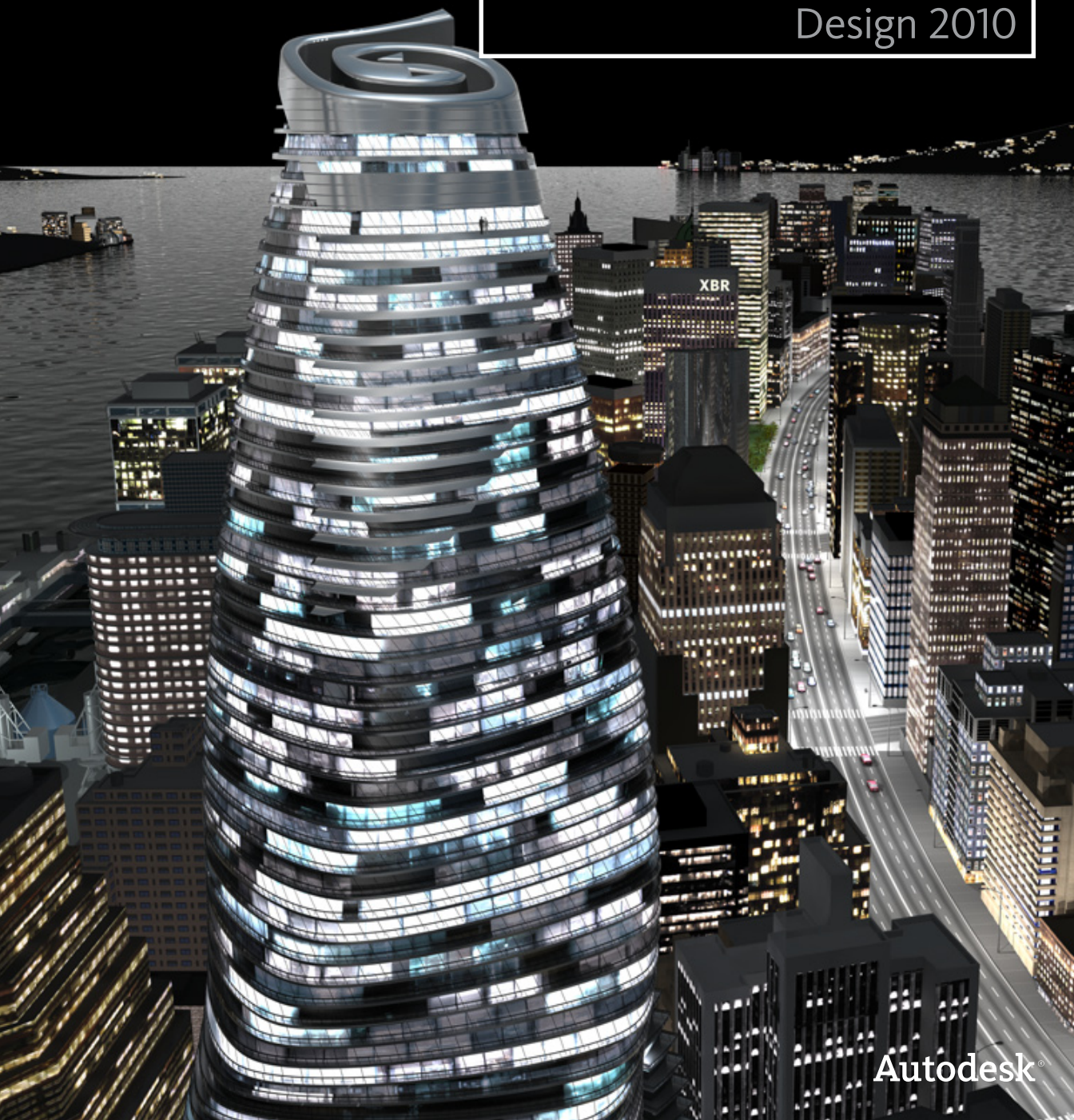


**Tutorials:  
Materials  
and  
Mapping**

# Autodesk® 3ds Max®

Design 2010



## Autodesk® 3ds® Max Design 2010 Software

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# Materials and Mapping

# 4

Materials are like paint. With materials, you make apples red and oranges orange. You put the shine in chrome and the polish on glass. By applying maps, you can add images, patterns, and even surface texture to objects. Materials are what make your scenes look real.

Mapping is a method of projecting pictorial information (materials) onto surfaces. It is a lot like wrapping a present with wrapping paper, except the pattern is projected mathematically, with modifiers, rather than being taped to the surface.

This tutorial introduces the Material Editor, the master design studio for materials and maps. In the following tutorials, you will learn how to assign materials to objects, how to create basic materials, and how to apply textures.



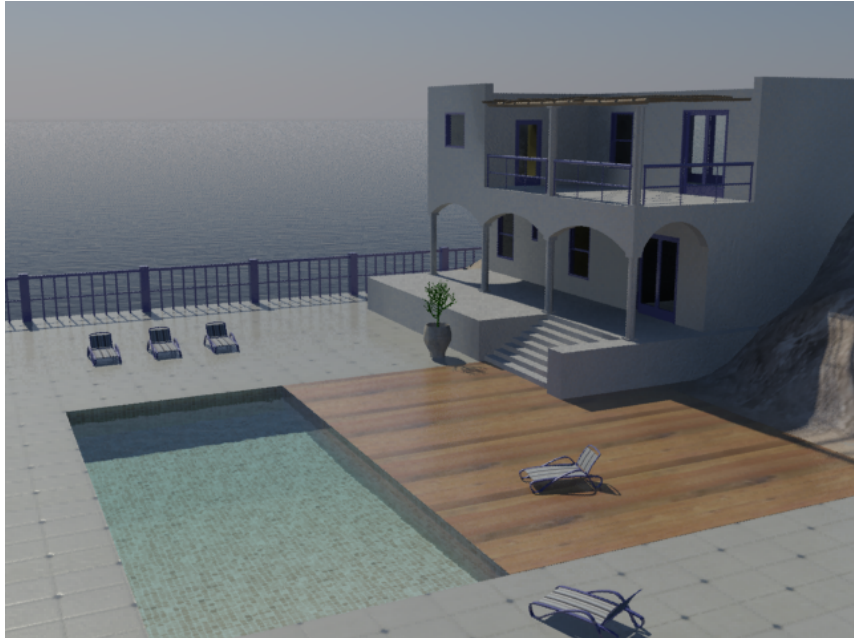
### Features Covered in This Section

- Using the 3ds Max Design Material Editor to create, edit and apply materials.
- How mapping coordinates work, and how to manipulate them using 3ds Max Design modifiers.
- How to layer multiple texture maps onto a surface to create a composite image.
- How to map textures onto curved surfaces.
- How to apply multiple sub-maps similar objects to give each their own unique identity.



# Introduction to Materials and Mapping

In this tutorial, you will use a model of a Mediterranean villa to learn more about materials and how they can improve the realism of a scene.



**A rendering of the villa after you have completed the tutorial**

In this tutorial, you learn how to:

- Create simple materials and apply them to objects
- Create a multi-sub/object material for more complex objects
- Apply texture maps to model real-world surfaces such as wood, foliage, and stone
- Apply bump maps to improve the realism of texture maps
- Use the Propagate option when you work with instanced objects


Skill level: Beginner

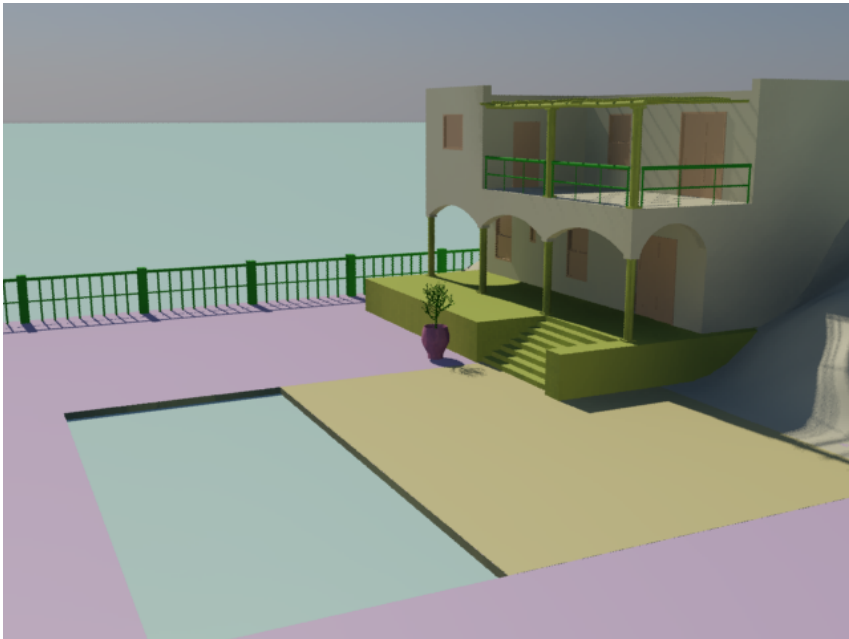
Time to complete: 1 1/2 hours

# Creating Simple Materials

For many surfaces, you can obtain good results by choosing a simple but appropriate material and changing just a few settings. In this lesson, you will use this approach to add surface detail to a railing, the walls of a house, and water in a swimming pool and ocean.

## Set up the lesson:

-  On the Quick Access toolbar, click Open File, navigate to the `\scenes\materials_and_mapping\med_villa` folder, and open the scene file `med-villa-mat_start.max`.

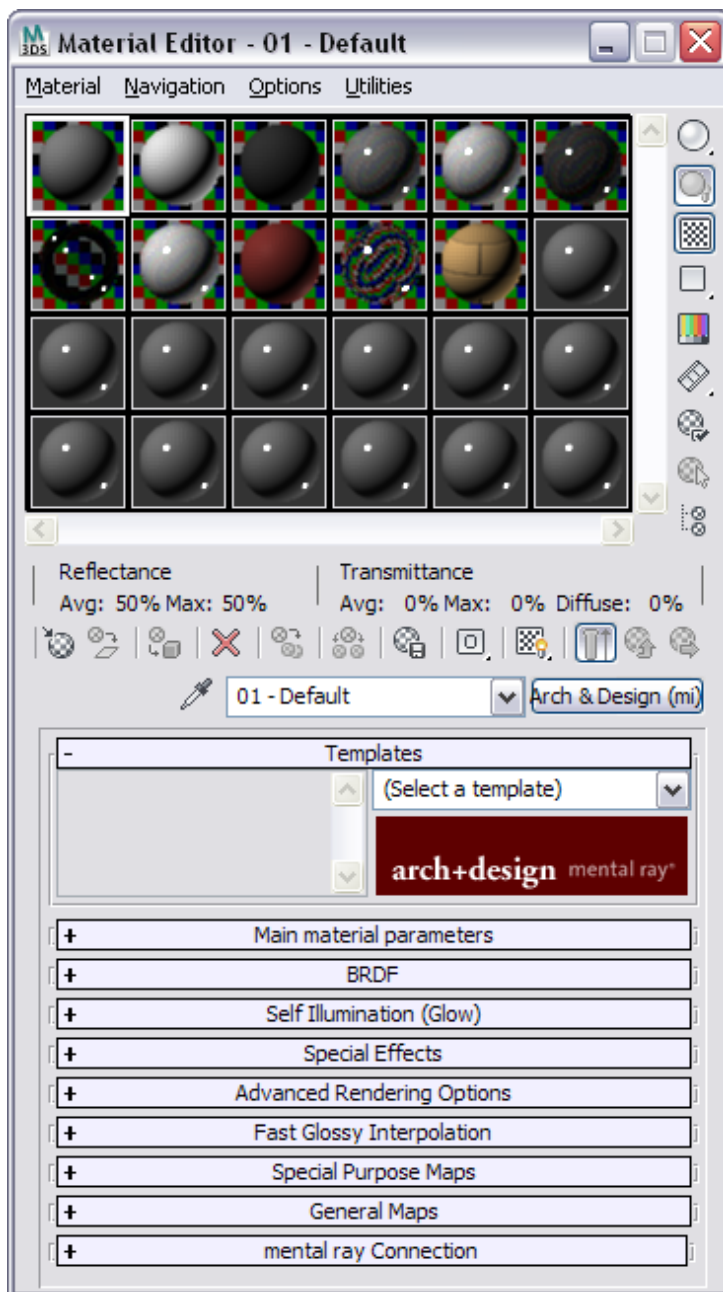


**The villa before applying materials**

Although the villa scene is set up with lighting and cameras, it has no materials. The effect is rather featureless and unrealistic: this is typical of newly created geometry in 3ds Max Design.

