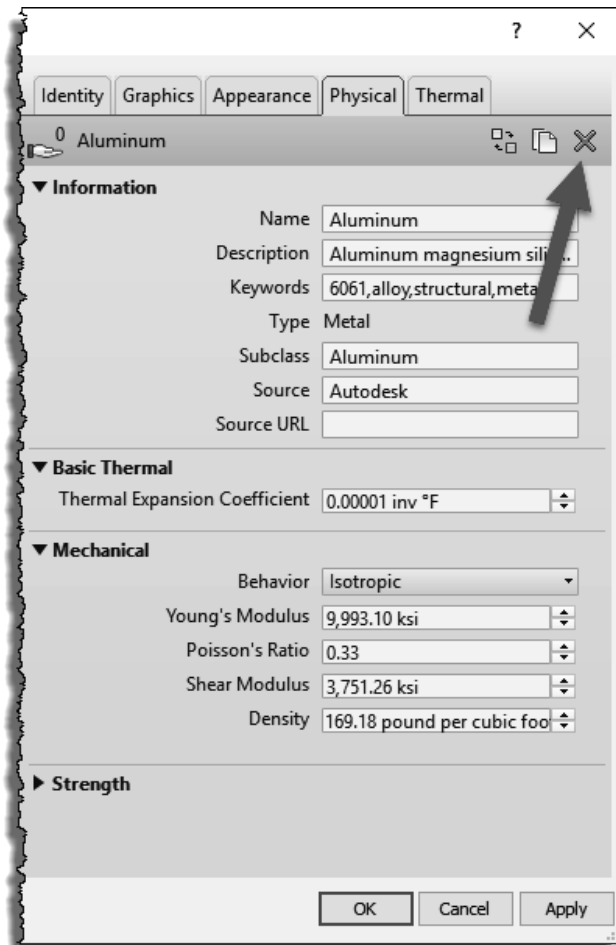
FIGURE 4-2.14 Texture Editor Dialog

- **Physical Asset**
  The *Physical* 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 programs. When this information is not applicable, the *Asset* can be deleted from the *Material*.

  The example shown to the left is for the **Aluminum** *Material*. The *Strength* section can be expanded to reveal additional information (Figure 4-2.15). Notice the *Replace, Duplicate* and *Delete* icons in the upper right.

FIGURE 4-2.15 Material Browser: Physical tab

- **Thermal Asset**
  The *Thermal* aspect of a *Material* is used in energy modeling calculations (Figure 4-2.16). The basics are computed directly within Revit, such as the R-Value and Thermal Mass of a wall or floor (Figure 4-2.17). More advanced calculations can be derived in external applications.

FYI: Deleting all the Thermal assets from your *Materials* will cause the calculated values, shown in Figure 4-2.17, to be blank.

It should be pointed out that the values shown are provided by Revit for many standard real-world materials. The average software user is not expected to know this information. However, once a *Physical* or *Thermal* asset is loaded into a project, a person knowledgeable in the area of structural design or energy modeling can make adjustments to these values if needed. An example might be a special new type of rigid insulation which has a higher R value. Therefore, the energy modeling expert can adjust the values for this known condition.
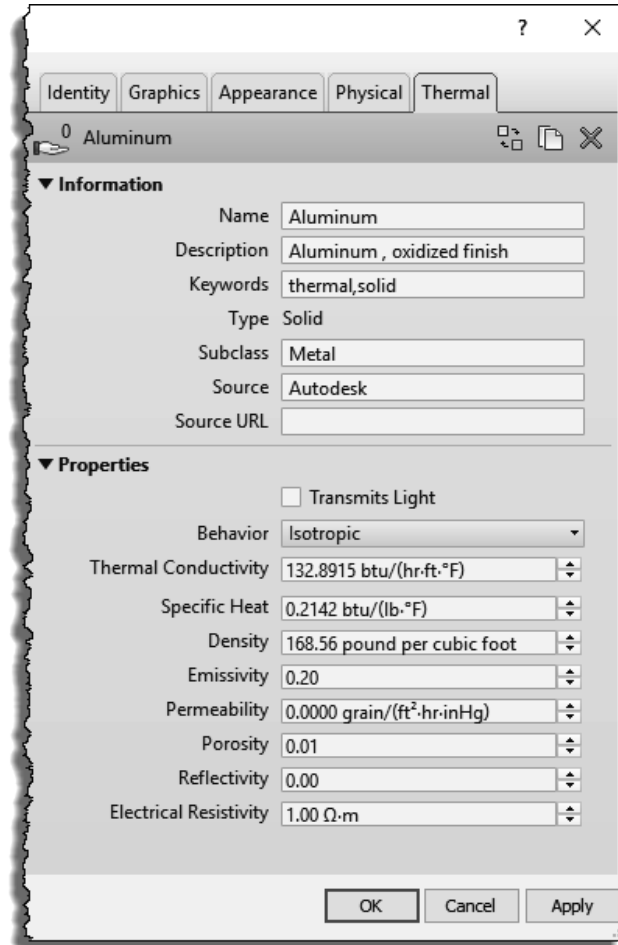
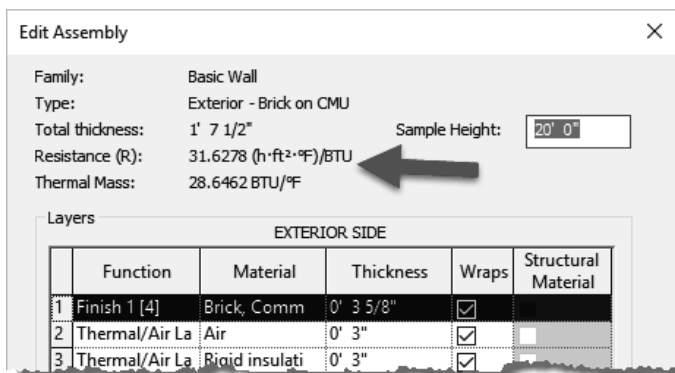**FIGURE 4-2.16** Material Browser: Thermal tab

FIGURE 4-2.17 Thermal calculations in wall assembly

Duplicating a Material _and_ its assets:
It is important to know how to properly duplicate a *Material* in your model, so you do not
unintentionally affect another *Material.*

If you **Duplicate** a
Material in your model,
the **Appearance Asset**
will be associated to the
new *Material* AND the
Material you copied it
from! For example, in
Figure 4-2.18, we will
right-click on <u>Carpet
(1)</u> and duplicate it.
Before we duplicate it,
notice the *Appearance
Asset* named "RED" is
not shared (arrow #3
Figure 4-2.18).
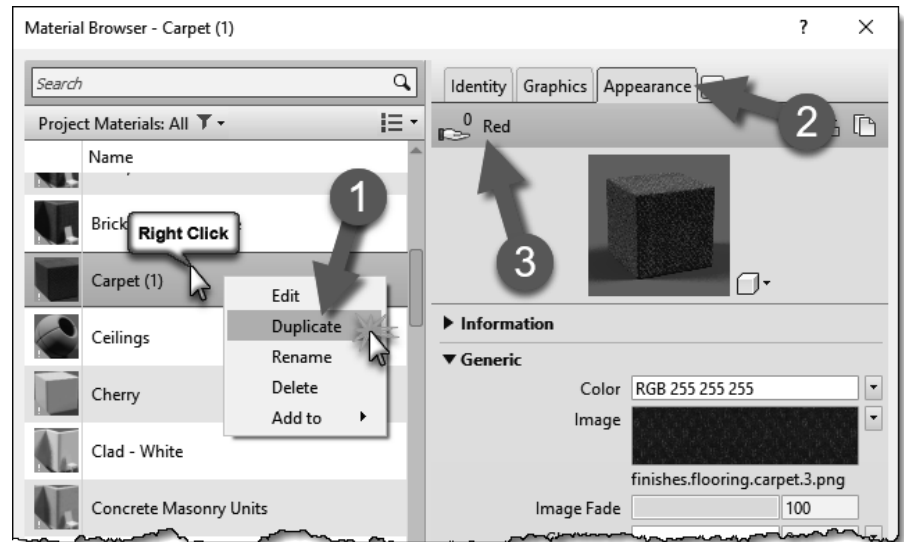
FIGURE 4-2.18 Duplicating a material

Once you have
duplicated a *Material,*
notice the two carpet
materials, in this
example, now indicate
they both share the
same *Appearance Asset.*
Changing one will affect
the other. Click the
Duplicate this asset
icon in the upper right
(Figure 4-2.19).

FIGURE 4-2.19 Duplicating an asset

Finally, when the
Appearance Asset has
been duplicated (Figure
4-2.20), you can expand
the information section
and rename the asset.
You can now make
changes to this material
without affecting other
materials. This applies to
all assets in a *Material.*

FIGURE 4-2.20 Renaming an asset

Adding or Replacing Assets

All of the *Assets*, except *Graphics* and *Identity* (which are not assets), can be replaced with another option from the provided library, called the *Asset Browser*. Additionally, the *Physical* and *Thermal* assets can be deleted.
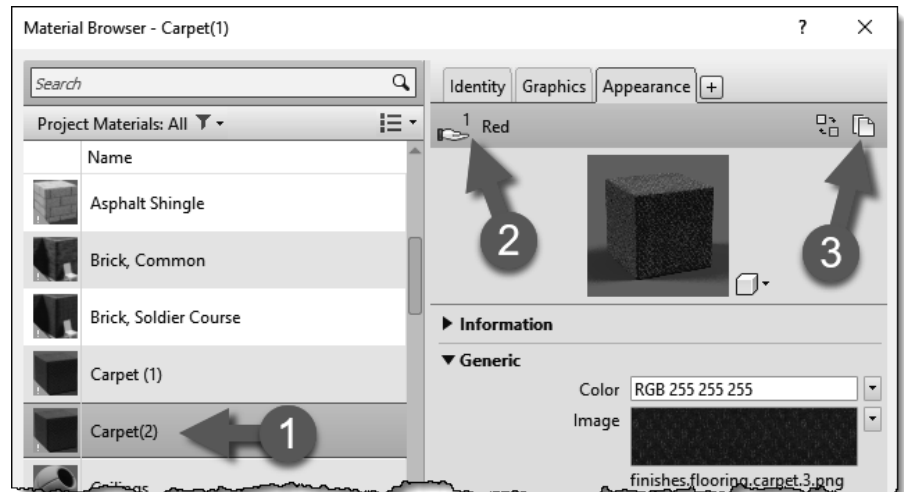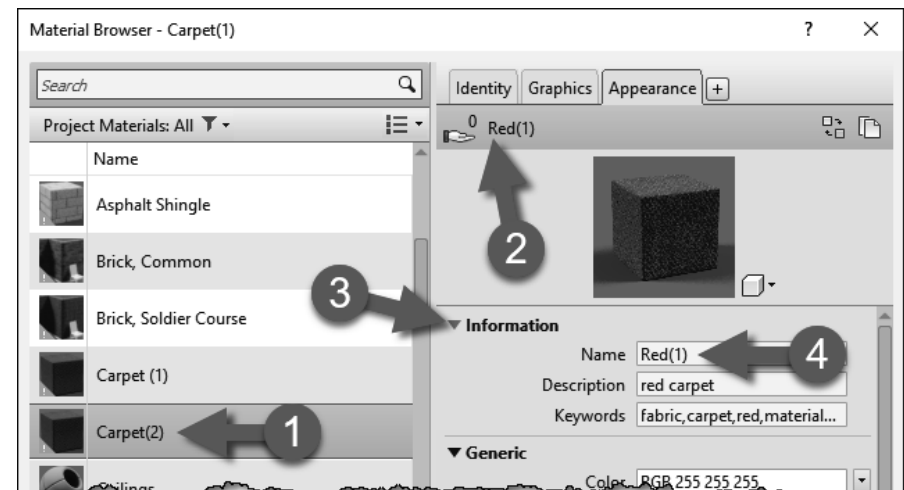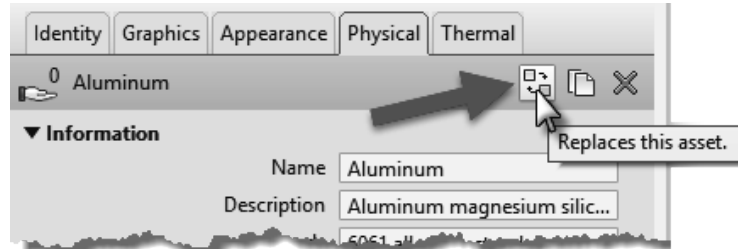

FIGURE 4-2.21 Replacing an asset

If the asset already exists, but you want to change it, click the "Replace" icon shown in Figure 4-2.21. This will open the **Asset Browser**, from which you can choose a different *Asset* (Figure 4-2.22). The *Asset's* properties are hard-wired in the libraries and not directly editable until loaded into a project.

Clicking the icon pointed out in Figure 4-2.22 (item # 2) will push the Asset into the currently selected *Material*.

If your *Material* does not have a *Physical* or *Thermal* asset, in the *Material Browser* you use the **Add Asset** icon option shown in Figure 4-2.23. This too will open the *Asset Browser*.

FIGURE 4-2.22 Asset browser dialog; choosing a physical asset

An asset can be associated with multiple *Materials*. For example, several materials may be based on the same *Physical* asset such as "Pine – Southern." Keep in mind, however, if the asset is adjusted, this will affect all the materials which use it. If a different version were needed, you would have to duplicate the asset before making changes. You will do this later in this chapter.
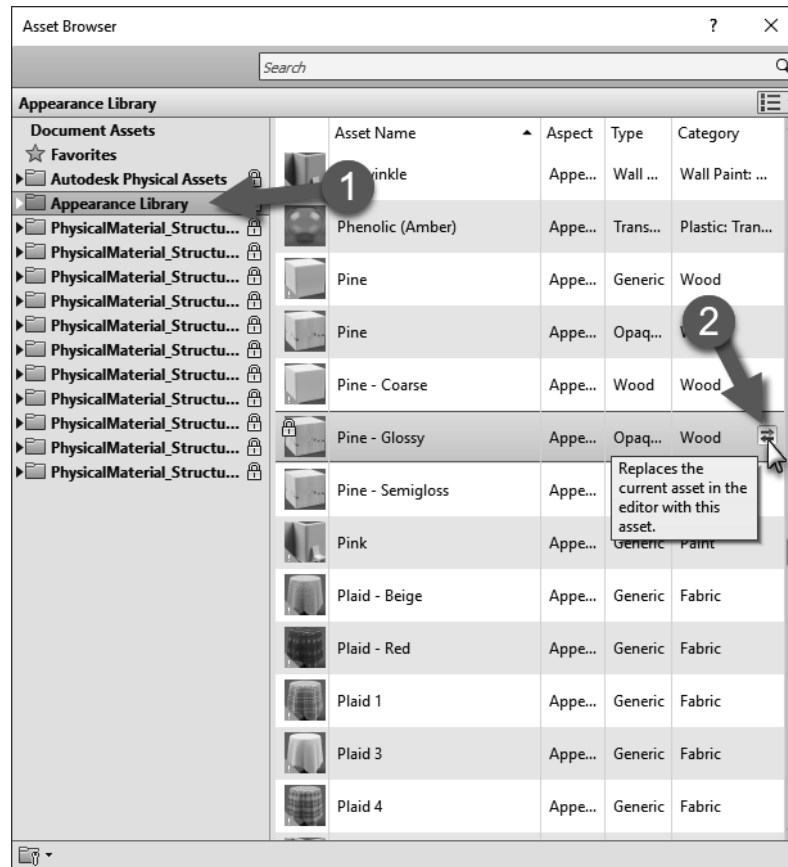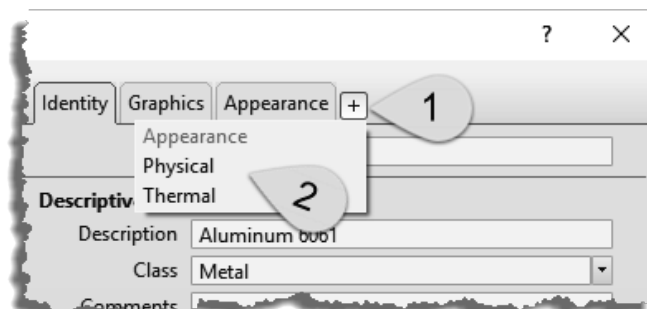

FIGURE 4-2.23 Accessing the asset browser

Materials Library
If the *Material* you want is not available in your project, in the *Project Materials* area of the *Material Browser*, you can either create one or load it from the **AEC Materials** library. If the *Material* you want exists in the library this is much faster than creating your own as it has all the assets, including *Physical* and *Thermal*, preloaded. *FYI:* To see the external materials below, you may have to click the icon shown as step 1 in Figure 4-2.24.

The search box at the top of the *Material Browser* actually searches both the materials in your project and the library (Figure 4-2.24). Notice there are six materials within the project which contain the word tile in the name AND there are several results, within several categories, below in the library.

It is possible to create a custom library here. The library can be stored on a server, allowing multiple users to access it. Use the icon in the lower left to get started with a custom library.
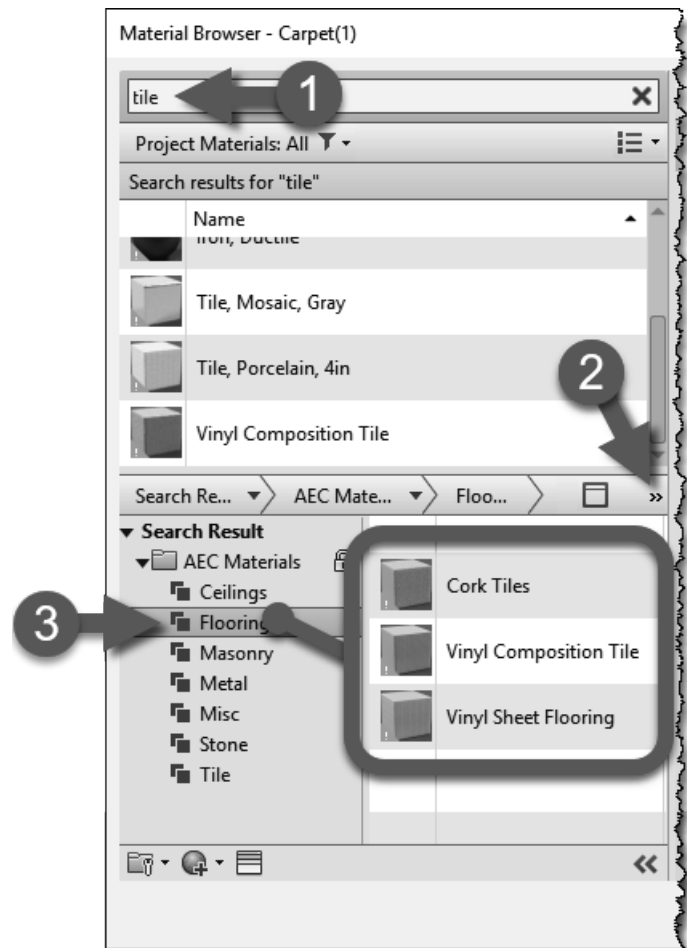
FIGURE 4-2.24 Material Browser; search for material

To load a Material into your project from the library, simply double click on it.

Custom Information
The **Custom Parameters** button, at the bottom of the *Material Browser*, gives you access to a list of *Material*-based parameters in the project. These are user-created parameters used to track pretty much anything you want. One example might be the source distance to better manage which products are locally sourced for LEED accreditation. Clicking this button opens a separate dialog to view the custom parameters (Figure 4-2.25). It is too bad one cannot initiate the creation of a *Material* parameter from this dialog.

FIGURE 4-2.25 Material parameters

Conclusion
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 recently put forth.

Exercise 4-3:
Revit Materials Concepts Applied – Part 1

This section will apply many of the concepts covered thus far. You will open the architectural starter project provided online and save it to your hard drive. Be sure to back up this file often as it is the file you will work on throughout this book.

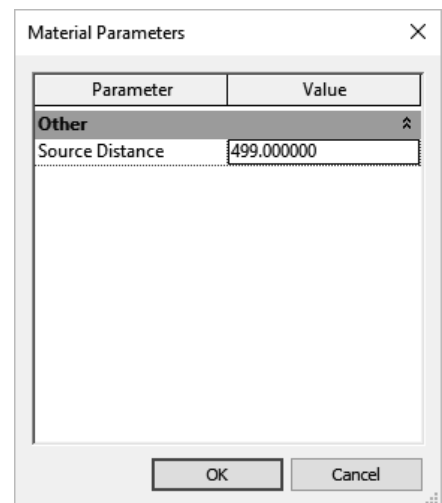Before we open Revit, we will cover a few technical points related to materials. Many materials are noted in drawings using abbreviations. The abbreviations used may vary slightly from firm to firm. A few standards exist and are generally good to follow. However, as long as the abbreviations used are 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 PANEL	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	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

You will select a starter file from the available online files for this book.

1. Open Revit and then select **Open** from the *Quick Access Toolbar*.

2. Browse to the downloaded **Law Office.rvt** model.

   a. See the inside front cover for more information on downloading files for this book from www.SDCpublications.com.

3. Select **Manage** *tab* ➔ **Settings** *panel* ➔ **Materials**.

Next you will create a duplicate of the Carpet(1) *Material*. 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 that it is already installed in the actual building.

4. In the *Project Materials* list, select ***Carpet (1)***.

5. Right-click *Carpet (1)* and then click the ***Duplicate*** in the pop-up menu (Figure 4-3.2).
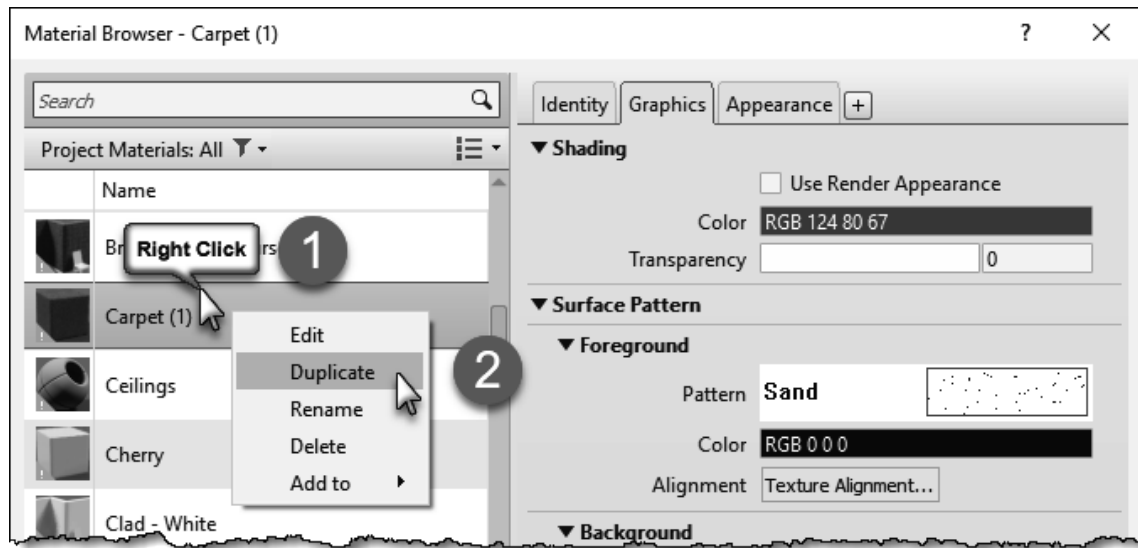

FIGURE 4-3.2 Duplicating a material

A new Material is created with a name similar to the original: Carpet (2). You will rename it.

6. **Rename** *Carpet(2)* to **CPT1**; you should be able to just select the text and change it. If you clicked off of the new material, you will need to right-click and select *Rename*.

7. Switch to the **Identity** tab for the new *Material – CPT1*; information shown will be entered in Step 13 (Figure 4-3.3).

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:	THE 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:	THE POND COLLECTION
STYLE:	WEIMAR (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:	THE POND COLLECTION
STYLE:	WEIMAR (12421)
SIZE:	20"X20" NOMINAL (50 CM X 50 CM)
COLOR:	6968 ACORN
LOC:	ACCENT

First you will focus on the carpet material CPT1, which is manufactured by Interface Flor.
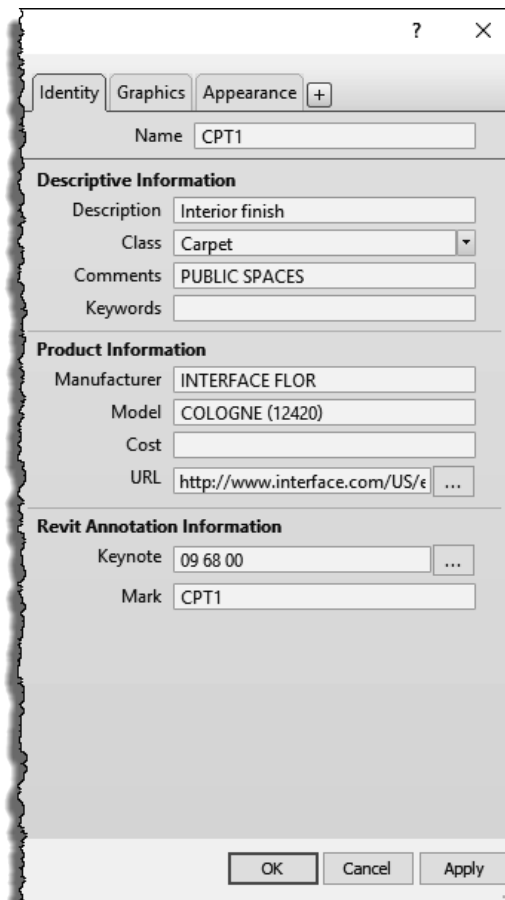
FIGURE 4-3.3 Editing CPT1 Identity data

8. Open your web browser; browse to http://www.interfaceflor.ca

9. Select your region, e.g. *Americas\United States*, and then click the **Search** link (Figure 4-3.4).

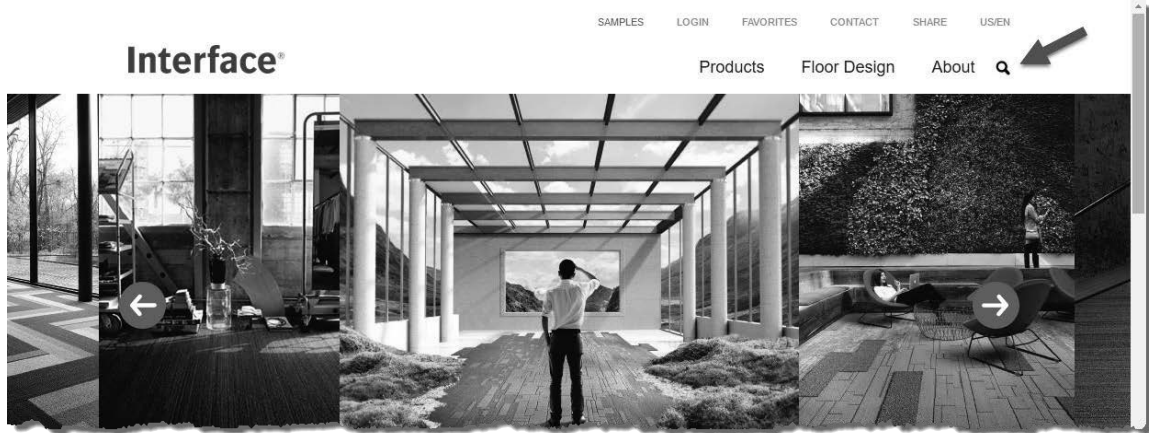   *FYI:* The *website design may change; follow along as best you can.*

FIGURE 4-3.4 Interface Flor website

10. In the search area type *Cologne* and then click **See all results**.

11. Find color **6363 (Peat)** as shown in Figure 4-3.5; click on it to see more details.

12. Click **Specifications** near the top of the page.

You now have access to all the information you need to define the Revit *Material* (Figure 4-3.6).