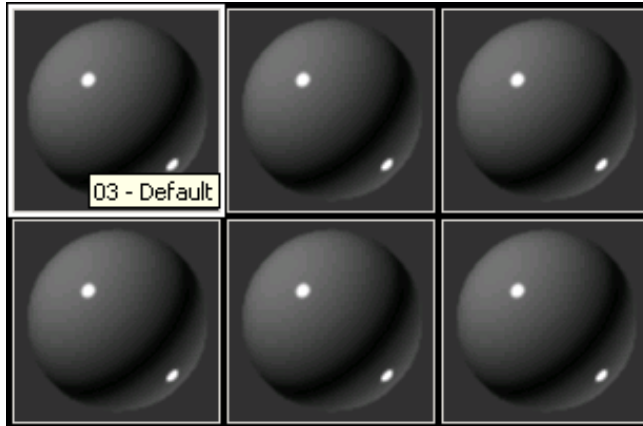
### Create a material for the railings:

- 1  On the main toolbar, click Material Editor to open the Material Editor.

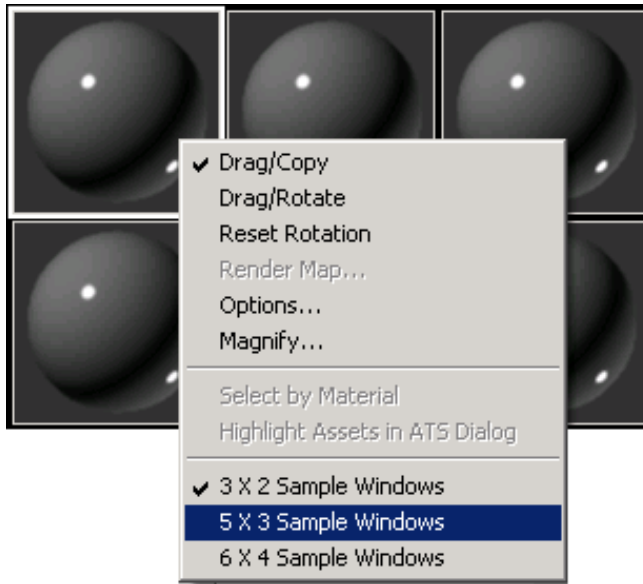




The Material Editor is a sort of workbench for creating, adjusting, managing, and applying materials to objects. The most obvious part of the Material Editor interface is an array of small windows with spheres in them. These are known as the *sample slots*.



**NOTE** When you start the Material Editor, you might see a different number of sample slots. This isn't important. You can change the number of visible slots by right-clicking a slot and choosing how many "sample windows" to display from the pop-up menu.



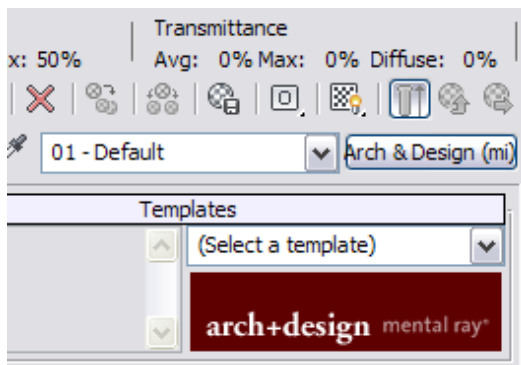
Below and to the right of the sample slots are buttons for various controls, and below this area are rollouts with detailed controls for specific materials. We will describe controls when you need to use them, without going into detail at this point.

- 2 The active sample slot has a white border. If the upper-left slot is not already active, click it to make it active.

In 3ds Max Design, Arch & Design is the default material type. This is an extremely versatile material interface, but it has a huge number of controls, as you can see, and it can be overwhelming to learn. Fortunately, 3ds Max Design provides simpler materials to accomplish some of the same effects. ProMaterials™ are based on Arch & Design. Like Arch & Design, they are physically accurate, but they have simplified interfaces based on real-world material settings.

- 3 Click the Type button to change the material type.

This button is currently labeled Arch & Design (mi). It is to the lower right of the sample slots and other material buttons, but above the first of the rollouts (which is labeled Templates).



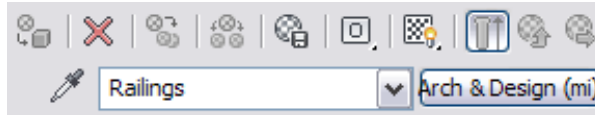
3ds Max Design opens a Material/Map Browser dialog.

The Browser lets you choose a material type.

- 4 In the Material/Map Browser, click the item ProMaterials: Plastic/Vinyl to highlight it, and then click OK.

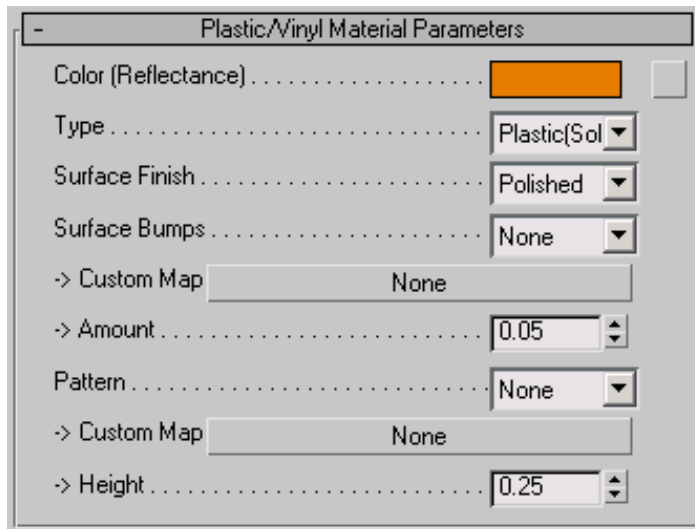
The material is now a Plastic/Vinyl ProMaterial. The active sample slot shows its default settings: highly glossy with an orange color. You will change some of these shortly. First, give the material a meaningful name.

- 5 In the Name field, just to the left of the Type button, change the material name to **Blue Railings**.



It is good to get in the habit of naming a material as soon as you create it. In a complex scene, intelligible material names are useful.

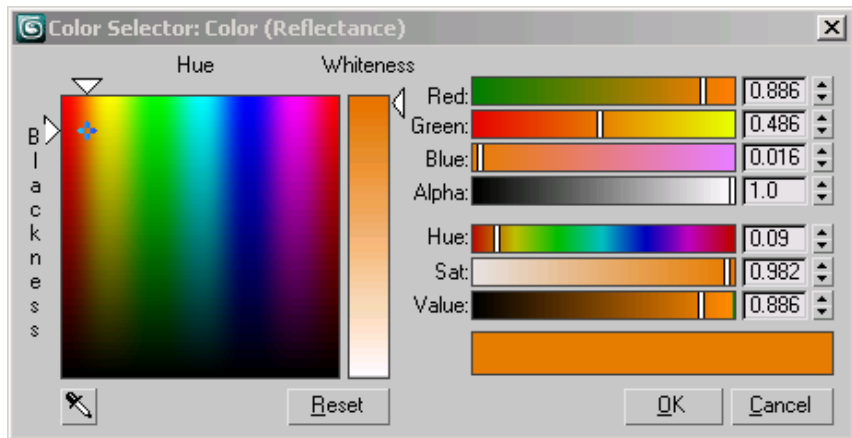
The main controls for the Plastic/Vinyl material are on the Plastic/Vinyl Material Parameters rollout. There are considerably fewer controls than on the main rollout for the Arch & Design material.



#### Adjust the Plastic/Vinyl material settings:

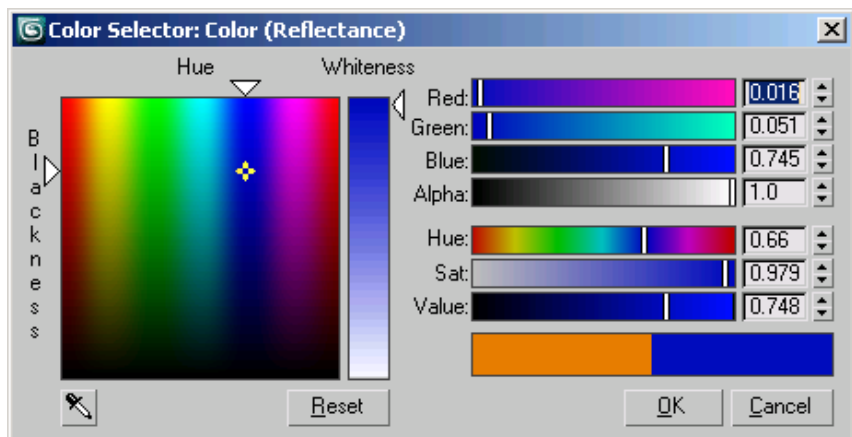
- 1 First, change the color to blue to match the new material name. Click the orange color swatch that is labeled Color (Reflectance).

3ds Max Design opens a Color Selector dialog.



- 2 In the Color Selector, choose a medium-dark blue color.

There are a few ways to do this, but probably it is easiest to click the large spectrum on the left side of the Color Selector.



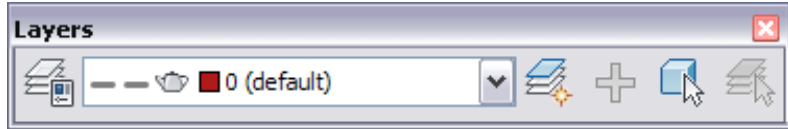
- 3 Click OK to close the Color Selector.  
The sample slot now shows the material's blue color.
- 4 On the Plastic/Vinyl Material Parameters rollout, use the Type drop-down list to change the material type to Vinyl.  
The highlights for vinyl are more diffuse, less sharp than they are for plastic.



- 5 Use the Surface Finish drop-down list to change the finish to Glossy. Leave the other Plastic/Vinyl controls set to their defaults.

### Apply the material to the railings:

- 1 If the Layers toolbar isn't visible, right-click the gray area to the right of the main toolbar, and choose Layers to display this toolbar.



- 2 From the drop-down list of layers on the toolbar, choose *Railings*.



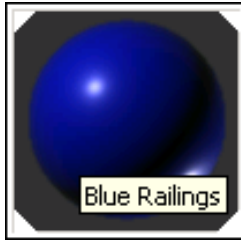
- 3 On the toolbar, click Select Objects In Current Layer. This selects the railings in the scene: both the railings along the deck, overlooking the ocean, and the railings on the balcony of the house.



- 4 In the Material Editor, click Assign Material To Selection. This button is one of the buttons in the row below the sample slots. It is third from the left.

In the scene, the railings turn blue.

Look at the sample slot: it now has angled corners. Angled corners on a sample slot mean that the material has been applied to at least one object in the scene. When the angled corners are solid white, as they are in this case, the material is said to be *hot*. When you make changes to a hot material, the scene changes immediately, and usually the viewport display shows the material changes you have made.



Angled corners on a sample slot indicate a "hot" material.

### Create a material for the house:



- 1 On the Layers toolbar, choose *exterior walls* from the list of layers, and then click Select Objects In Current Layer.

This selects the exterior walls of the house.

- 2 In the Material Editor, click the next sample slot to make it active. Name this material **White Concrete**.

- 3 Click the Material Type button, and choose ProMaterials: Concrete from the list in the Material/Map Browser. Click OK to close the Browser.



- 4 Click Assign Material To Selection.

In the shaded viewports, the house turns gray. The White Concrete material is now the hot material.

- 5 On the Concrete Material Parameters rollout, click the Color (Reflectance) color swatch to display the Color Selector.

- 6 In the Color Selector, use the Whiteness slider to change the concrete color to an off-white (Value equal to about 0.9).

In the shaded viewports, the house immediately becomes brighter.

- 7 Click OK to close the color selector.

- 8 Open the (Texture) Coordinates For Built-In Textures rollout. On that rollout, change the Tiling value to **10.0**.

This adjusts the concrete texture to the scale of the house.

### Change the view to get a better view of the concrete finish:

- 1 Right-click the Camera-Terrace viewport to make it active.

---

**TIP** From time to time throughout this tutorial, you might have to move the Material Editor window in order to see the viewport you're working with.