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 4-3.7.

    NOTE: You will learn more about keynoting later in the book.

Cologne
Peat 6363

FIGURE 4-3.5
Product preview data

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. However, as you will learn later, it is possible to add additional custom parameters in Revit.

14. Switch back to the **InterfaceFlor** website.

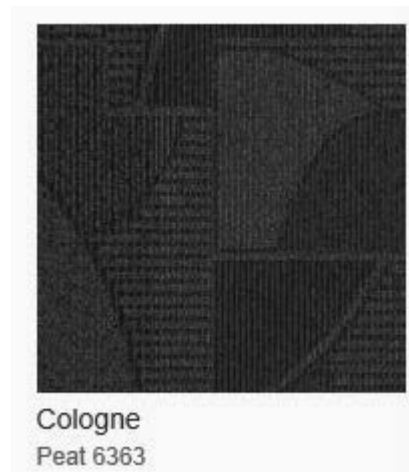15. Near the top of the screen, click **High-res Images** (Figure 4-3.6).

16. Click to **download a zip archive of all high-res images**, and then click **Save** (or *Save As*) when your browser prompts to save the ZIP file.
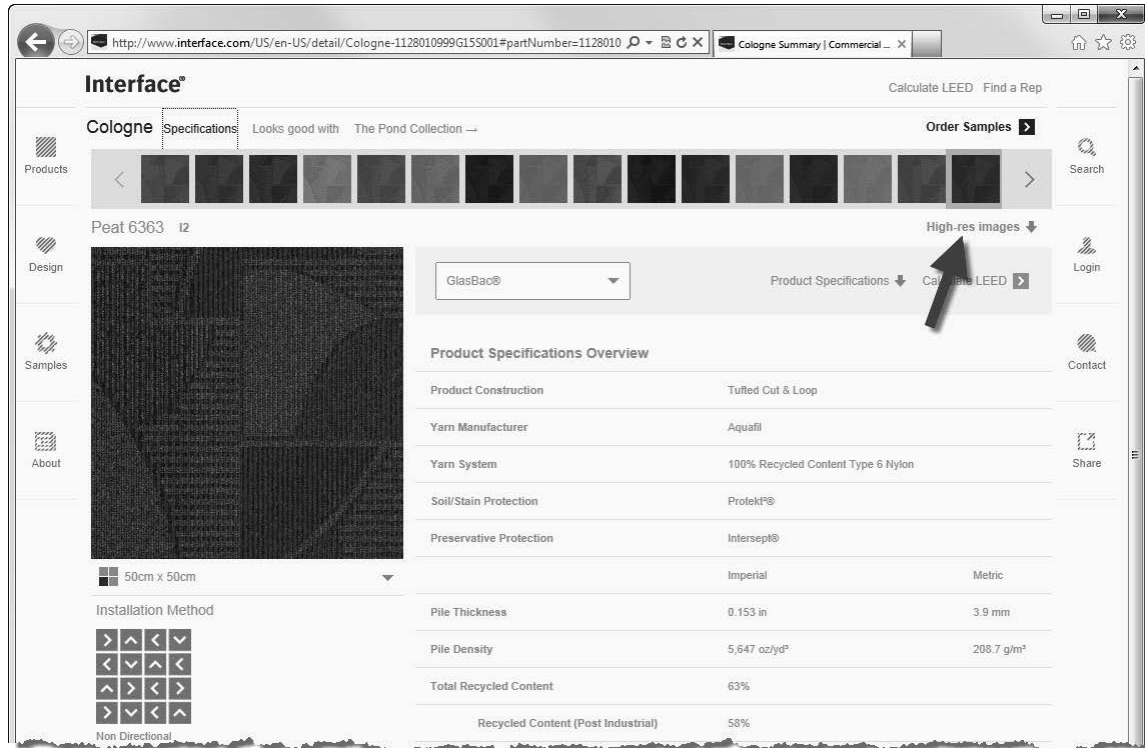

FIGURE 4-3.6 Interface Flor website - specific product page

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 4-3.8), that a PNG raster image is assigned to this material. You will download an image from the carpet manufacturer's 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 your local hard drive.

TIP: *You can set the path to the raster images via File Tab → Options → Rendering. Do this on each user's computer.*
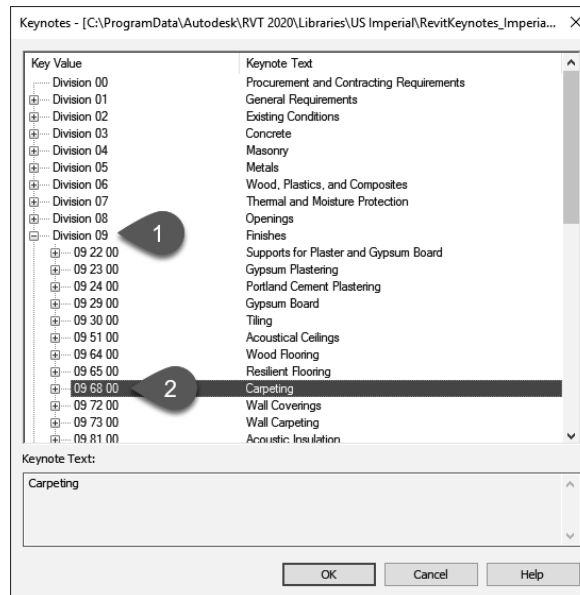

FIGURE 4-3.7 Keynotes selection dialog

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 file location in a moment.

17. Double-click on the Zip file in File Explorer (Windows) and Copy/Paste **cologne_6363_Peat_Variation1.jpg** to your project folder.

You now have an image file which represents the specified carpet style available on your computer or network. You will assign this image to the *Appearance* asset. But first you will duplicate the *Appearance* asset because the one named "Red" (Figure 4-3.2) is not applicable.

18. Back in Revit, on the *Appearance* tab, click the **Duplicate this asset** icon (Figure. 4-3.8).
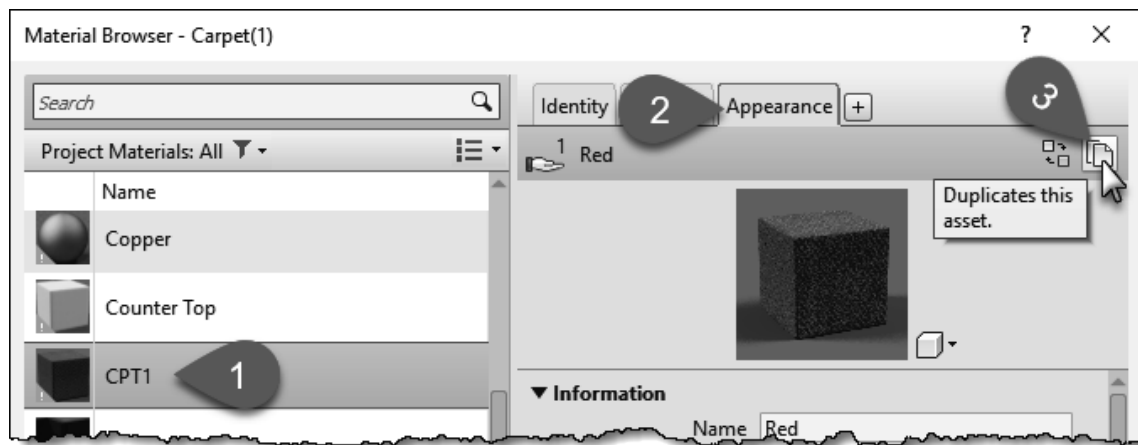

FIGURE 4-3.8 Duplicating an appearance asset

19. Expand the **Information** area and change the *Name* to **CPT1** (see Figure. 4-3.9).

   a. You should also edit the *Description* and keywords.

You now have a new *Appearance* asset in your project named CPT1. This can be changed without affecting any other material.

20. In the *Generic* section, click on the file name link pointed out in Figure 4-3.10.

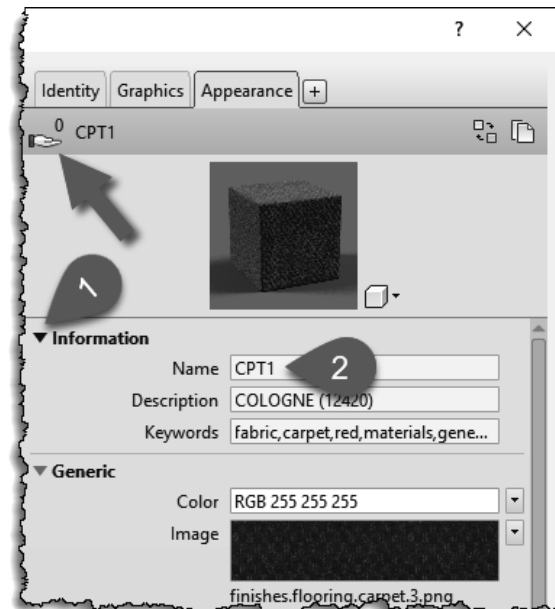21. Browse to the image file saved in Step 17 above, select it and click **Open**.

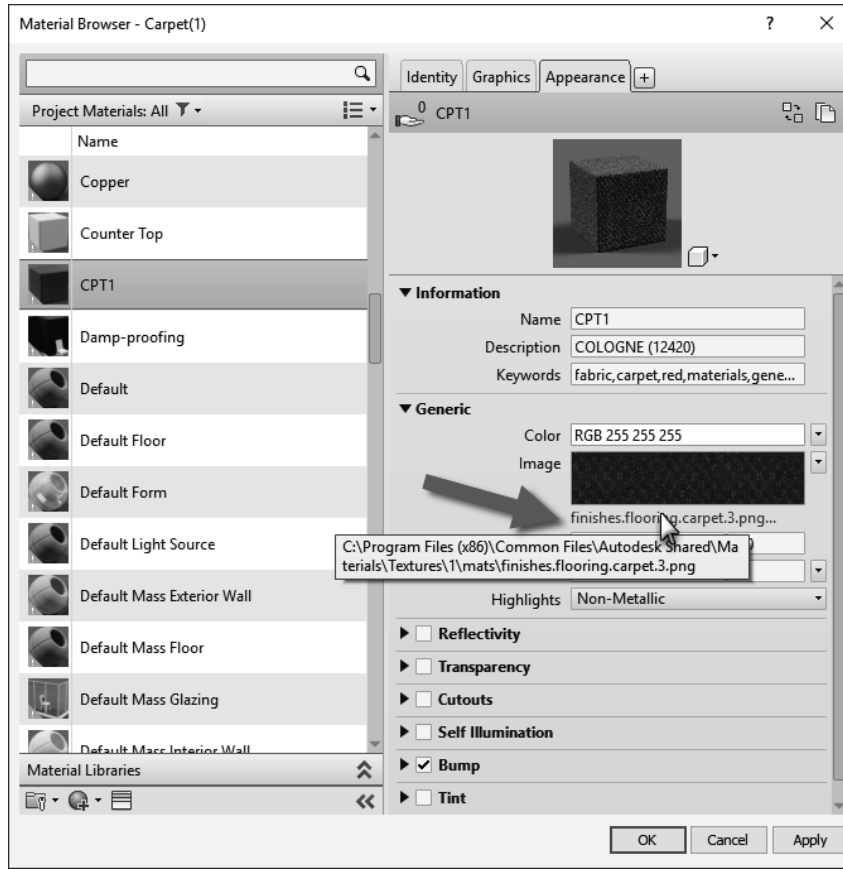**FIGURE 4-3.9** Editing an appearance asset

FIGURE 4-3.10 Keynotes selection dialog

Now, when using the *Realistic* or *Ray Trace* display styles OR doing a rendering, 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.