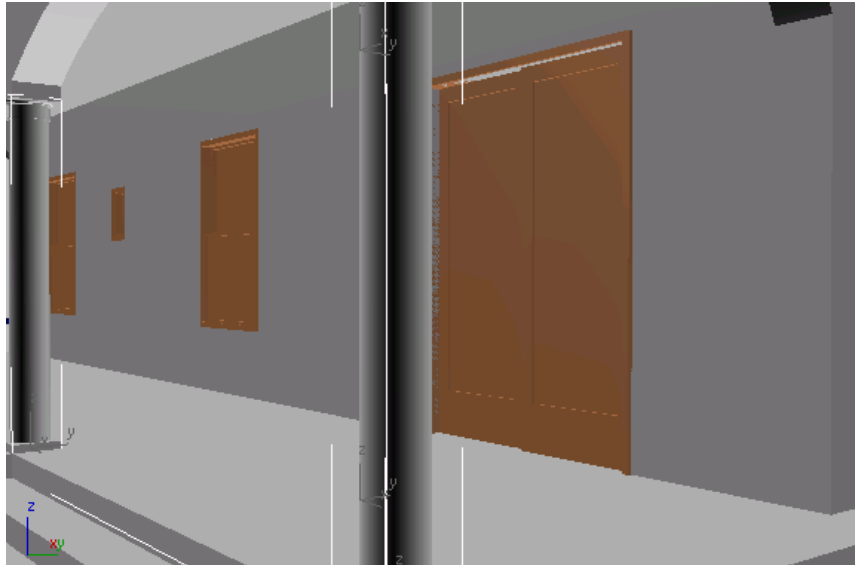
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- 2 Click the Point Of View (POV) viewport label (it now shows "Camera-Terrace"), and choose Perspective.

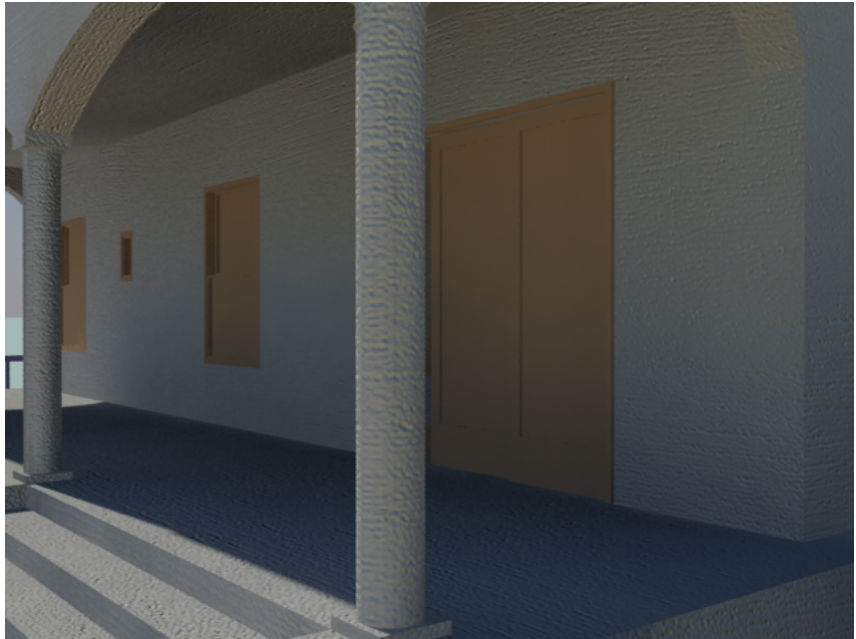
This way, the viewport adjustments you make won't affect the camera itself.



- 3 Use Zoom, Pan, and Orbit to adjust the viewport so it shows a closer view of the house's front door and porch.



- 4 Click Render Production to see how the concrete appears.



This rendering uses the default texture setting of straight broom. The alternative Curved Broom might be more appropriate for a house of this style.

- 5 On the Concrete Material Parameters rollout, choose Curved Broom from the Surface Finish drop-down list.



- 6 Click Render Production to render the scene again.





The new texture looks better for the Mediterranean house.

- 7 Click the Point Of View (POV) viewport label (it now shows “Perspective”), and choose Cameras > Camera-Terrace.

This restores the original camera view.

#### Create a material for the interior walls:



- 1 On the Layers toolbar, choose *interior walls* from the list of layers, and then click Select Objects In Current Layer.

In the views that are active now, you can’t really see the interior.

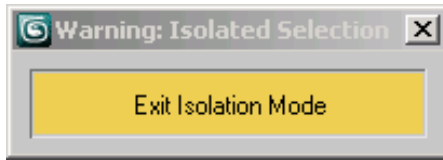
- 2 Right-click a viewport, and choose Isolate Selection from the Display (upper-right) quadrant of the quad menu.

Now you can see the interior wall selection even in the shaded camera viewports.

---

**TIP** You might have to move the Warning: Isolated Selection dialog to see the geometry clearly.

---



- 3 In the Material Editor, click the next unused sample slot to make it active, and name this material **Interior Walls**.
- 4 In the Material Editor, click the Material Type button. In the Browser, choose ProMaterials: Wall Paint from the list of materials, and then click OK.
- 5 Click the Color (Reflectance) color swatch. In the Color Selector, choose a light cream color: approximately Red=0.9, Blue=0.8, Green=0.5. Click OK to close the Color Selector.



- 6 Click Assign Material To Selection.  
In the shaded viewports, the interior walls now have a light color.
- 7 On the WallPaint Material Parameters rollout, choose Platinum as the Surface Finish. Leave the Application Method set to its default of Roller.
- 8 On the Warning: Isolated Selection dialog, click Exit Isolation Mode so you can see the entire scene once again.

### Create a water material for the swimming pool:

- 1 Click the next unused sample slot to make it active. Name this material **Water - Pool**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Water from the list of materials, and then click OK.  
The default settings for the Water material are Swimming Pool for the Type, and Tropical for the custom color. These are appropriate for this scene, so don't change them. (There is also a Wave Height setting, but the swimming pool doesn't need waves.)
- 3 Drag the sample slot from the Material Editor into one of the shaded viewports, and release the mouse ("drop" the material) over the *pool-water* object.  
The water turns transparent.

Dragging and dropping a sample slot is a shortcut way to assign a material. It is useful when you apply the material to a simple selection, such as the water in the pool.

**Create a different water material for the ocean:**

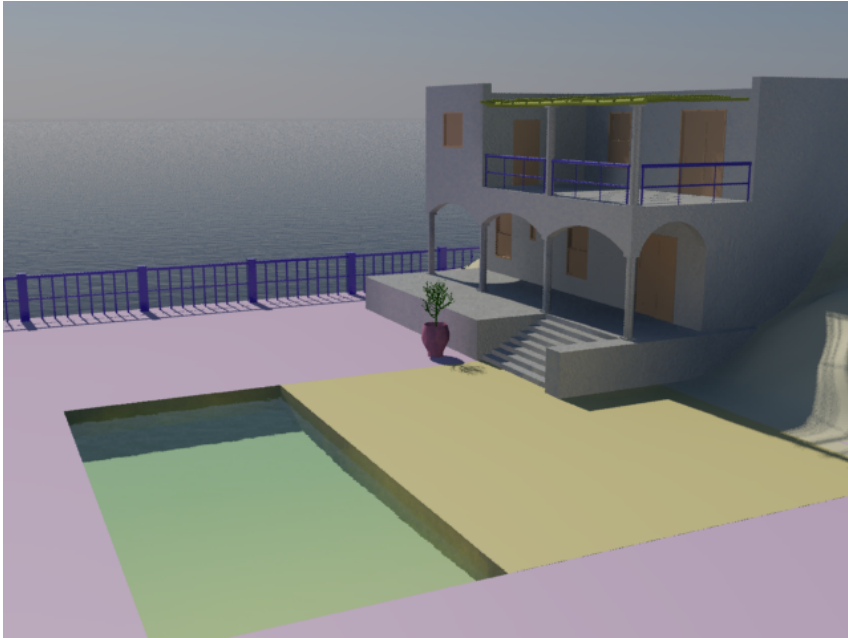
- 1 Click the next unused sample slot to make it active. Name this material **Water - Ocean**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Water from the list of materials, and then click OK.

---

**TIP** While in the Browser, you can also double-click an entry to choose that material and close the Browser at the same time.

---

- 3 On the Water Material Parameters rollout, change the Type to Sea/Ocean and the Color to Sea/Ocean.
- 4 Right-click the Top viewport to make it active.
- 5 In the Top viewport, press F3 to make the viewport shaded, and then click to select the aqua-colored *Ocean* object.  
You might have to zoom out in the Top viewport to see the ocean clearly.
- 6 Drag the Water - Ocean sample slot onto the *Ocean* plane, and then release the mouse.



**Rendering of the villa with simple materials applied**

Even simple materials greatly improve the realism of the scene.

### **Save Your Work**

- Save the scene as **my\_villa\_simple\_mtls.max**.

### **Next**

[Using a Multi/Sub-Object Material for the Doors and Windows](#) on page 266

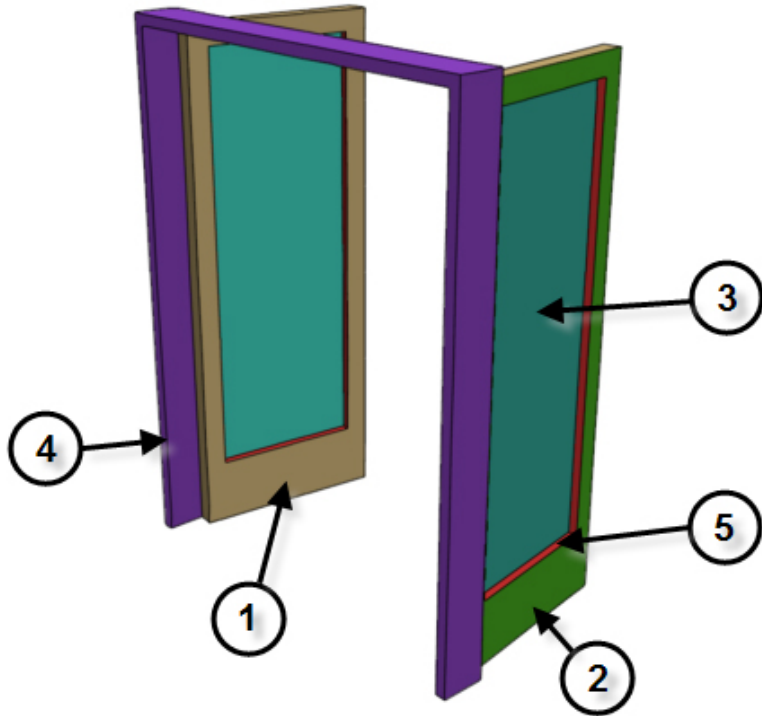
## **Using a Multi/Sub-Object Material for the Doors and Windows**

The villa includes doors and windows. These objects use multiple *material IDs* to enable you to apply different materials to different surfaces of the object. (Some other architectural objects, and even some primitives, use the same method.)



A material ID is simply an ID number associated with certain surfaces on an object. It works with the Multi/Sub-Object material. The Multi/Sub-Object material contains multiple sub-materials, each of them linked by material ID to the object that uses the Multi/Sub-Object material.

Doors and windows use material IDs in the same general way, as shown in the following illustration.



#### Material IDs for a door or window

1. Front of door
2. Back of door
3. Inner bevel
4. Door frame
5. Inner door


In this lesson, although doors and windows employ five different ID values, you use only two sub-materials: a solid color for the wooden parts, and a

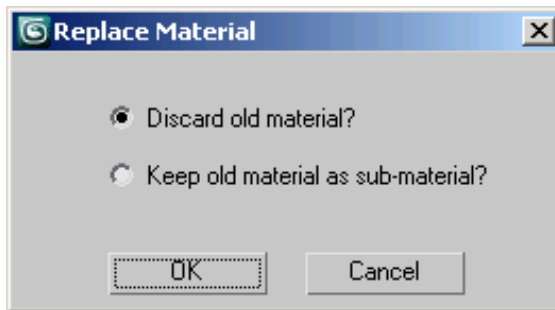
transparent material for the glazing or glass panel, which corresponds to the “inner bevel” ID.

### Set up the lesson:

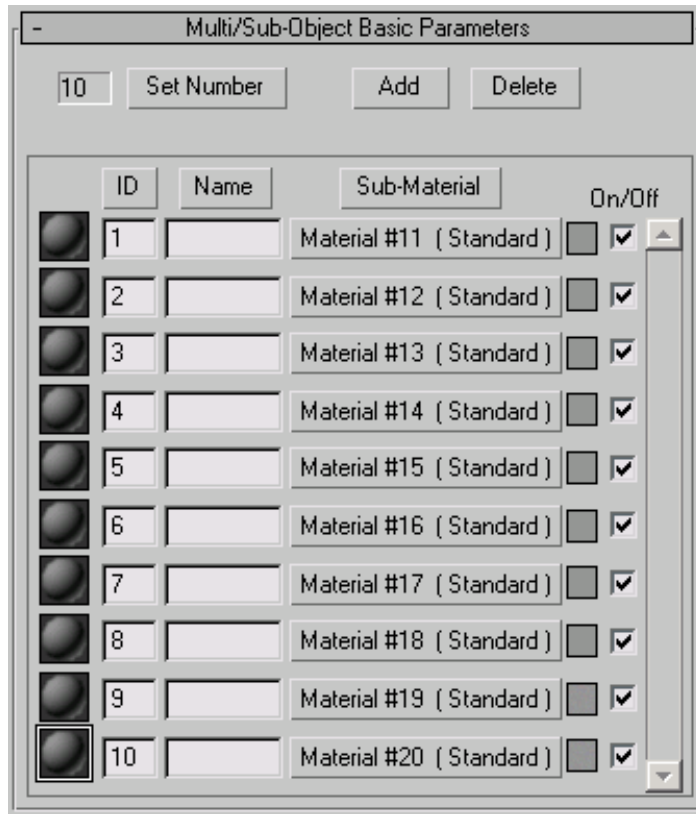
- Continue from the previous lesson, or open the scene file *med-villa-mat\_multisub.max*.

### Create the top-level multi/sub-object material:

- 1  In the Material Editor, click the next unused sample slot to make it active. Name this material **Doors & Windows**.
- 2 Click the Material Type button. In the Browser, choose Multi/Sub-Object from the list of materials, and then click OK.  
3ds Max Design opens a dialog that asks whether you want to discard the original (gray) material or use it as a sub-material.



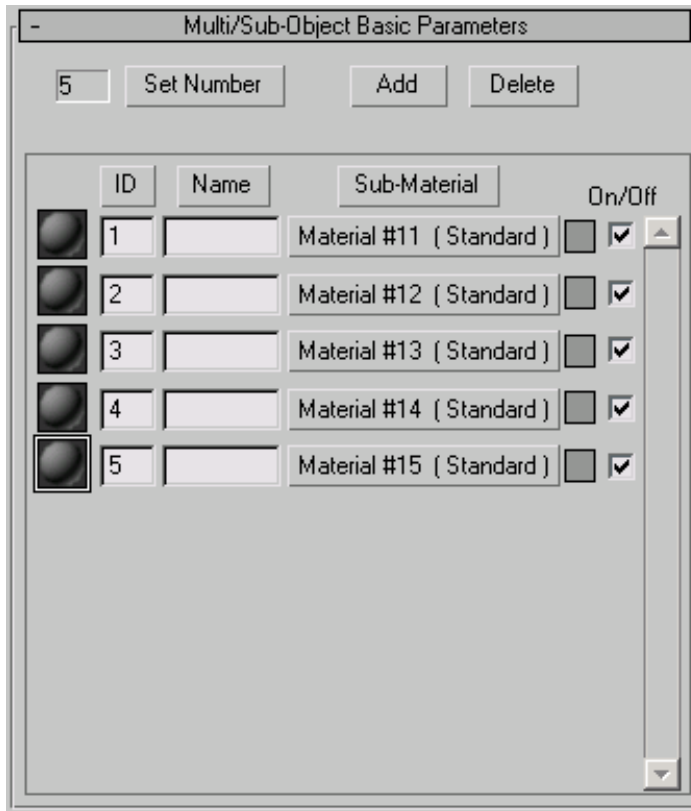
- 3 In this case, choose Discard Old Material, and then click OK.  
The Material Editor shows the rollout for a Multi/Sub-Object material.



By default, a Multi/Sub-Object material has ten “slots” for sub-materials, but doors and windows use only five IDs, so you should reduce the number.

- 4 Click Set Number. In the small dialog that opens, reduce the number of sub-materials to 5, and then click OK.

Now the rollout shows only five sub-materials.



### Create the solid sub-materials:

For the solid parts of the doors and windows, you can use the same blue paint material you used for the railings of the deck and house.

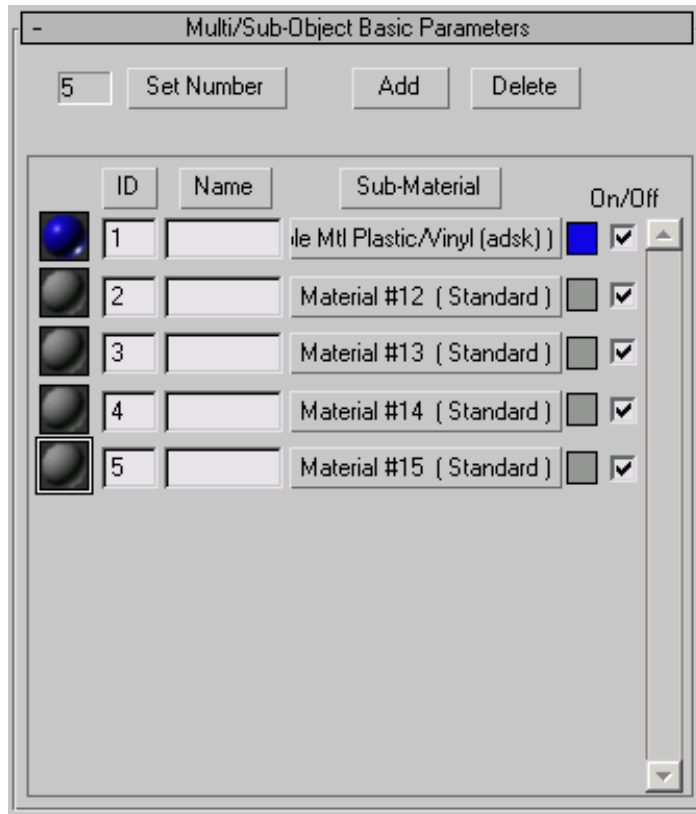
- 1 Drag the Blue Railings sample slot over the Multi/Sub-Object Basic Parameters rollout, and drop it onto the first of the Sub-Material buttons (the one whose ID is 1).

---

**NOTE** Drop it onto the button that is on the same line as the small sample sphere, *not* the button at the top of the list that says “Sub-Material.” The buttons at the top of the list (ID, Name and Sub-Material) simply sort the list.

---

3ds Max Design opens a dialog asking if you want this material to be an instance or a copy. Make sure Instance is chosen, and then click OK.



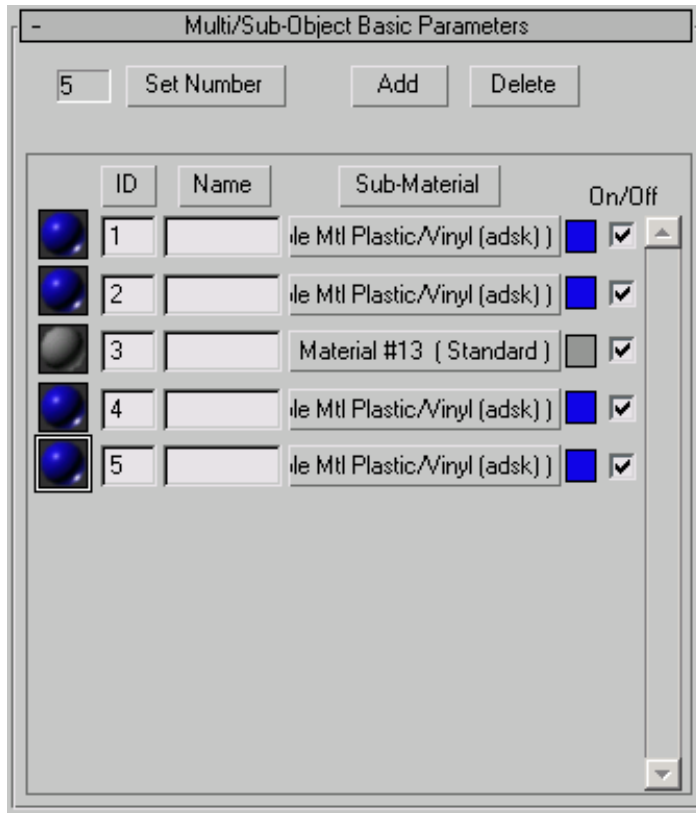
Now the Blue Railings material is also used as sub-material number 1, which corresponds to the front of the door and window frames.

- 2 The other parts of the door and window frames correspond to IDs 2, 4, and 5. Now that Blue Railings is part of the Multi/Sub-Object material, you can simply drag the Sub-Material button itself. To begin, drag the Sub-Material button for ID number 1 onto the Sub-Material for ID number 2.

Once again, make sure Instance is chosen in the Instance (Copy) Material dialog, and then click OK. (When you drag buttons, an additional option, Swap, appears, but don't choose this option.)

- 3 Repeat the previous step for sub-materials 4 and 5.

All the solid parts of the door and window frames now use the same solid blue material.



### Create the glazing sub-material:

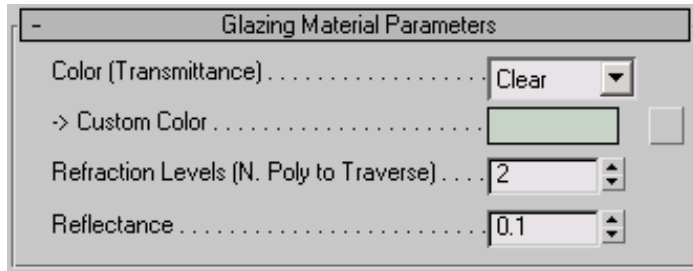
For the glazed parts of the doors and windows, you need a different sub-material that is transparent.

- 1 Click the Sub-Material button for ID number 3. The small sample sphere and color swatch for this sub-material are still colored gray.

The Material Editor opens controls for this sub-material. By default, it is a Standard material.

- 2 Click the Material Type button, and in the Browser choose ProMaterials: Glazing from the list of materials, and then click OK.

Now the Material Editor shows controls for the Glazing ProMaterial. For the time being, use this material's default settings.



**Select the doors and windows, and apply the material:**

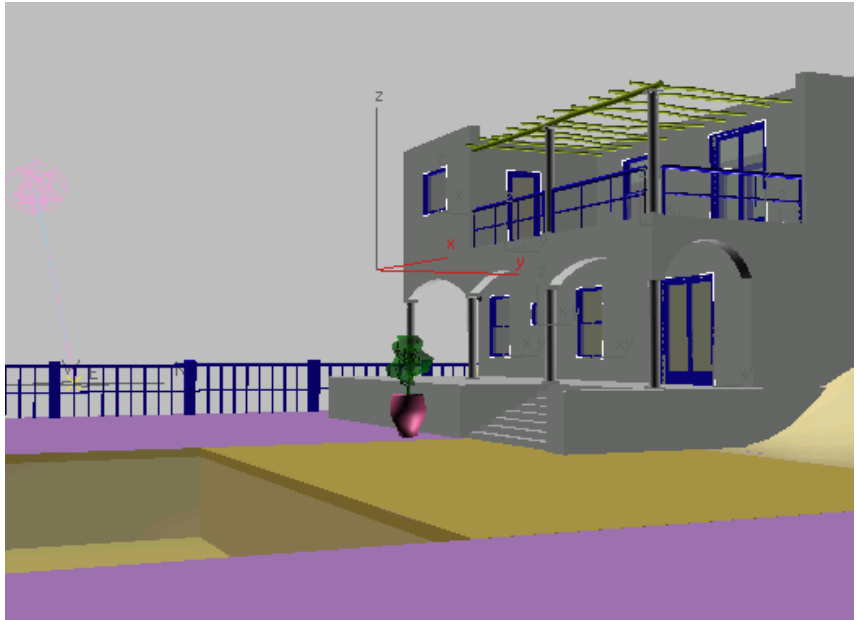
- 1 If the Layers toolbar isn't visible, right-click the gray area to the right of the main toolbar, and choose Layers to display this toolbar.



- 2 On the Layers toolbar, choose *Doors & Windows* from the drop-down list of layers, and then click *Select Objects In Current Layer*. This selects all the doors and windows in the house.



- 3 In the Material Editor, click *Assign Material To Selection*. This applies the Multi/Sub-Object material to doors and windows: the frames turn blue, while the glazed parts ("inner bevels") turn transparent.