22. *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 Browser* dialog (Figure 4-3.11). 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.

23. Click the **chain icon** pointed out in Figure 4-3.11.

Next you will adjust the *Scale* dimensions. Even though the project is set up 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. Interface happens to manufacture their carpet tile to a metric size, so you will try this now.

24. Highlight the value listed next to *Width* and type: **50cm**.

25. Make the same change for *Height*.

26. Click **Done**.

27. Uncheck **Bump** on the *Appearance* tab.

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 working on a copy of the image in another program such as Adobe Photoshop, which will not be done at this time.

28. Switch to the *Graphics* tab and check **Use Render Appearance** under *Shading*.

Notice how Revit automatically adjusts to 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.

FIGURE 4-3.11 Texture Editor

29. Using the steps just covered, create two more *Materials* for **CPT2** and **CPT3** as defined on page 4-24. Be sure to duplicate the *Appearance* asset each time.

    FYI: When you duplicate CPT1 *you save some typing (i.e. data entry) as all the values for the selected* Material *are also duplicated. However, you need to be careful and review everything so you do not leave incorrect information assigned to the new* Material.

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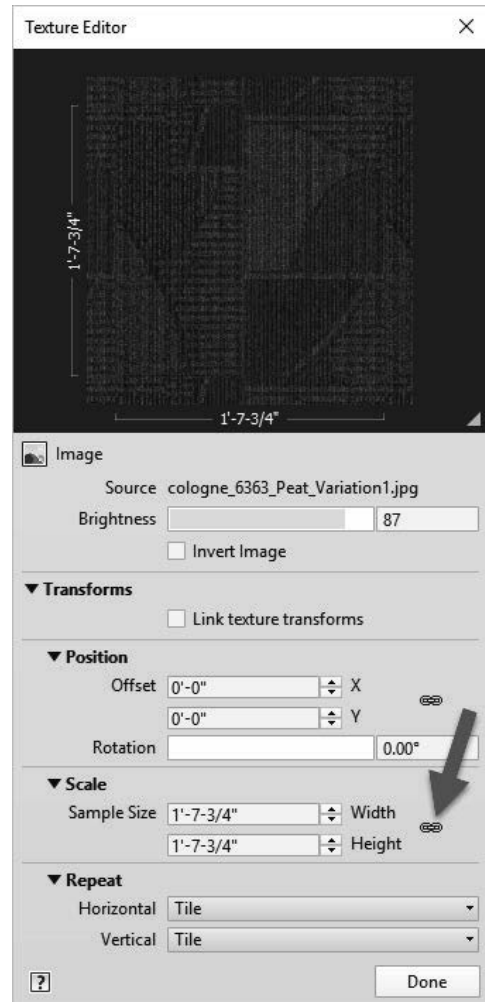
Each paint manufacturer organizes their color information a little differently. We will take a look at the Sherwin-Williams website specifically. Often, the other paint manufacturer's sites will be similar. Be sure to check out the various color tools provided, such as the smart phone and Adobe Photoshop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

09 91 00 - PAINTING AND COATING

PT1 PAINT 1 (WALLS) *R242 G224 B195*
    COLOR: "BEIGE"
    MFG: SHERWIN-WILLIAMS
    SW0051 CLASSIC IVORY
    Revit Material Settings: *Application*: Roller, *Finish*: Eggshell

PT2 PAINT 2 (INTERIOR HM DOORS & FRAMES / STEEL) *R99 G101 B98*
    COLOR: "GRAY"
    MFG: SHERWIN-WILLIAMS
    SW7068 GRIZZLE GRAY
    Revit Material Settings: *Application*: Brush, *Finish*: Semi-gloss

PT3 PAINT 3 (CEILINGS & SOFFITS, EXPOSED STRUCTURE) *R233 G236 B232*
    COLOR: "WHITE"
    MFG: SHERWIN-WILLIAMS
    SW7007 CEILING BRIGHT WHITE
    Revit Material Settings: *Application*: Roller, *Finish*: Flat

PT4 PAINT 4 (ACCENT WALL COLOR) *R120 G107 B100*
    COLOR: "BROWN"
    MFG: SHERWIN-WILLIAMS
    SW6040 LESS BROWN
    Revit Material Settings: *Application*: Roller, *Finish*: Eggshell

PT5 PAINT 5 (TOILET ROOMS) *R203 G184 B162*
    COLOR: "BROWN"
    MFG: SHERWIN-WILLIAMS
    SW6093 FAMILIAR BEIGE
    Revit Material Settings: *Application*: Roller, *Finish*: Eggshell

30. Browse to the Sherwin-Williams website: http://www.sherwin-williams.com.

31. Choose your region if prompted.

32. Select **Paints, Stains, Colors & Supplies → For Architects, Specifiers & Designers**.

33. Click the **Color Selection** link; look at the options.

34. In the search box at the top, type **SW0051** and then press **Enter**.

35. Click on the preview swatch for **Classic Ivory** and then click **Details** to see more information (Figure 4-3.12).

You should now see the information shown below (Figure 4-3.12). Notice the RGB Value listed: 242,224,195. These are 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.
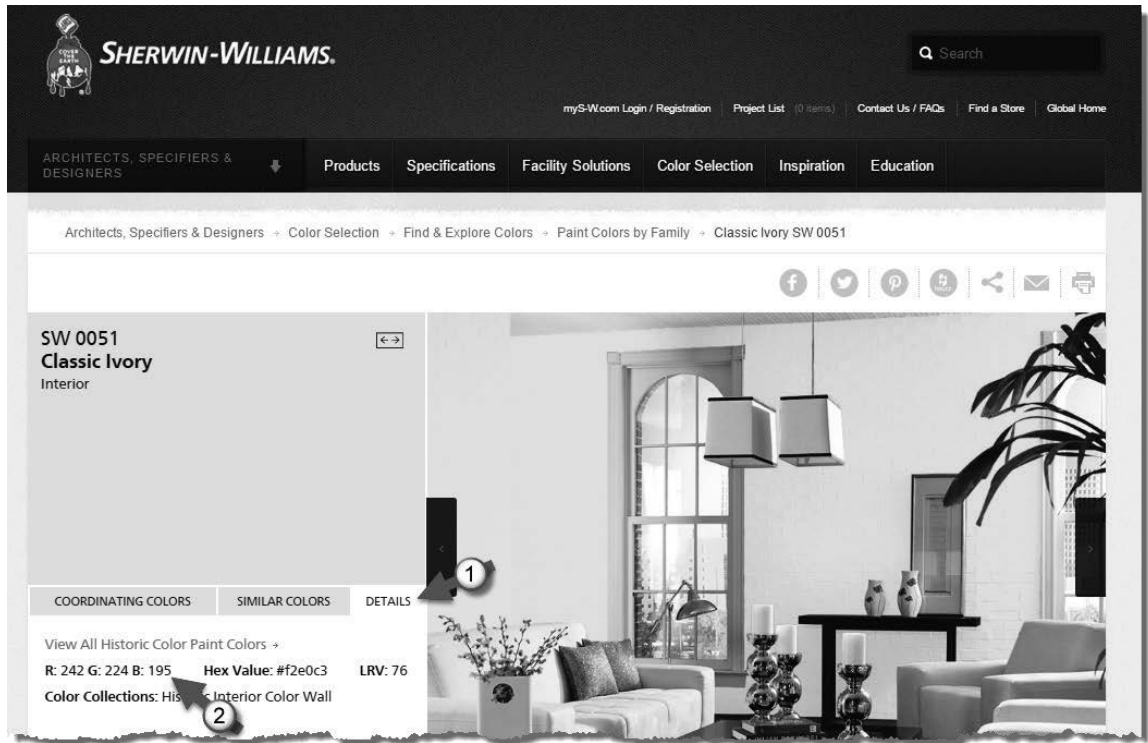
FIGURE 4-3.12 Sherwin Williams website

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.

36. Back in your *Law Office* Revit model, open the **Materials** dialog.

37. Select the *Material* **Gypsum Wall Board**.

38. **Duplicate** the *Material* (via right-click).

39. Rename the new material to **Gypsum Wall Board – PT1**.

40. Fill out the **Identity** tab using the information from the website as shown in Figure 4-3.13.
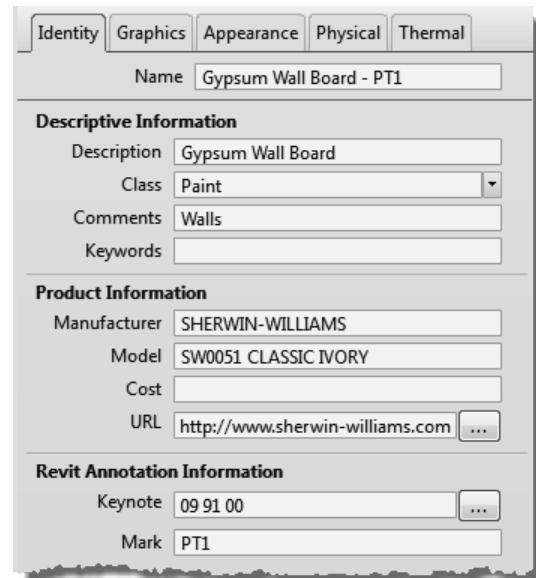

FIGURE 4-3.13 Identity info for PT1

41. Switch to the **Appearance** tab.

Next you will need to replace the *Appearance* asset with one specifically meant for paint. Currently it is set to *Generic* and not *Wall Paint* as pointed out in Figure 4-3.14.

42. Click the **Replace this asset** icon (Figure 4-3.14).

The *Asset Browser* has now opened (Figure 4-3.15). Here you need to select a *Wall Paint* asset and overwrite the *Generic* asset in the law office model.

FIGURE 4-3.14 Replace asset icon

All the *Wall Paint* assets provided are for specific colors, so we essentially need to duplicate one and rename it. However, the assets in the Autodesk libraries are not editable. So, we need to load one into the project and then rename it. We will do this next.

43. In the *Appearance Library* list on the left, select **Wall Paint** (Figure 4-3.15).

44. Click the "load into project" icon for the **Beige** asset, or double-click the asset name.

The appearance asset should now be updated in your project. Next you will rename it. This can be done in the *Asset Browser*.
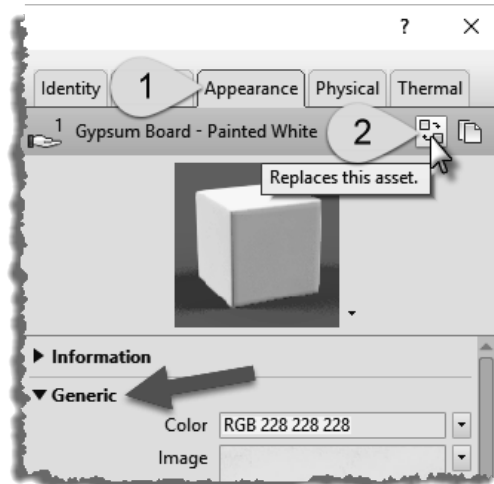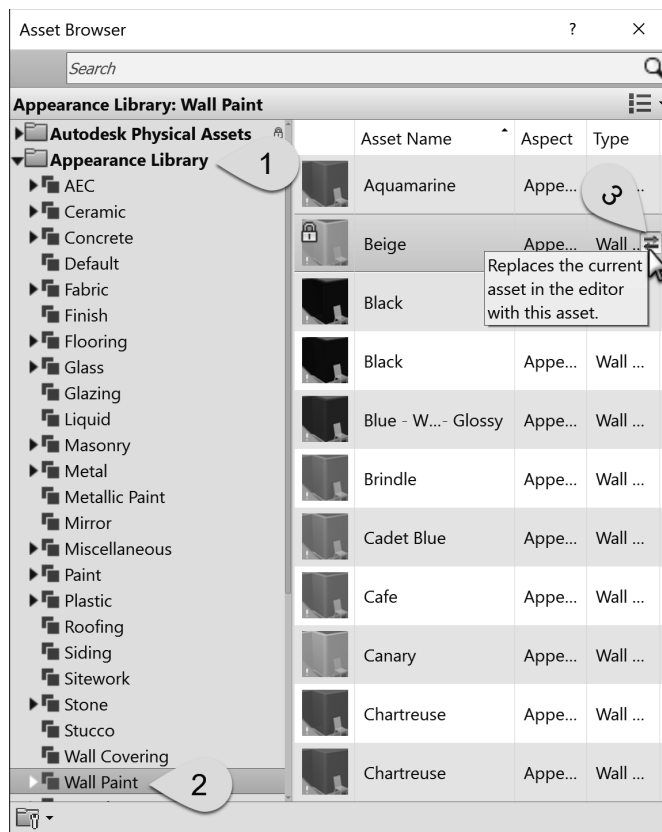
45. **Close** the *Asset Browser* dialog.

FIGURE 4-3.15 Asset browser, appearance library

46. Expand the **Information** area in the *Appearance* tab (Figure 4-3.16).

47. Change the *Name* **SW 0051 Classic Ivory**.

Now you can adjust the specific paint information for your *Material* (Figure 4-3.17). Keep in mind that this *Appearance* asset may be applied to other *Materials* in your project. For example, the asset could be applied to a CMU wall or metal railing. Any adjustments made to the asset are instantly applied to all *Materials* which use it.