### Adjust the glazing transparency:

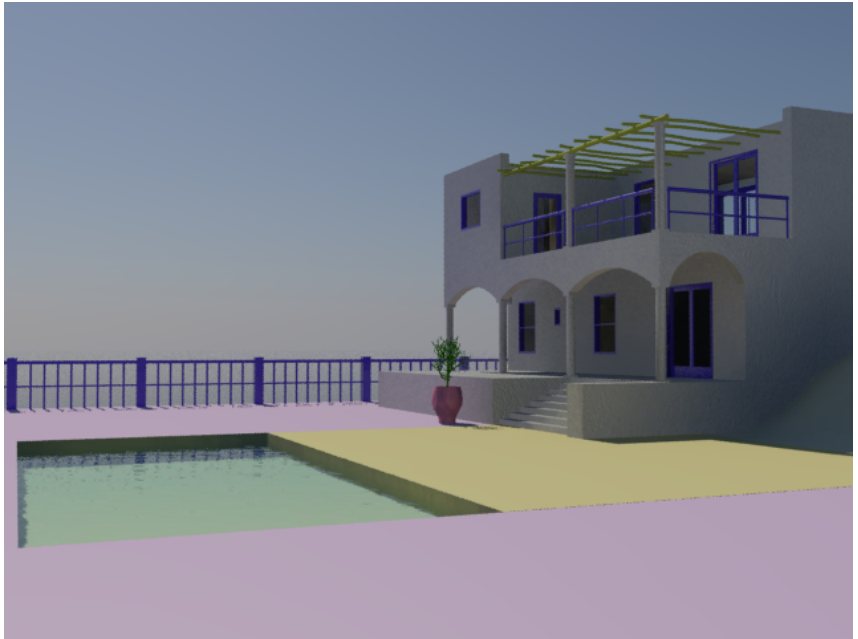
You can't see the full effect of any material until you render, so you will do that now to check the effect of the Multi/Sub-Object material.



- Right-click the Camera-Terrace viewport to make it active, and then click Render Production.

3ds Max Design renders the scene.





#### Return to the top:



- In the Material Editor, click Go To Parent.  
This button is in the row of tools below the sample slots. It is the second button from the right.  
Now you are at the top-level Multi/Sub-Object material once again. Materials with sub-materials (or maps, as you will see in the next lesson) are organized in a tree-like hierarchy. Controls in the rollouts portion of the Material Editor depend on which level you are at: after you adjust a sub-material or a map, you can click Go To Parent to get back to the topmost, main material level.

#### Save Your Work

- Save the scene as **my\_villa\_doors\_and\_windows.max**.

## Next

[Using Texture Maps](#) on page 276

# Using Texture Maps

Bitmaps are a simple but versatile way to add visual detail to scenes. When a bitmap is used to provide an object's color, it is also known as a *texture map*. In this lesson, you apply bitmaps to various parts of the scene (the deck, the terrain, the vase, the bottom of the swimming pool, and the arbor trellis on the upper porch of the house) to achieve realistic effects. Different kinds of geometry require different techniques of mapping, as the sections that follow will show.

## Set up the lesson:

- Continue from the previous lesson, or open the file *med-villa-mat\_mapped.max*.

## Create Materials for the Terrace

### Create the wooden deck material and apply it:

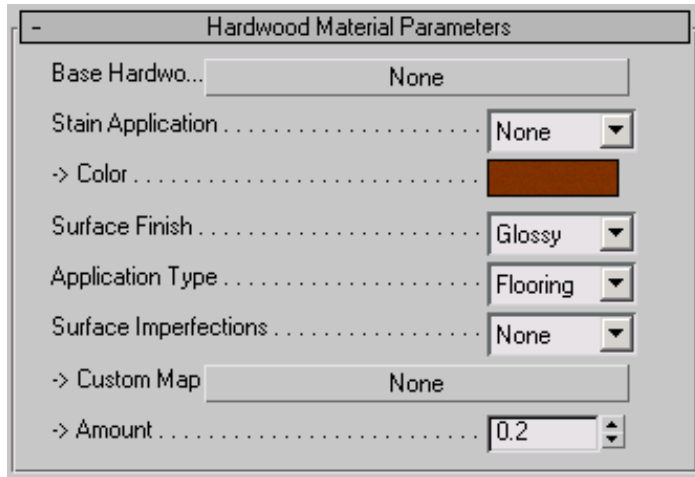


- 1 In the Camera-Hi-Point viewport, click to select the *Wood-Deck* object.

The *Wood-Deck* overlies the *Terrace* object, so you might have to move the mouse around till you see the name *Wood-Deck* in a tooltip. Don't select the *Terrace* at this point. If you have trouble finding *Wood-Deck* with the mouse, press H and select *Wood-Deck* in the Select From Scene dialog.



- 2 In the Material Editor, click the next unused sample slot to make it active. Name this material **Wood - Deck**.
- 3 Click the Material Type button. In the Browser, choose ProMaterials: Hardwood from the list of materials, and then click OK.  
The Material Editor displays the Hardwood ProMaterial controls.




---

**NOTE** Most materials in 3ds Max Design give you the option of mapping the material's color or other components. The Hardwood material is unusual in that it *requires* you to specify a map in order to work correctly.

---

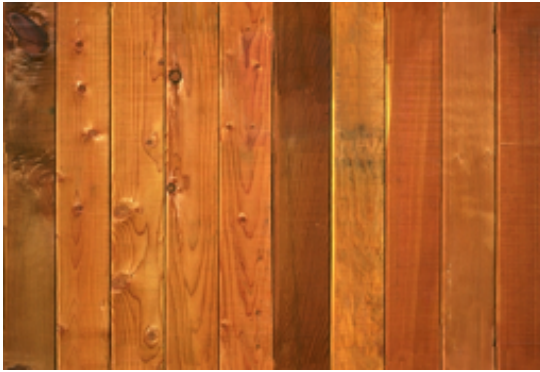
- 4 On the Hardwood Material Parameters rollout, click the Base Hardwood button.

(The label is at the left; on the button itself, the text at this point is "None".)

3ds Max Design opens a Material/Map browser.

Because you clicked a map button, rather than the Material Type button as you've done so far in this tutorial, the Browser shows a list of map types rather than material types.

- 5 In the Browser, click the Bitmap entry to highlight it, and then click OK. 3ds Max Design opens a file dialog.
- 6 In the file dialog, browse to the `\sceneassets\images` folder. Choose the file `cedfence.jpg`, and then click Open.



**Cedar texture for the wooden deck**

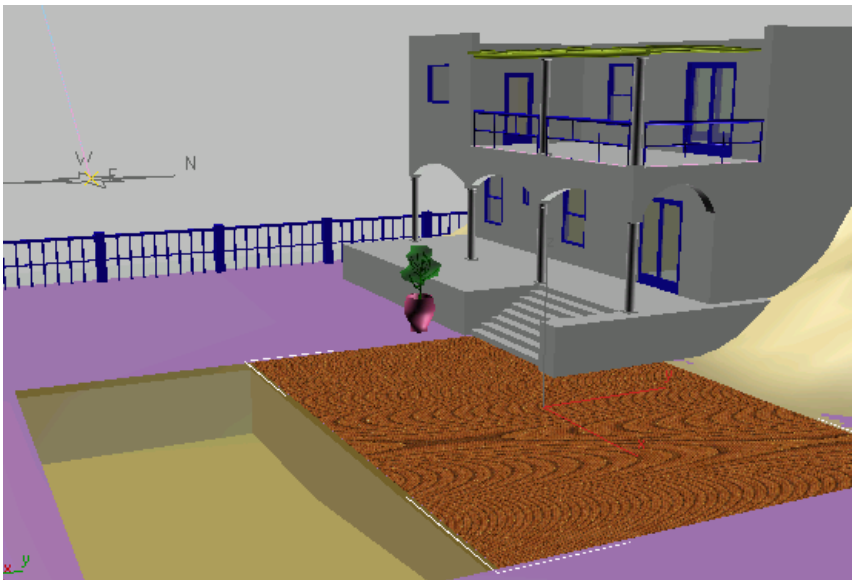


- 7 Click Assign Material To Selection.

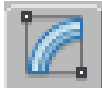
In the shaded viewports, the *Wood-Deck* object turns brown.



- 8 Click Show Standard Map In Viewport to turn it on.

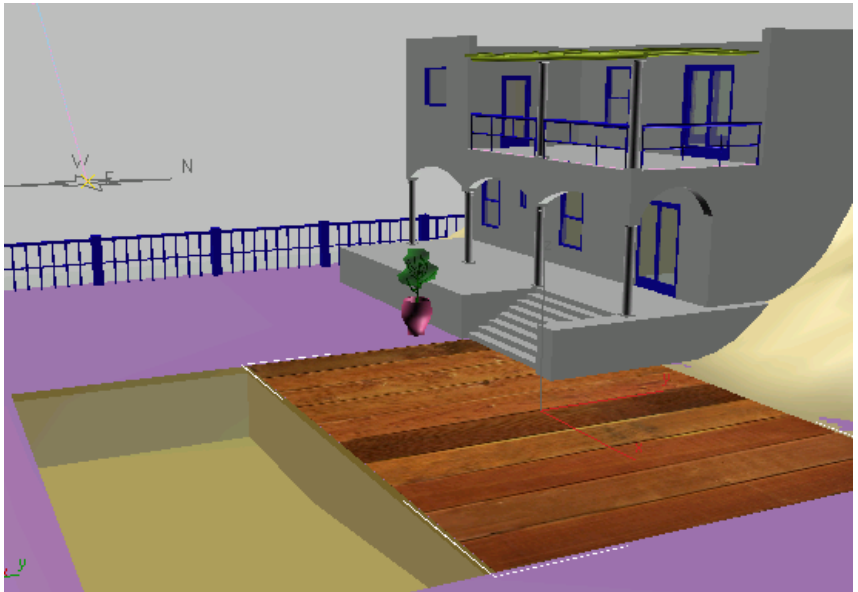


Now the *Wood-Deck* object shows a pattern in the shaded viewports. However, the pattern is rather scrambled and is not quite the effect we're looking for. To improve the appearance of the wooden deck, you'll adjust how the material is mapped.



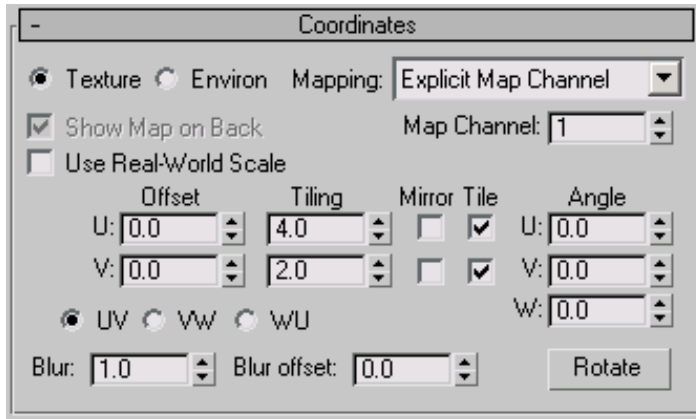
- 9 Go to the Modify panel, and on the Parameters rollout for the *Wood-Deck* object, click to turn off Real-World Map Size.

On the Coordinates rollout for the map there is a corresponding toggle, Use Real-World Scale. To work effectively, these two toggles should either be both on at the same time, or both off at the same time.



Now the appearance of the deck is closer to what it should be.

- 10 In the Material Editor, on the Coordinates rollout, change Tiling in the U dimension to **4.0**, and tiling in the V dimension to **2.0**.



Tiling repeats the cedar planking pattern so the individual planks don't look so enormous. Now the wooden deck matches the rest of the scene.

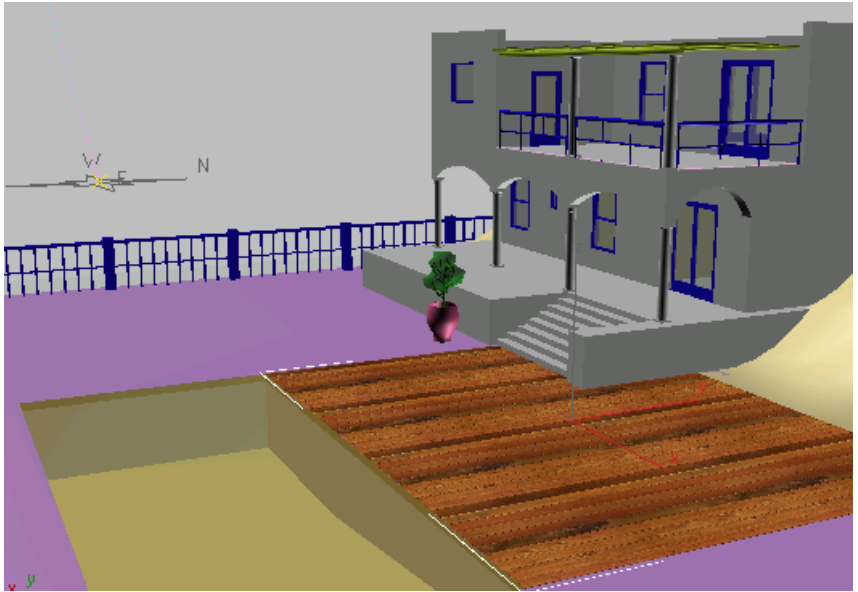
---

**NOTE** U and V are simply the 2D coordinates of the texture map. By convention, U and V (and W) are used because they refer to the local dimensions of the object, and not to the X and Y (and Z) coordinates of the overall scene.

---



- 11 Click Go To Parent to move from the map controls to the Hardwood material controls.
- 12 On the Hardwood Material Parameters rollout, change the Surface Finish value to Satin. This tones down the highlights and reflections from the wooden deck.  
Leave the Application Type set to its default value of Flooring, as that matches how this object is used in the scene.

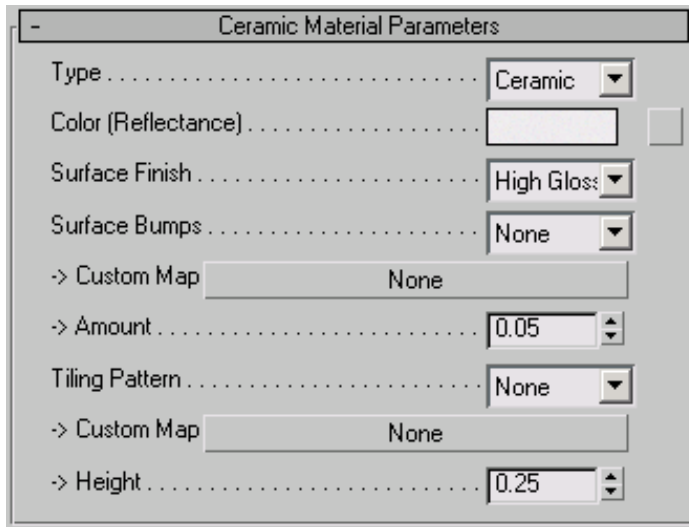


This completes the wooden portion of the terrace.

#### Create the tiled terrace material:

The wooden deck used an arbitrary, user-defined tiling for its texture map. For the tiled portion of the terrace, you also use a texture map, but this time you will use the real-world option.

- 1 Click the next unused sample slot to make it active. Name this material **Terrace**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Ceramic from the list of materials, and then click OK.  
The Material Editor displays the Ceramic ProMaterial controls.



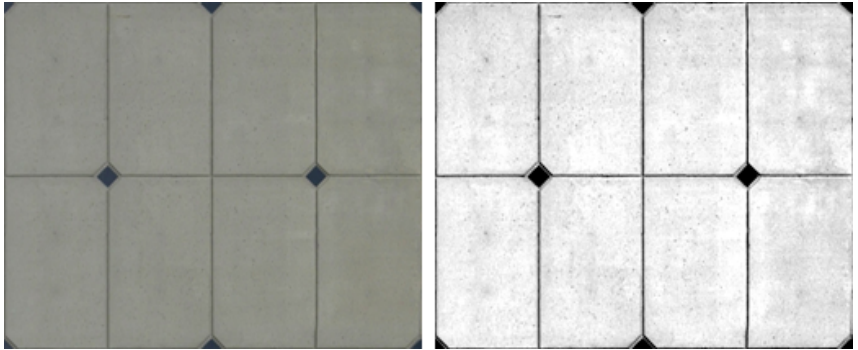

---

**NOTE** The Ceramic material is more typical than Hardwood, in that it has a (gray) map button for the Color component, but doesn't require you to assign a map.

---

- 3 On the Ceramic Material Parameters rollout, change Surface Finish to Satin, so the surface won't be too shiny.
- 4 Click the map button for Color (Reflectance). This is the gray button just to the right of the color swatch.  
3ds Max Design opens a Material/Map Browser.
- 5 In the Browser, click to highlight the Bitmap map type, and then click OK.  
3ds Max Design opens a file dialog.
- 6 In the file dialog, browse to the `\sceneassets\images` folder. Choose the file *tile-cast.jpg*, and then click Open.






**Left: Pattern bitmap for the deck tiles**

**Right: Bump map for the deck tiles (see below)**

For the tiling on the terrace, you will use both a texture map, *tile-cast.jpg*, and later add a bump map, *tile-cast-bump.jpg*. But the first thing to do is to apply the material and adjust its mapping.

- 7  In the Camera-Hi-Point viewport, click to select the *Terrace* object.

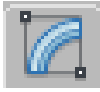
- 8  In the Material Editor, click Assign Material To Selection.

- 9  Click Show Standard Map In Viewport to turn it on.

In the shaded viewports, the terrace turns gray, but it doesn't display the tile map the way the deck displayed the wood grain. This is an indication that there is another step you must take.

The *Wood-Deck* object is a Box object. Like other boxes and all other standard primitives, it already has default mapping coordinates. The *Terrace* object, on the other hand, is an editable mesh. Editable surfaces such as mesh, patch, and poly *do not* have default mapping coordinates, so you must add a modifier that supplies these coordinates. This is the subject of the next series of steps.

### Set up mapping for the tiles:



- 1 With the *Terrace* object still selected, go to the Modify panel.
- 2 Open the Modifier List drop-down list, and choose UVW Map.

---

**TIP** While the Modifier List is open, you can press the U key until UVW Map is chosen.

---

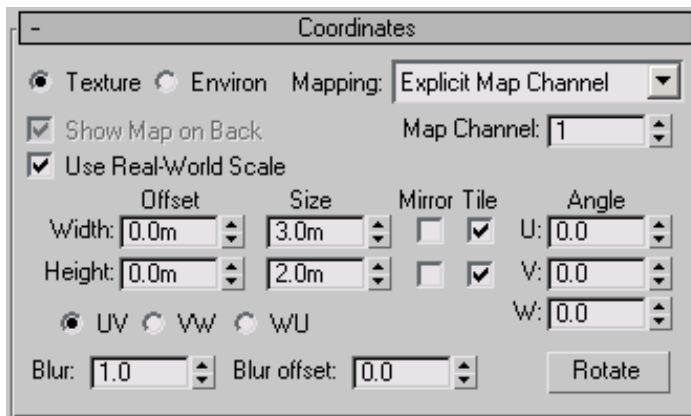
The Modify Panel now displays controls for the UVW Map modifier. Also, a version of the tile texture map is now visible in shaded viewports.

- 3 On the Modify panel > Parameters rollout > Mapping group, make sure Real-World Map Size is turned on.
- 4 On the Material Editor > Coordinates rollout, make sure Use Real-World Scale is turned on.

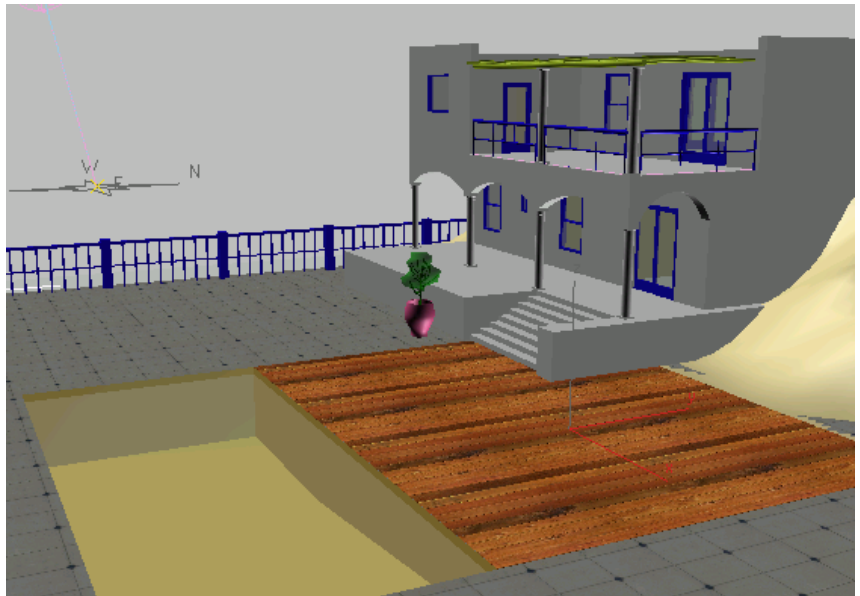
Remember that these two settings should either both be on or both be off at the same time.

The terrace tiling that the viewports show now appears to be muddled. This is because you need to set the size of the tiles.

- 5 On the Material Editor > Coordinates rollout, set Size in the Width dimension to **3.0m** (meters), and Size in the Length dimension to **2.0m** (meters).

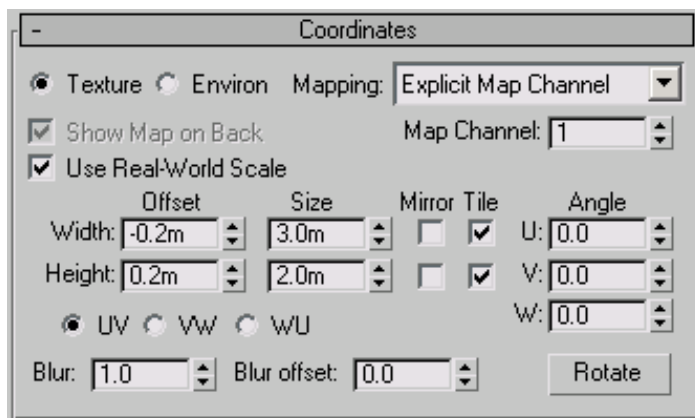


Now the tiling pattern on the terrace is nicely matched to the rest of the scene.

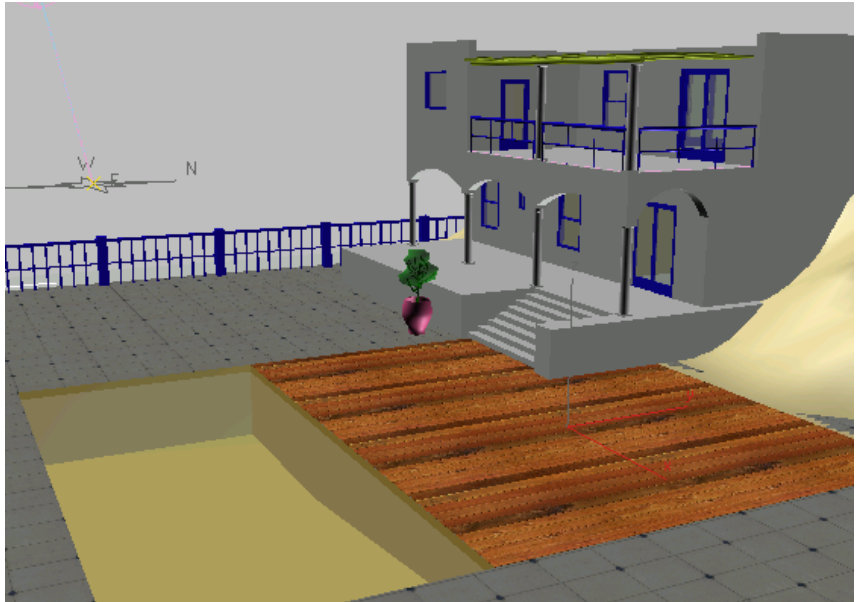


There is one small problem, however: the edges of the tiles don't match the edge of the swimming pool. You can fix this by adjusting the tiling offset.

- 6 On the Material Editor > Coordinates rollout, set Offset in the U dimension to **-0.2m** (meters), and Offset in the V dimension to **0.2m** (meters).



Now the tiles are nicely aligned with the pool.



#### Add bump mapping to the terrace tiles:



- 1 Click Go To Parent so you can view the main Ceramic material controls
- 2 On the Ceramic Material Parameters rollout, change Surface Bumps from None to Custom.
- 3 Click the Surface Bumps > Custom Map button.  
3ds Max Design opens a Material/Map Browser.
- 4 In the Browser, choose Bitmap as the map type, and then click OK.  
3ds Max Design opens a file dialog.
- 5 In the file dialog, browse to the `\sceneassets\images` folder. Choose the file `tile-cast-bump.jpg` and click Open.