48. Click on the **RGB color numbers** to adjust them.

49. Change the RGB numbers as follows (Figure 4-3.18):

      b.   R: 242

      c.   G: 226

      d.   B: 195

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!

50. Adjust the *Finish* option to **Eggshell**.

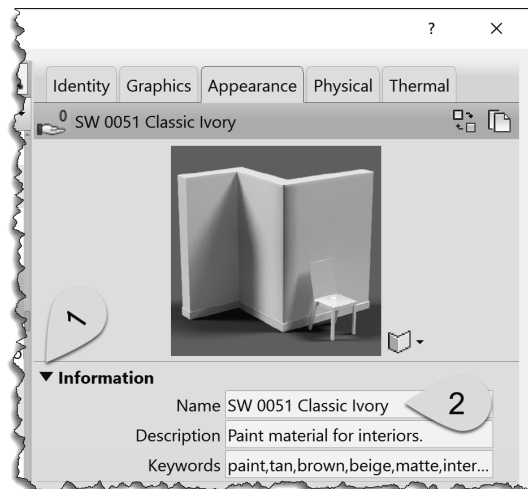51. Adjust the *Application* option to **Roller**.
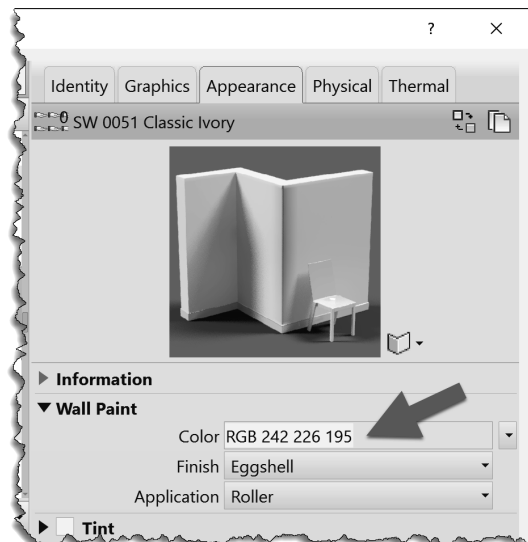

FIGURE 4-3.16 Rename new assert

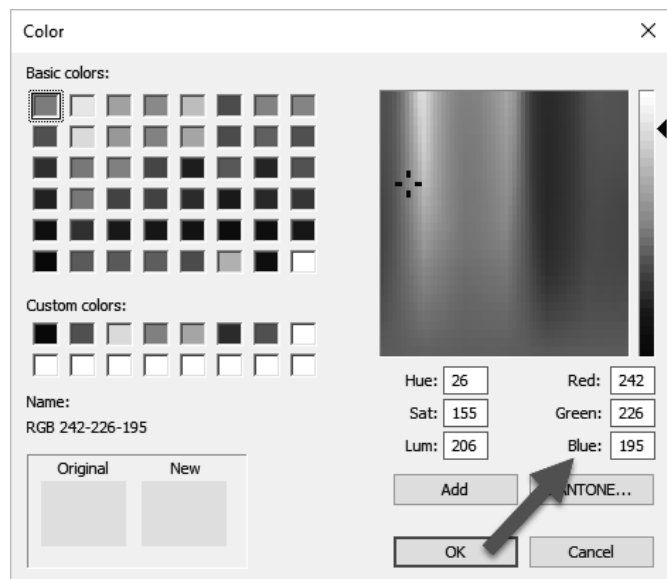**FIGURE 4-3.17** Final appearance settings

FIGURE 4-3.18 Materials dialog; Adjust appearance color

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 do not really apply.

52. Switch to the **Graphics** tab.

53. Make sure the **Use Render Appearance** under *Shading* is checked (Figure 4-3.19).

Notice how the RGB color matches the value you entered for the render *Appearance*. Again, the *Appearance* information is for *Realistic* & *Ray Trace* 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*.

Next you will set the cut pattern to *None*. It is not typically necessary to hatch this material (i.e. gypsum board) because it is not very thick (1/2″ – 5/8″ typically), so the pattern does not read well.

54. Set the *Foreground Cut Pattern* to **None** (Figure 4-3.19).

55. Repeating the steps just covered, create a material for **PT2** through **PT5** as shown on page 4-30.

    a. **PT2** should be duplicated from *Steel, Paint Finish, Ivory, Matte* in AEC Materials library.

    b. **PT3** should be duplicated from *Gypsum Ceiling Board.*

    c. **PT4** & **PT5** should be duplicated from **PT1.**

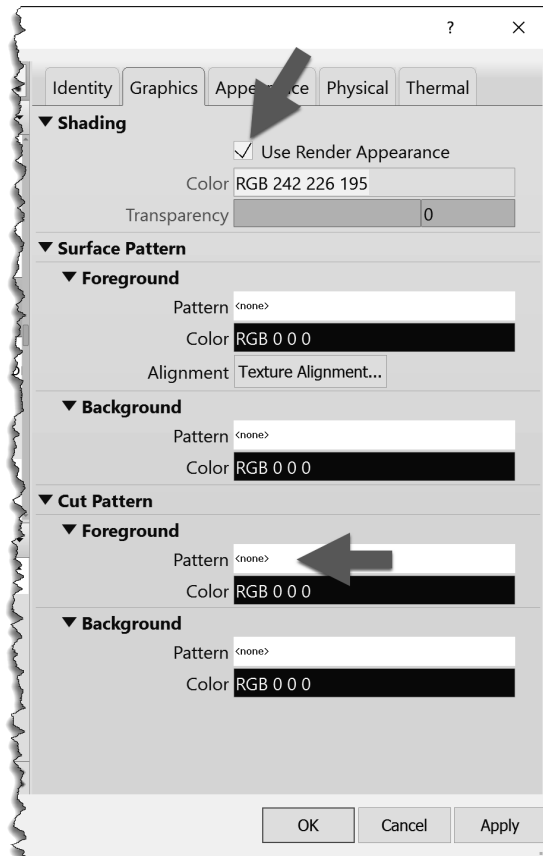56. Remember to **Save** your project often to avoid losing work.

FIGURE 4-3.19
Material Browser; Graphics tab

Exercise 4-4:
Revit Materials Concepts Applied – Part 2

We will continue to develop several real-world materials in Revit.

```
09 30 00 - TILING
    CT1  CERAMIC TILE 1 (SHOWER WALL TILE)
        MFG:          DALTILE
        STYLE:        MATTE WALL TILE
        SIZE:         4-1/4" X 4-1/4" NOMINAL
        COLOR:        X735 ALMOND
        GROUT:        944 LIGHT CHOCOLATE (RGB = 99, 77, 61)

    CT2  CERAMIC TILE 2 (SHOWER CEILING TILE)
        MFG:          DALTILE
        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 (RGB = 248, 248, 248)

    PRT1  PORCELAIN TILE 1 (FLOOR TILE)
        MFG:          DALTILE
        STYLE:        CITY VIEW
        SIZE:         18" X 18" NOMINAL
        COLOR:        CY04 DOWNTOWN NITE
        GROUT:        TEC 927 LIGHT PEWTER (RGB = 126, 128, 130)

    PRT2  PORCELAIN TILE 2 (WALL BASE TILE)
        MFG:          DALTILE
        STYLE:        CITY VIEW
        SIZE:         6" X 12" NOMINAL COVE BASE
        COLOR:        CY04 DOWNTOWN NITE
        GROUT:        TEC 927 LIGHT PEWTER (RGB = 126, 128, 130)
```

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.

1. Open the *Material Browser* dialog in Revit.

2. Filter the material list by *Class* **Ceramic**; click the down arrow as shown in Figure 4-4.1.

You should see two materials: "Ceramic Tile – 4″ Blue" and "Porcelain, Ivory."
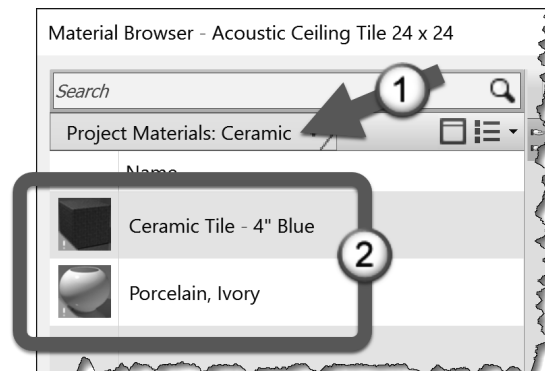

FIGURE 4-4.1 Filter materials by class

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. We will discuss this more in the chapters dealing with modeling.

3. Select **Ceramic Tile – 4″ Blue** and **Duplicate** it via right-click.

4. Rename the new *Material* to **CT1**.

5. With the new *Material* selected, switch to the **Identity** tab.

Next you will go to the Daltile 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.

6. Go to www.daltile.com using your web browser.

7. In the search box enter **X735**.

8. Click on the **Matte** option, via the *Matte* wall tile preview.

9. Use the current web page address for the *Material* **URL** in Revit.

FIGURE 4-4.2 Material Browser; Identity tab

10. Find the X735 tile sample (click on it).

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.

11. Finish entering the information on the *Identity* tab as shown in Figure 4-4.2.
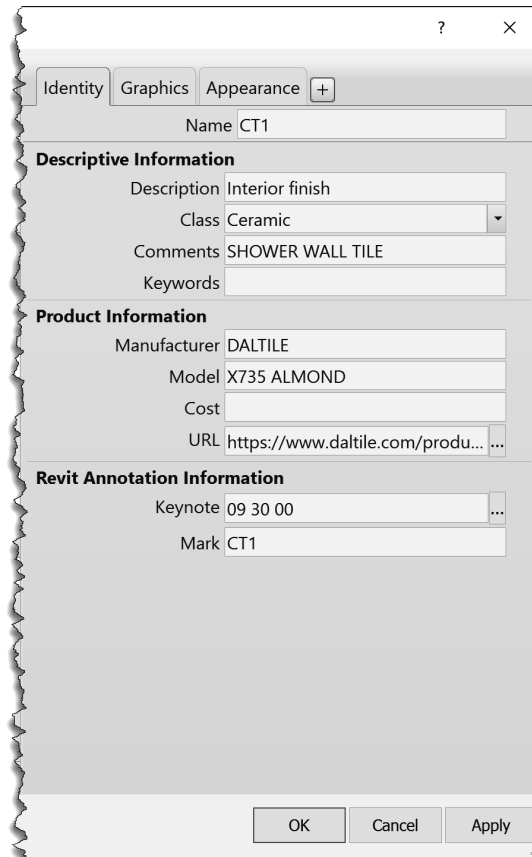
Note that the *Class* being set to *Ceramic* on the *Identity* tab (Figure 4-4.2) only relates to which category the *Material* is listed under in the *Material Bowser* and does not directly relate to the actual material assigned on the *Appearance* tab. However, you should make sure they match so there is no contradiction.

12. In Revit, switch to the **Graphics** tab.

13. Make sure **Use Render Appearance** under *Shading* is **not** checked.

14. Click the color swatch to adjust the RGB color.

15. Set the RGB color to
    R=231, G=220, B=202
    (similar to Figure 4-3.17).

16. Click the *Foreground Surface Pattern*
    preview, select the **Model** option,
    and then select **4.25″ Tile**. Click **OK**
    to close the *Fill Patterns* dialog.

17. Set the *Cut Pattern* for the tile to
    None (Figure 4-4.3); click the
    preview and then click the *No Pattern*
    button.

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 do not have a representative image with a repeating grout pattern to download, you have to either find one in the *Autodesk Library*, modify a material, take a picture of the tile installed somewhere or find something online.

FIGURE 4-4.3 Material Browser; Graphics tab

18. Switch to the **Appearance** tab.

19. Duplicate the *Appearance Asset* and rename it **CT1** (Steps 1 & 2, Figure 4-4.4).

Notice this material is currently using an image file to represent the tile (Figure 4-4.4). 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.

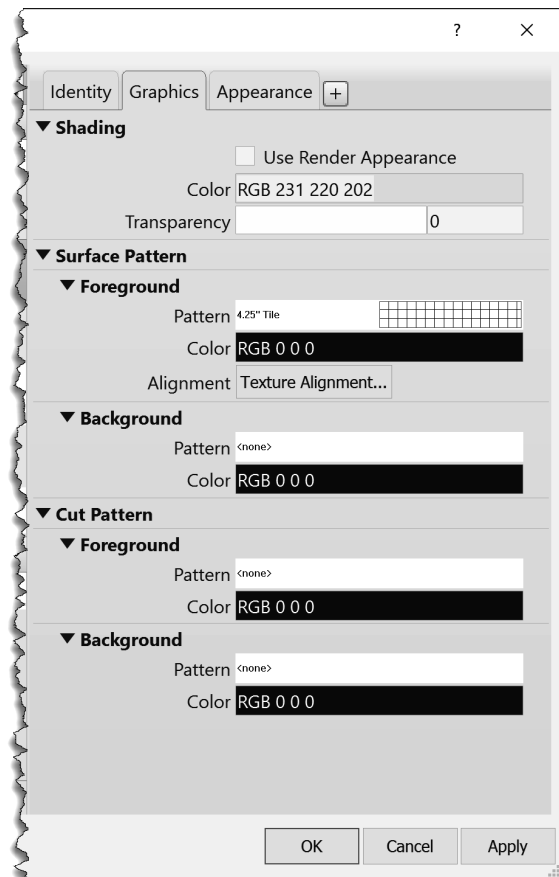20. Click the down-arrow to the right of the image preview (Step 3, Figure 4-4.4).