---

**NOTE** As in this case (see the illustration above), an effective bump map is often simply a black-and-white version of the texture map.

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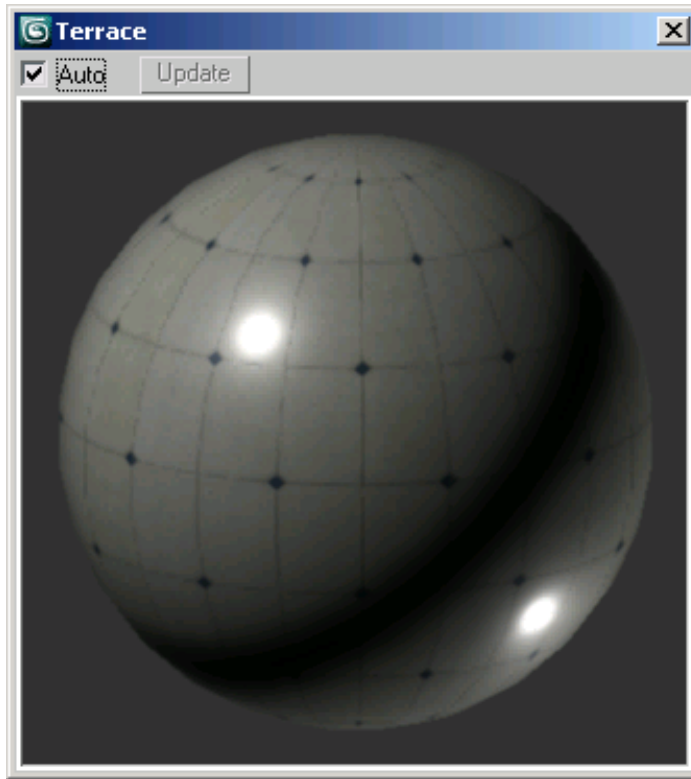
The UVW Map modifier belongs to the object: it affects both the texture map and this new bump map equally. However, you must also make sure that the bump map's own mapping coordinates are the same as the texture map's: otherwise, the bump effect will be “out of phase” with the texture, and won't appear correctly.

- 6 On the Coordinates rollout, make sure that the bump map settings are the same as the texture map settings:
  - Use Real-World Scale turned on
  - Width Offset = **-0.2m**
  - Length Offset = **0.2m**
  - Width Size = **3.0m**
  - Length Size = **2.0m**



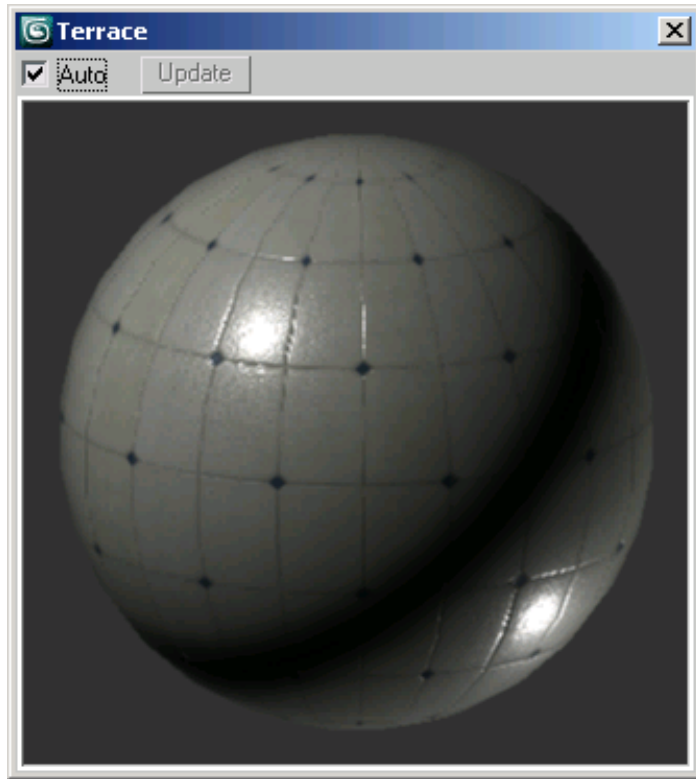
- 7 Click Go To Parent to return to the main Ceramic material level.

The bump effect is subtle, and hard to see in either the viewport or the sample slot. To get a better idea of the bump effect, double-click the sample slot. This displays the slot in an independent window. Drag a corner of the sample-slot window to make it larger.



The bump effect is still not apparent.

- 8 On the Ceramic Material Parameters rollout, increase the value of Surface Bumps > Amount to **0.7**.



Now the bump effect is apparent.

---

**NOTE** This is still a subtle effect for the long shots displayed in the two camera viewports. Whenever you texture a scene, bear in mind how much detail you want to use to make the scene believable. Will you need to make a close-up of the tiles on the terrace? In fact, some of the rendering tutorials do feature terrace closeups.

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- 9 Close the enlarged sample-slot window.

### Create a Material for the Swimming Pool

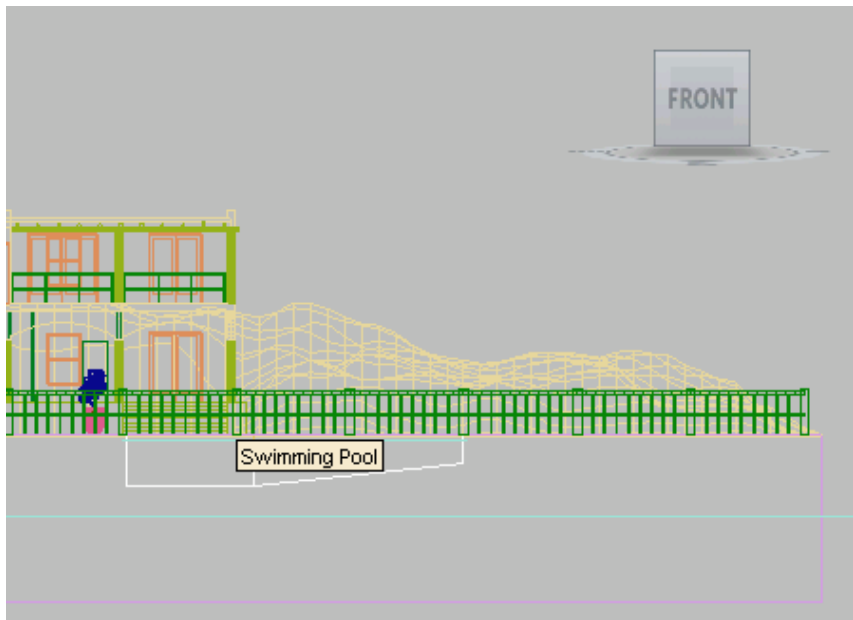
The floor and sides of the swimming pool are also made of ceramic tiles, but in this case the tiles are small, and might better be described as terrazzo or mosaic.

### Create the mosaic material:

- 1 Click the next unused sample slot to make it active. Name this material **Swimming Pool**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Ceramic from the list of materials, and then click OK.  
The Material Editor displays the Ceramic ProMaterial controls.  
In this case (unlike the terrace tiles), leave the Surface Finish set to its default value of High Gloss.



- 3 In the Front viewport, click to select the *Swimming Pool* object.

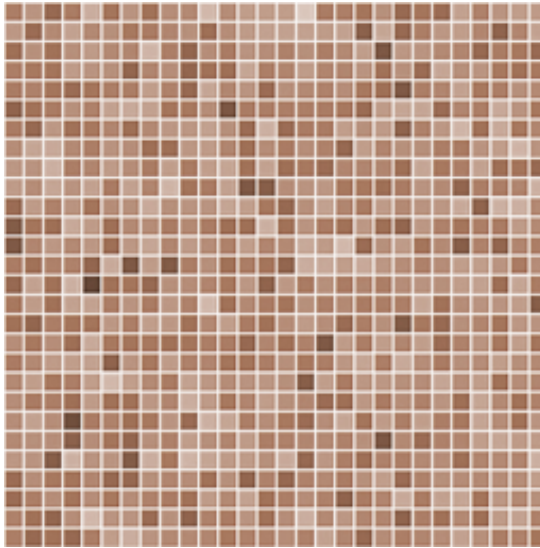


This selects the sides and bottom of the swimming pool.

- 4 In the Material Editor, on the Ceramic Material Parameters rollout, click the Color (Reflectance) map button.  
3ds Max Design opens a Material/Map Browser. In the Browser, click to highlight the Bitmap map type, and then click OK.  
3ds Max Design opens a file dialog.



- 5 In the file dialog, browse to the `\sceneassets\images` folder. Choose the file *mosaic.jpg* and click Open.



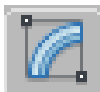
**Mosaic map for the sides and bottom of the swimming pool**

- 6 On the Coordinates rollout, lick to turn on Use Real-World Scale, and then set Width Size = Length Size = **3.0m** (meters).



- 7 Click Assign Material To Selection.

The swimming pool is an editable mesh, so as with the terrace, you need to apply a mapping modifier.



- 8 Go to the Modify panel, and choose UVW Map from the Modifier List drop-down list.

Make sure the UVW Map modifier's Real-World Map Size toggle is turned on. (It should be on by default.)



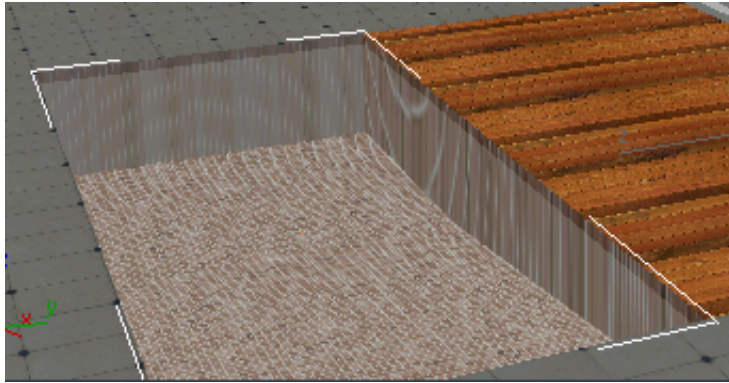
- 9 In the Material Editor, click Show Standard Map In Viewport to turn it on.

---

**NOTE** This button is enabled at the map level but not at the material level.

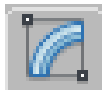
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- 10 Examine the mapping in the Camera-Hi-Point viewport.



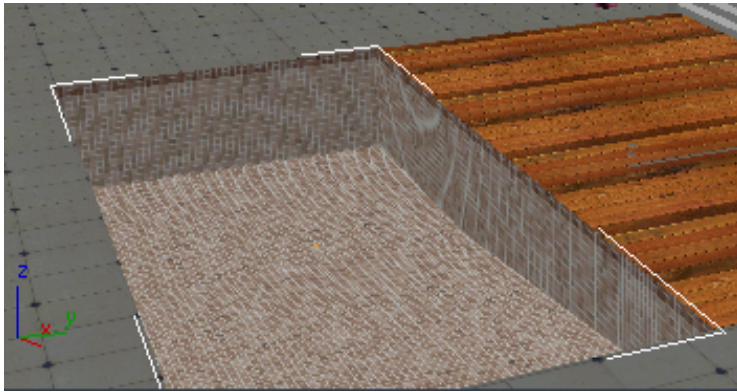
The bottom of the pool doesn't look bad, but the sides are streaked.

Unlike the wooden deck and the tiled terrace, which are flat surfaces, the swimming pool has both flat (or nearly flat) surfaces and vertical ones, so the default Planar mapping doesn't work.

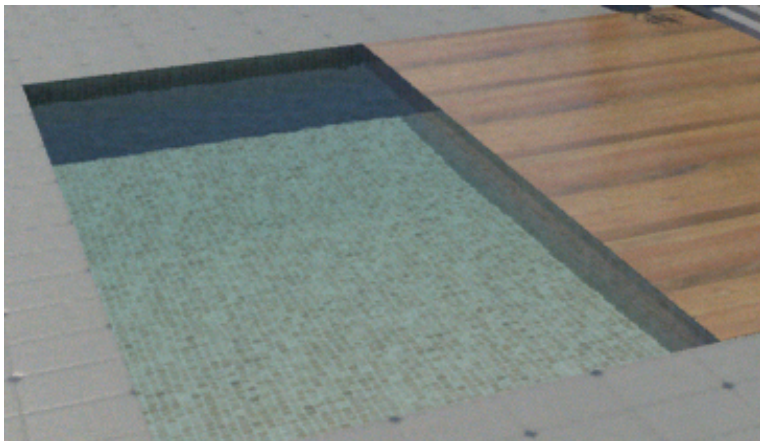


- 11 On the Modify panel > Parameters rollout, change the map projection from Planar to Box.