21. Select **Tiles** from the list.

Revit still understands this material to be "ceramic" but rather than using an image, it is now using a "synthetic" tile pattern. The appearance asset is synthetic in that it is computer generated. As you will see in a moment, this provides the designer with the tools to quickly create a tile pattern when an image file is not available.

You are now in the *Texture Editor* shown in Figure 4-4.5. Here you can adjust all sorts of settings related to how the tile pattern should appear. One of the adjustments one can make is the tile pattern. Is the pattern stack bond, running bond, common flemish bond, etc.? You can even adjust the grout color and size.

This method can be used for many other materials such as sidewalks. For sidewalks, the number of rows can be set to zero and the column set to be about 5'-0" or whatever spacing you want.

FIGURE 4-4.4 Material Browser; Appearance tab

22. Make the adjustments shown in Figure 4-4.5.

23. Click **Done** to exit the Texture Editor.

FYI: The grout types listed are manufactured by TEC. If interested, you can visit their website at www.tecspecialty.com. Look for AccuColor® Premium Unsanded Grout (Cementitious Grout).
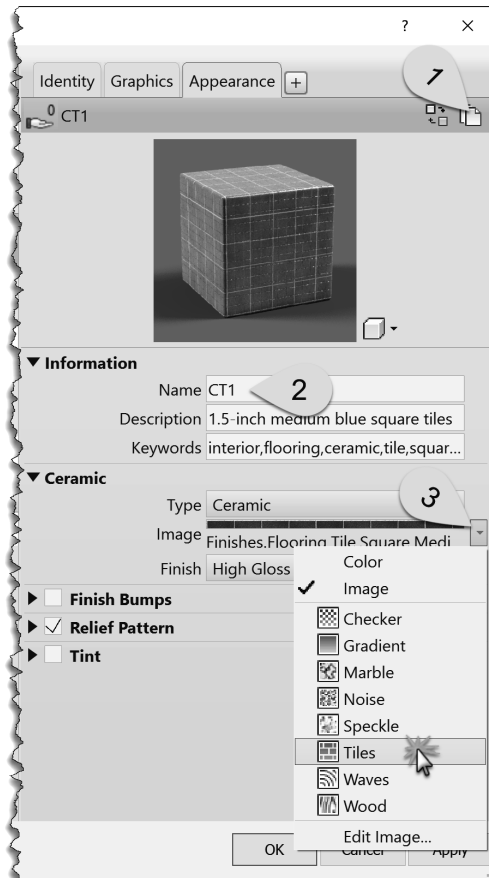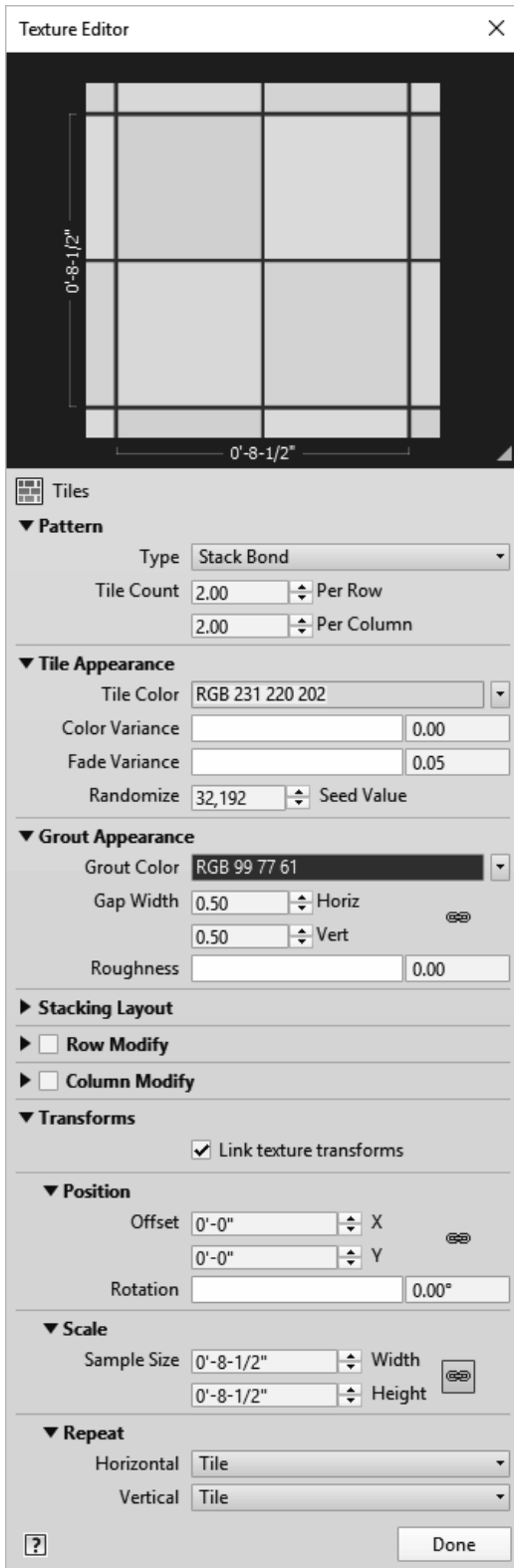
FIGURE 4-4.5 Texture editor

The *Material Browser* dialog below shows one of the other options shown in Figure 4-4.4. This is the **Checker** option where you can select two separate colors. This can be used for an entire wall or in an accent area (Figure 4-4.6). Be sure to explore the other options, such as *Wood*, which can be used to represent wood or other things such as art glass.
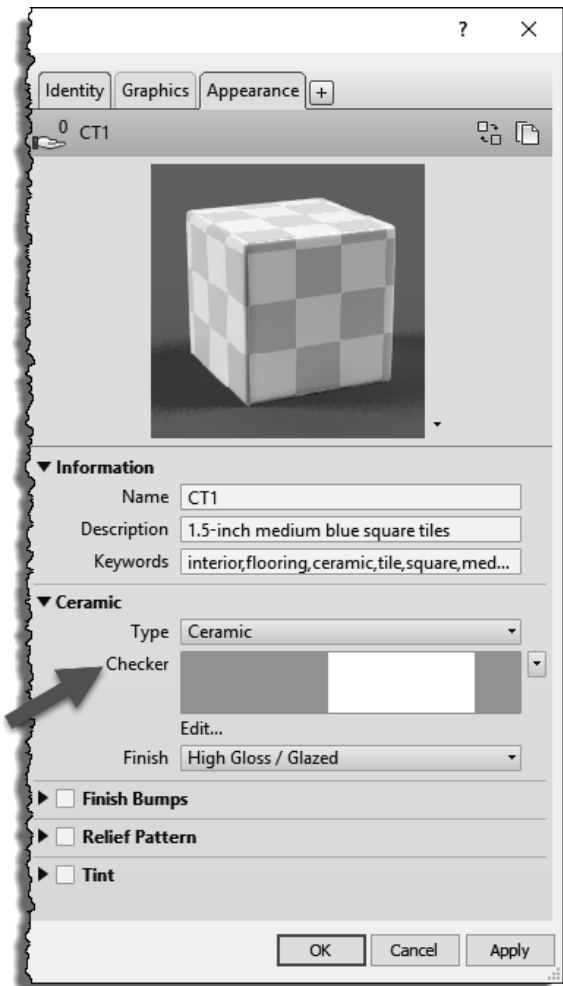

FIGURE 4-4.6 Material Browser (alternate option)

A *Relief Pattern* would be like embossing a piece of paper. In the raster image currently being used (TileSquareBump.png in this case) the non-white areas are debossed on the otherwise flat/infinite ceramic material. This *Relief Pattern* gives the general appearance of a tile pattern.

24. Switch the *Relief Pattern* to a **Tiles** pattern, similar to steps 20 and 21.

25. Adjust the settings to match Figure 4-4.7.

Notice the other options, including the ability to rotate the pattern.

26. Click **Done**.

27. Switch back to the *Graphics* tab.

28. Click the **Texture Alignment** button.

This can be used to make sure the surface pattern and the appearance pattern align.
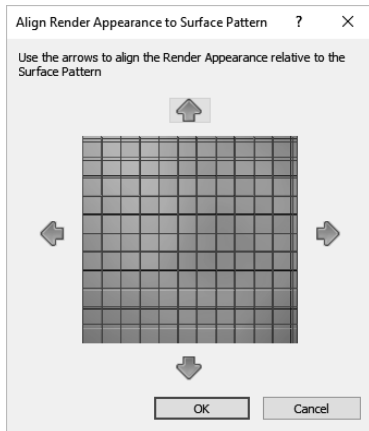

FIGURE 4-4.8 Texture alignment

29. Click the arrows if necessary to make the fill pattern align with the render appearance pattern (Figure 4-4.8).
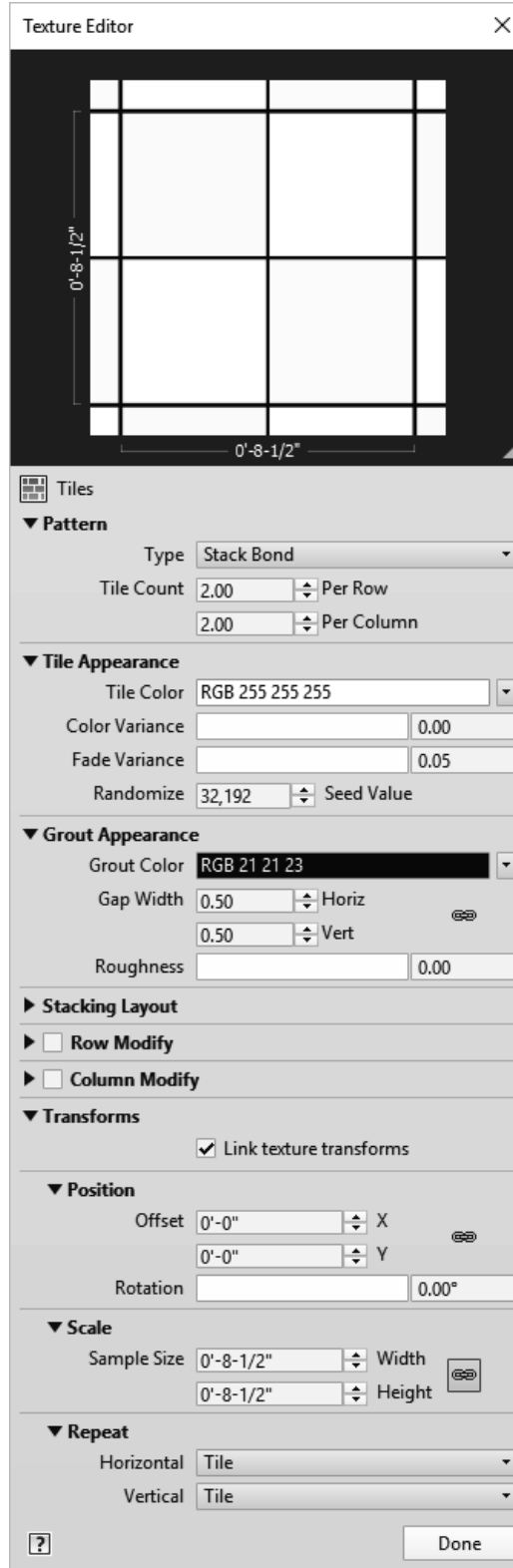
30. Click **OK** to close the *Material Browser*.

FIGURE 4-4.7 Texture Editor for relief pattern

The following two images in Figure 4-4.9 highlight the difference in a rendered image when the *Relief Pattern* is used, as seen in the example on the left, and when one is not, on the right. The *Relief Pattern* actually gives the material a three-dimensional look. The lighting in the space is actually in sync with the *Relief Patterns* as well. Notice how the shade and highlights correspond with the lighting primarily coming from the top right in the image on the left. The image on the right is flat and void of any shading or highlights at the edge of the tiles.
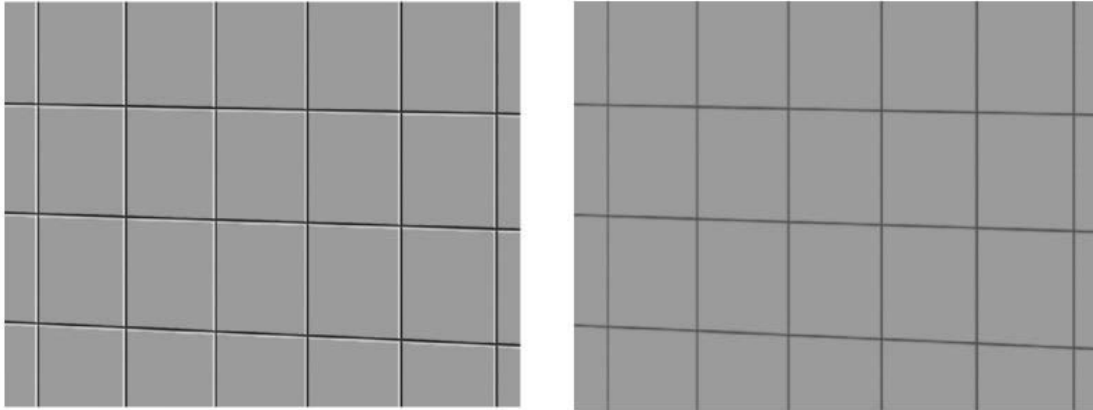

FIGURE 4-4.9 Rendered material with *Relief Pattern* on left, and without on right

Now you will create another ceramic tile pattern using CT1 as a starting point.

31. Create *Material* **CT2**:

    a. *Duplicate* CT1 via a right-click

    b. *Rename* to CT2

32. Switch to the **Graphics** tab.

33. Use the following RGB values for shading: R=244, G=240, B=237.

Next you will adjust the *Surface Pattern* so it is rotated 45 degrees.

34. On the **Graphics** tab, click the pattern preview next to *Foreground Surface Pattern*.

35. Set the *Pattern Type* to **Model** and then click the **New fill pattern** button.

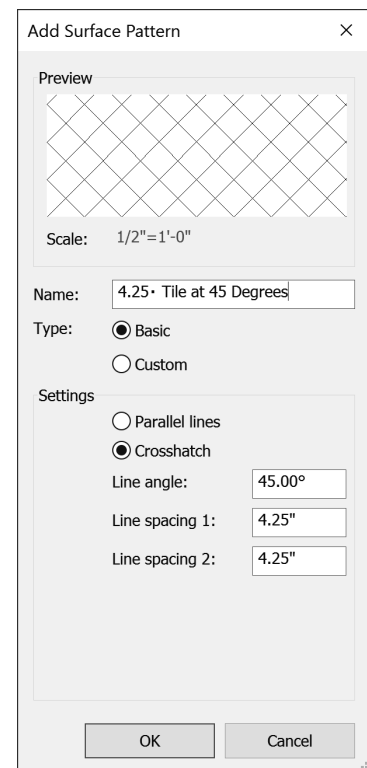36. Adjust the settings to match Figure 4-4.10; enter the *Name* **4.25″ Tile at 45 Degrees**.

FIGURE 4-4.10
Add Surface Pattern dialog

37. Click **OK** to create the new model pattern. Remember, model patterns do not change size when the view scale is changed for a given view.

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

38. In the Fill Pattern dialog, click **OK** to accept the new pattern for the material's *Foreground Surface Pattern*.

39. Switch to the *Appearance* tab.

Before making any changes to the *Appearance* asset you need to understand that the *Material* you just copied (i.e. CT1) is using the same asset. Revit reminds you of this by the icon pointed out in Figure 4-4.11; it indicates that this asset is shared with one other material. So, if you rotate the *Appearance* asset for CT2, it will also change CT1. In the next few steps you will rename the *Appearance* asset and notice how both materials are affected. Then you will duplicate the *Appearance* asset and assign the new one to CT2.
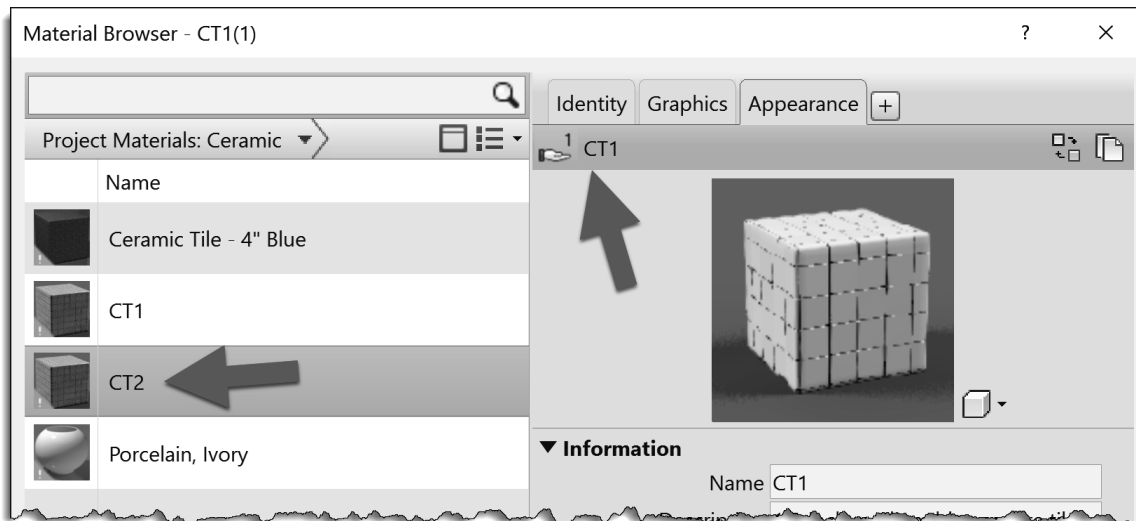

FIGURE 4-4.11 Material Browser; shared appearance asset icon

40. Expand the *Information* section, on the *Appearance* tab, and change the *Name* to **CT2**.

41. Switch between *Materials* CT1 and CT2 and notice they both have this newly renamed *Appearance* asset assigned to them.

Next you will duplicate the *Appearance* asset for CT2 and correct the name for CT1.

42. In the *Material Browser*, select **CT2**.

43. On the *Appearance* tab, click the "Duplicate this asset" icon (Figure 4-4.12).

44. Switch over to the **CT1** *Material* and rename the *Appearance* asset back to CT1.

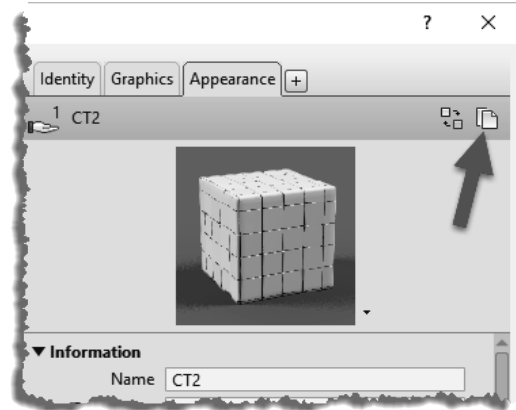45. Now switch back to *Material* **CT2** and rename the *Appearance* asset CT2(1) to **CT2**.

FIGURE 4-4.12 Duplicate asset icon

You now have a new *Appearance* asset called CT2 which can be applied to multiple *Materials* if needed. Changing it in one place changes it in all locations.
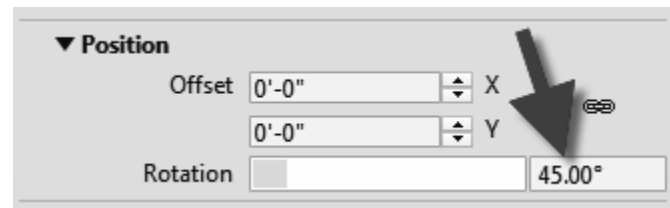
46. Adjust the rotation of the *Appearance Asset* to **45** degrees; click **Edit…** in both the *Ceramic* and *Relief Pattern* sections (Figure 4-4.13).

FIGURE 4-4.13 Rotate texture 45 degrees

47. Adjust the RGB color for the ceramic to R=244, G=240, B=237.

48. Switch back to the **Graphics** tab.

49. In the *Surface Pattern* area, click the **Texture Alignment** button.

50. 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.

51. Click **OK** to close the *Material* dialogs.

52. **Save** your project.

Your *Material* preview should look like that shown in Figure 4-4.14 to the right.
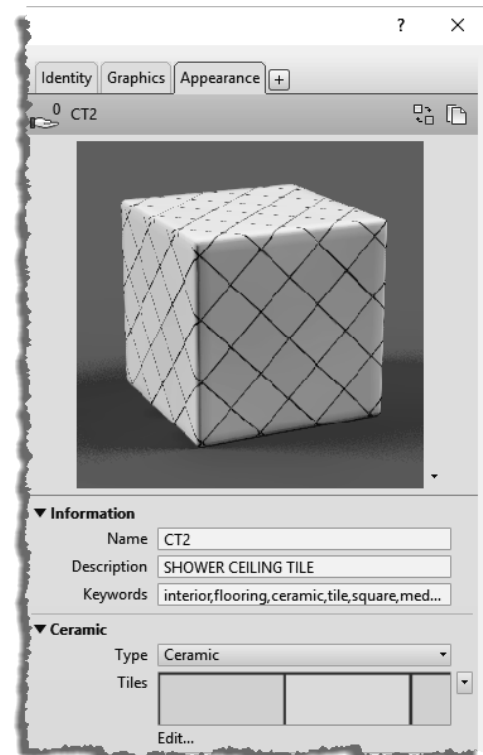

FIGURE 4-4.14 Completed CT2

Next you will create the last two tile materials.

53. In the *Materials* dialog, select CT1 and then **Duplicate** it; name the new material **PRT1**.

54. Adjust the **Identity** information per the steps previously covered to create the ceramic materials; see page 4-35.

55. Switch to the **Graphics** tab.

56. Check **Use Render Appearance for Shading**.

57. Click the *Foreground Surface Pattern* preview area.

58. Set the *Pattern Type* to **Model** and then click **New**.

59. Create a new pattern named **18″ Tile**; adjust the settings to match Figure 4-4.15.

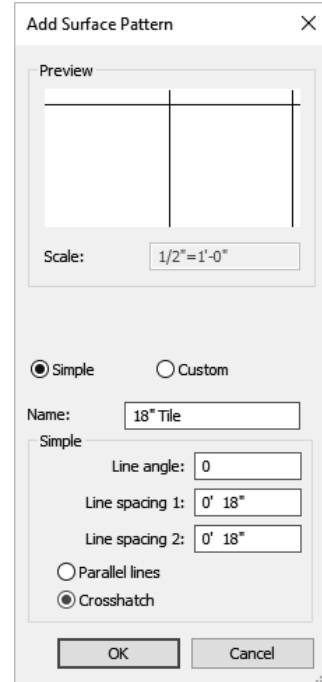60. Click **OK** twice to get back to the *Material Browser*.

FIGURE 4-4.15 Add surface pattern

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.

61. Switch to the **Appearance** tab.

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.

62. Go to www.daltile.com and search for tile number **CY04**.

   a. CY04 appears to be discontinued. Search for **EQ10** and download the zip file per the following instructions. The ZIP file still has the required image file in it.

   b. The required JPG file (*City View - Downtown Nite CY04.jpg*) can be accessed from the download files available with this book; see the inside front cover for instructions and your unique access code.

63. Double-click on the Zip file to open it and then locate the file named **City View - Downtown Nite CY04.jpg**.

64. **Copy/Paste** this file to your project folder.

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; 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 correct the problem. To add the joint, you would want half a joint so it tiles, or repeats, properly on a surface in the model. You will not be required to make these types of edits at this time.
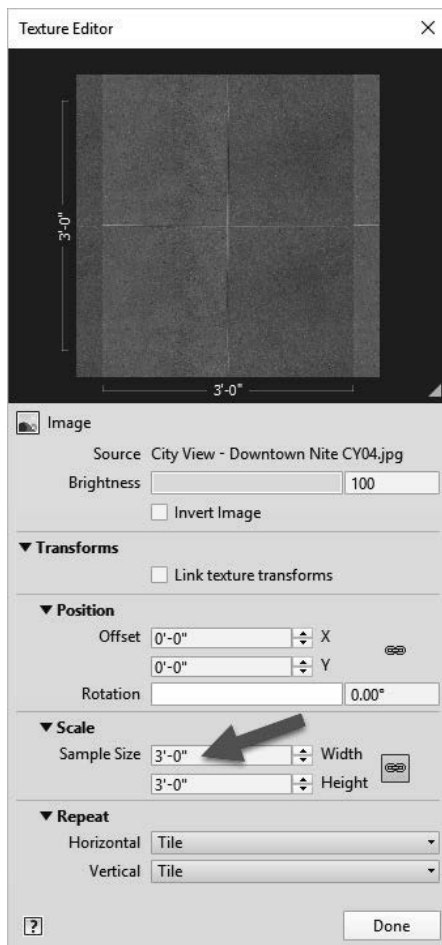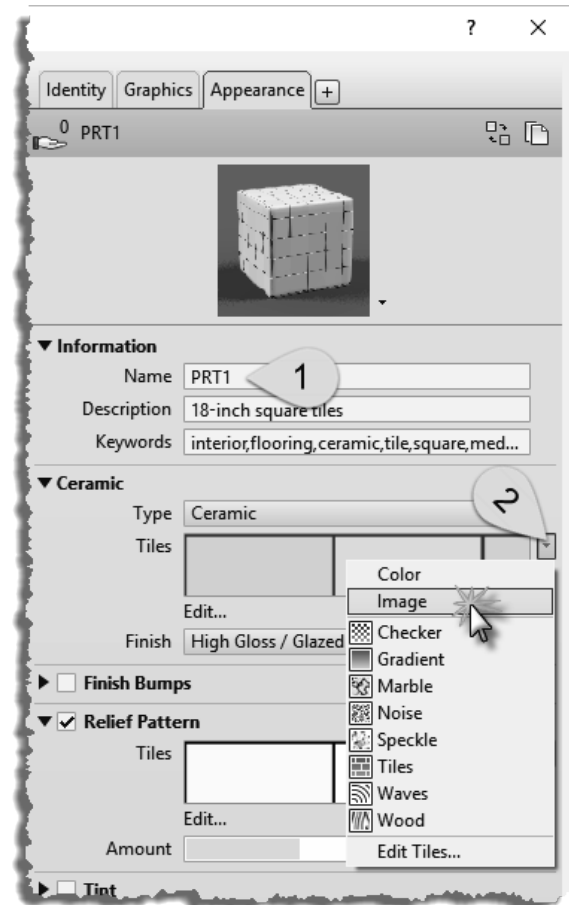
FIGURE 4-4.17 Adjusting texture size

FIGURE 4-4.16 Appearance tab

65. **Duplicate** the *Appearance* asset, and rename the new copy to **PRT1** (similar to step 43).

66. Back in the *Material Browser*, with PRT1 selected, adjust the *Description* as shown in Figure 4-4.16.

Next you will change the *Appearance* asset to use an image rather than the "synthetic" *Tiles*.

67. Select the down-arrow to the right of the *Tiles* preview and select **Image** (Figure 4-4.16).

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

68. Browse to the raster image of the CY04 tile you saved from the Daltile website.

69. The *Texture Editor* opens automatically; if you need to open it again later, click on the image preview in the *Material Browser*.

70. In the *Texture Editor*, change the *Sample Size* to **3′-0″x3′-0″**; this is for two 18″ tiles in each direction (Figure 4-4.17).

71. Click **Done** to close the *Texture Editor*.

Now you need to adjust the *Relief Pattern*. This will remain the "synthetic" Tiles option. You will adjust the spacing to align with the grout joints in the image. You will also make an adjustment so the joint does not look too deep.

72. Edit the **Relief Pattern** as follows:

    a. Set the *Sample Size* to **3'-0"**

    b. Set the *Grout Color* to R= 125, G=125, B=125

Note that the raster image and the relief pattern are both set up to show full tiles. If this were not the case you would need to offset the relief pattern to align with the image.

To better visualize the changes you are making, it is possible to adjust the preview image to be larger and to represent a wall.

73. Click the down-arrow next to the material preview and select **Walls** (Figure 4-4.18).

FIGURE 4-4.18 Changing preview image

74. Adjust the preview size by dragging the width of the dialog box (to adjust the width) and the horizontal line just below the image (to adjust the height).

You now have a larger image which looks like a wall to better visualize your material. Notice how the grout joint does not appear to be as deep. In the *Relief Pattern*, the darker the graphics, the deeper the relief appears in those areas in the material. Therefore, when we make the grout lines a lighter grey, the appearance becomes less recessed.
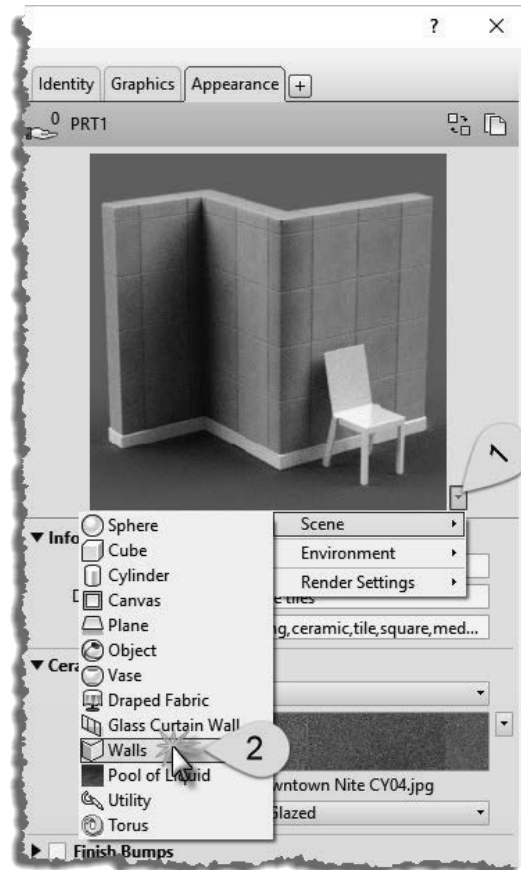
Next you will duplicate PRT1 to create PRT2. Both are based on the same tile. One is for the floor and the other is meant to be used as wall base. The wall tile is 6″x12″. This can be set up as 12″x12″ as the tile will be cropped by the surface it is applied to in the model. That is, PRT2 will only be used as a wall base and only applied to an area that is six inches tall.

75. Duplicate PRT1 as **PRT2**.

76. Adjust the *Identity* tab.

    a. *Comments*: PORCELAIN WALL BASE TILE

    b. *Mark*: PRT2   *Remember to always set this value when duplicating a material*

    c. Everything else is the same as PRT1.

77. On the *Graphics* tab, set the *Foreground Surface Pattern* to **12″ Tile**.

78. On the *Appearance* tab, duplicate the asset and then adjust the texture size to be **2′x2′**; this is for two 12″ Tiles.

    a. Do this for both the image and the relief pattern.

79. Close the *Materials* 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.

80. **Save** your project file. You will use this model in subsequent chapters.

You should save all the image files you create or download into a single folder if possible. If working in an office, the folder should be on a network, accessible to everyone on the design team. In Revit, everyone can go to **File Tab → Options → Rendering** and add "additional render appearance paths" so Revit knows where the images are located and can access them when needed.

This wraps up a fairly thorough overview of using and managing *Materials* in Revit. You should hang onto 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 or custom material library so they are available immediately for all your projects.

Exercise 4-5:
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*.

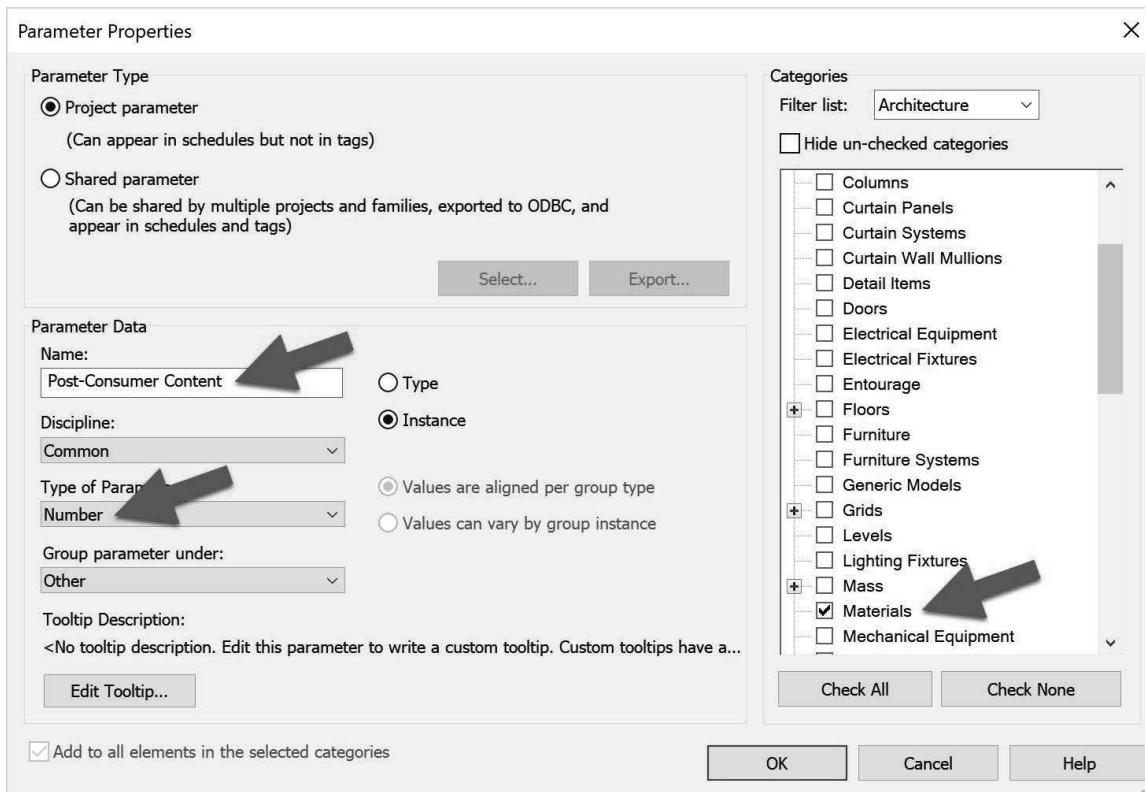4. Enter the information as shown in Figure 4-5.1 below.

FIGURE 4-5.1 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** and then click **OK** again to close the *Project Parameters* dialog.

8. Open the ***Materials*** dialog, and open the *Material Browser* if not already open.

9. Click the **Custom Parameters** button in the lower left (Figure 4-5.2).

10. Add the information shown in Figure 4-5.2.

Notice the custom parameters area associated with every *Material* – be sure the correct *Material* is selected before editing the *Custom Parameters*. You are able to add as many custom parameters as you need. This information can also appear in a schedule; you will learn more about schedules later in the book.
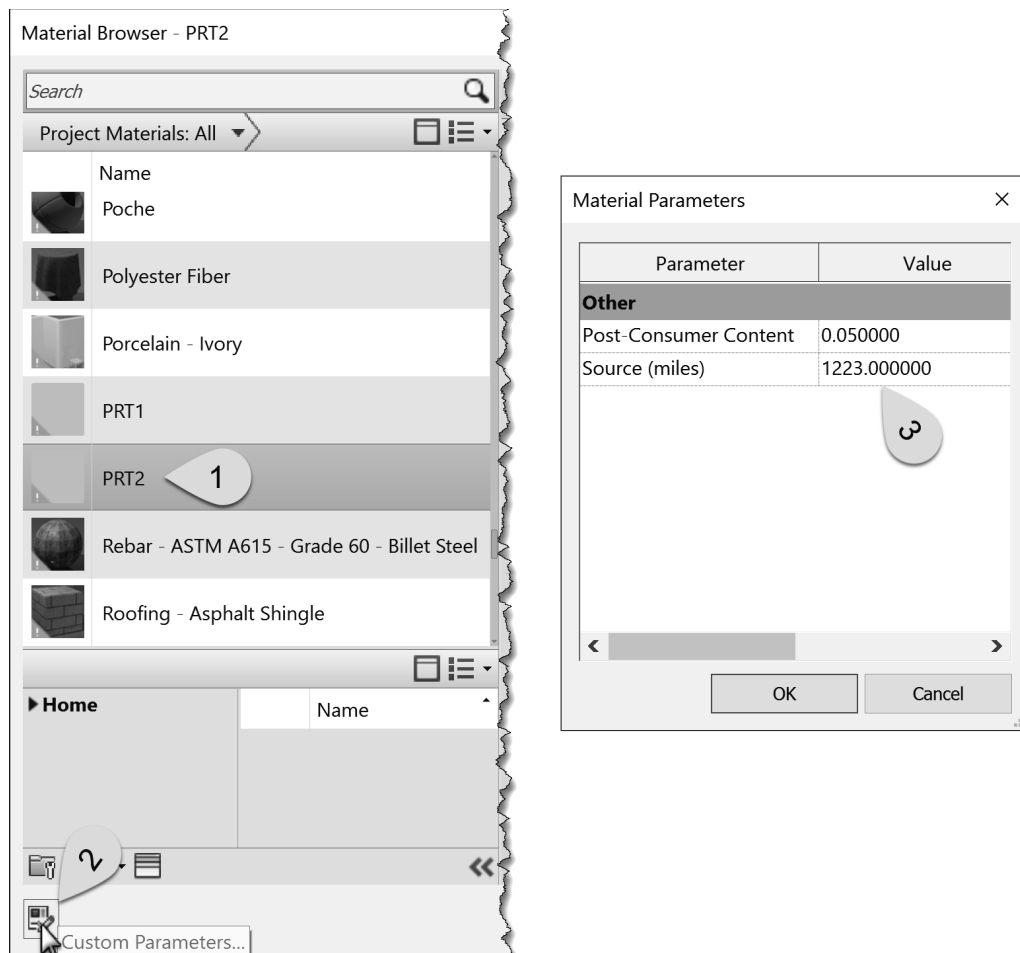

FIGURE 4-5.2 Custom material parameters in the *Materials* dialog

Self-Exam:
The following questions can be used as a way to check your knowledge of this lesson. The answers can be found at the bottom of this page.

1. To control the extents of the *Paint* tool on a face, use the *Split Face* tool. (T/F)

2. A material cannot store information about the manufacturer. (T/F)

3. It is not possible to rotate a surface pattern. (T/F)

4. Not all render appearance materials tile properly. (T/F)

5. You can store custom information in a Revit material. (T/F)

Review Questions:
The following questions may be assigned by your instructor as a way to assess your knowledge of this section. Your instructor has the answers to the review questions.

1. To change a material "*By Face*" use the *Paint* tool. (T/F)

2. You can only duplicate materials, not start from scratch. (T/F)

3. A material's surface pattern is what would be seen in an interior elevation. (T/F)

4. List three primary ways materials are added: by _____, by _____, and by _____.

5. For a render appearance, a relief pattern would be like debossing a piece of paper. (T/F)

6. The glass material is transparent in 3D but not in elevation. (T/F)

7. The *Identity* tab, in the *Materials* dialog, has a section for shading adjustments. (T/F)

8. Revit does not come with any *Materials*. (T/F)

9. Model *Fill Patterns* adjust size when the view scale changes. (T/F)

10. When a 3D element has its material parameter set to <by category>, the _____ material is used.