The radio buttons at the top of the UVW Map Parameters rollout control how a map is “projected” onto the surface of an object. For the pool, Box projection works better than Planar.



Now the pool has a fine-grained mosaic tile texture of the correct size. It's a little too fine-grained to show up well in viewports, but when you render it, it looks correct, and it interacts nicely with the Water - Pool material above it.



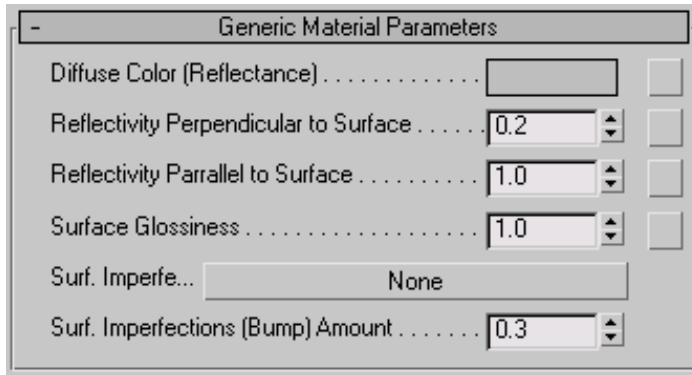
### Create a Material for the Terrain

The terrain is an oblong of undeveloped land behind the terrace. The house rests partly on the terrace, and partly on the terrain.

#### Create the terrain material:

- 1 Click the next unused sample slot to make it active. Name this material **Terrain**.

- 2 Click the Material Type button. In the Browser, choose ProMaterials: Generic from the list of materials, and then click OK.  
The Material Editor displays the Generic ProMaterial controls.



We use a generic material here because the terrain doesn't correspond to any of the preset ProMaterials; instead, its appearance comes completely from the texture map.

- 3 On the Generic Material Parameters rollout, set Reflectivity Perpendicular To Surface, Reflectivity Parallel To Surface, and Surface Glossiness all equal to **0.0**.

---

**TIP** The easiest way to set a spinner value to zero (or to the minimum allowed value) is to right-click the spinner arrows.

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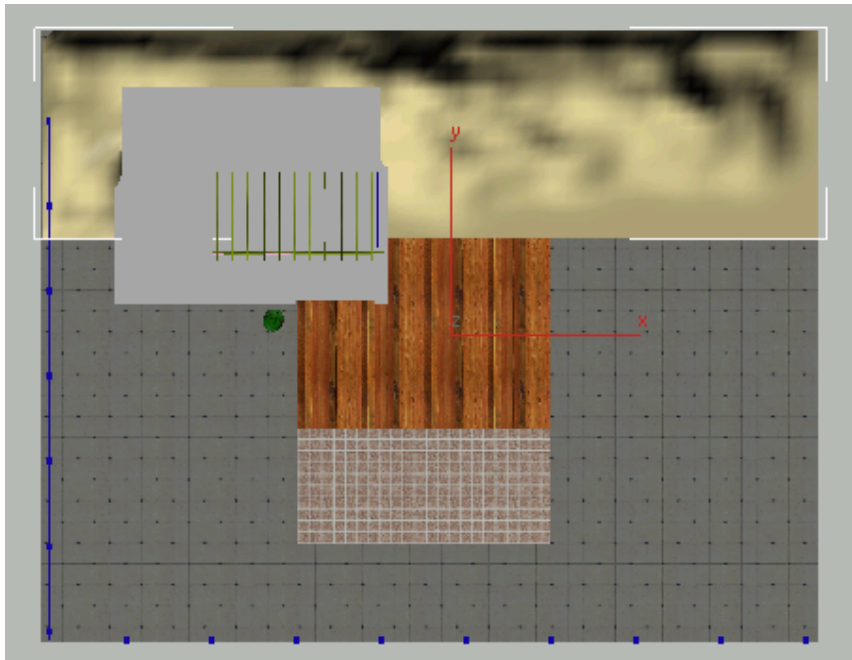
- 4 Click the Diffuse Color (Reflectance) map button. This is the gray button to the right of the color swatch.  
3ds Max Design opens a Material/Map Browser. In the Browser, click to highlight the Bitmap map type, and then click OK.  
3ds Max Design opens a file dialog.
- 5 In the file dialog, browse to the `\sceneassets\images` folder. Choose the file *terrain.jpg* and click Open.



**The terrain texture**



- 6 In the Top viewport, click to select the *terrain* object.  
The terrain is easiest to see if the viewport is shaded. If it isn't, press F3 to turn on shading.



**Terrain object selected in the Top viewport**



- 7 In the Material Editor, click Assign Material To Selection.



- 8 Click Show Standard Map In Viewport to turn it on.

---

**NOTE** This button is enabled at the map level but not at the material level.

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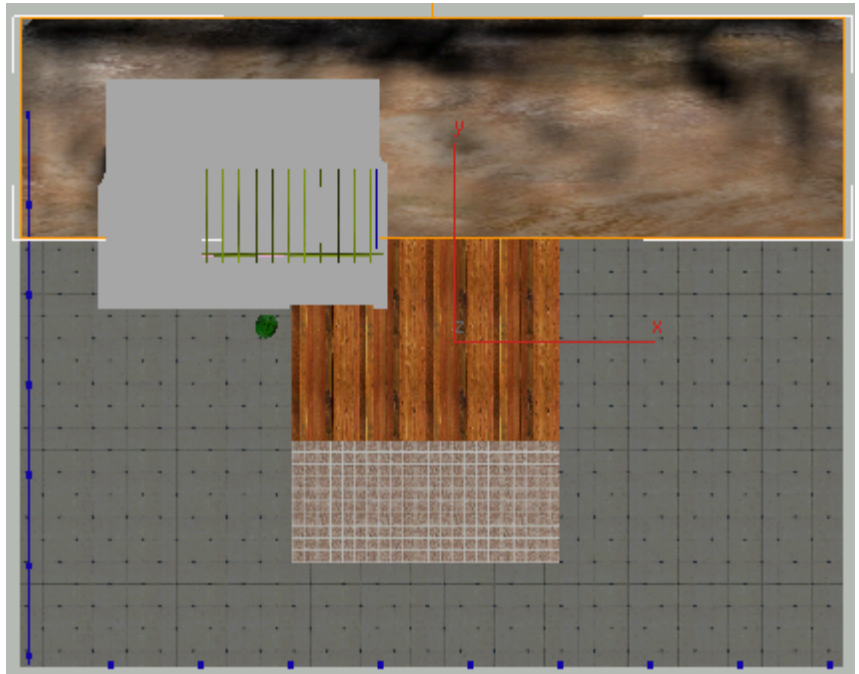
The map doesn't appear in viewports yet because the *terrain* object is also an editable mesh, and requires a mapping modifier.

### Adjust the mapping:



- 1 On the Modify panel, choose UVW Map from the Modifier List drop-down list.

The map is now visible in shaded viewports.



Planar mapping is appropriate again, in the case of the terrain. Turn off Real-World Map Size for UVW Map, and make sure that that Use Real-World Scale is turned off on the map's Coordinates rollout. However, the map appears to be squashed: this is because the original texture is square, while the terrain object is oblong. You can fix this by cropping the map.

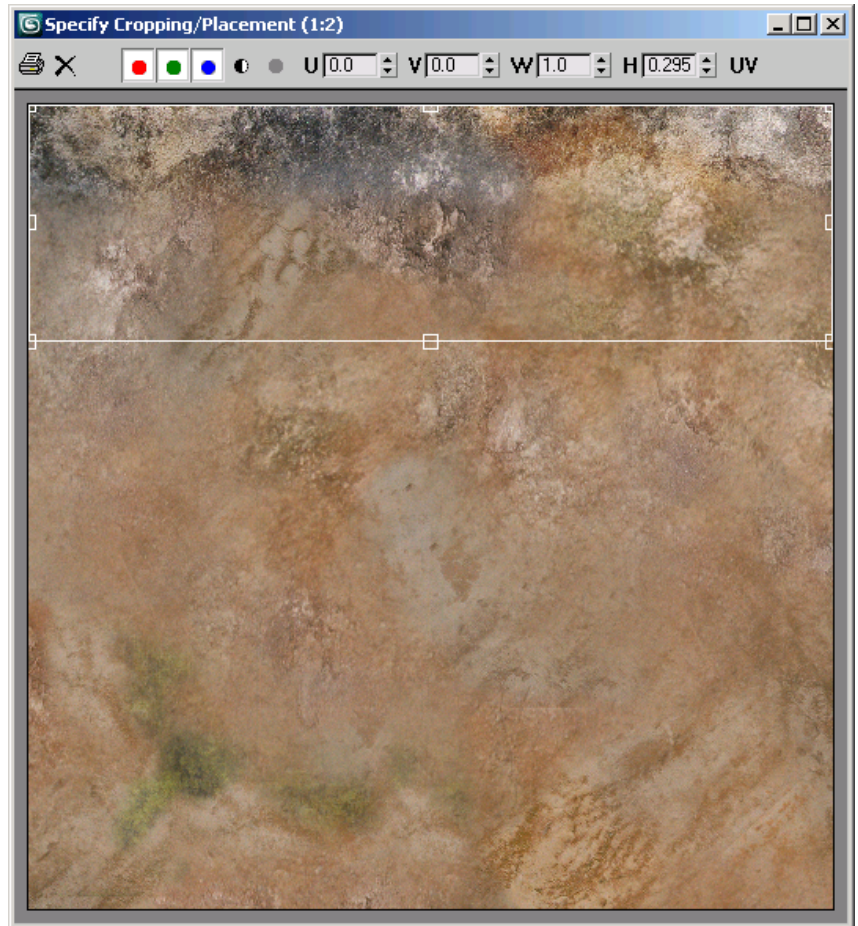
- 2 In the Material Editor, in the Bitmap Parameters rollout > Cropping/Placement group, click the View Image button.  
3ds Max Design opens a Specify Cropping/Placement dialog. It displays the map, surrounded by a white box with square handles. You can move the box, or use the handles to resize it.



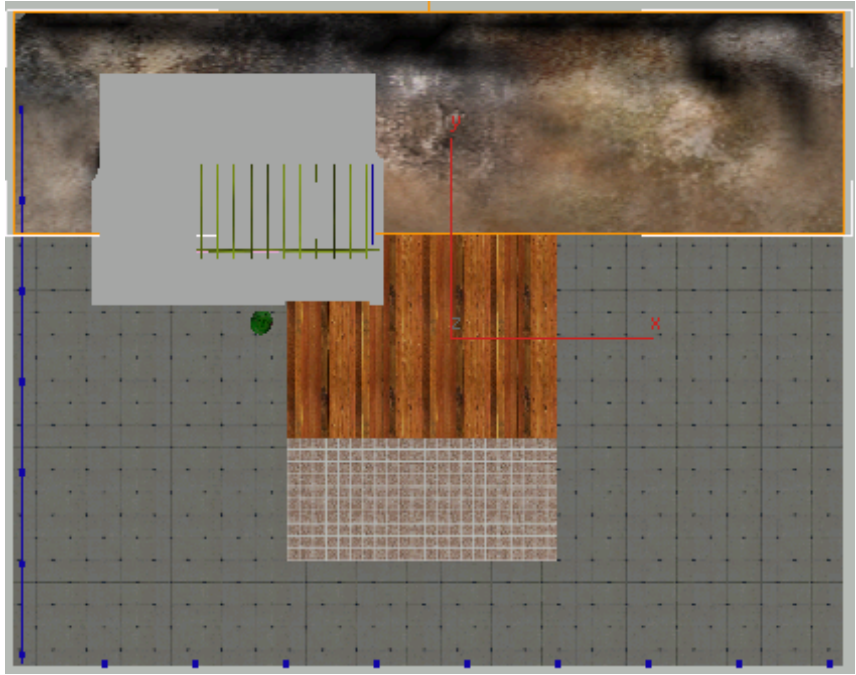


- 3 In the Specify Cropping/Placement dialog, drag the handle in the middle of the lower edge upward, until the cropping box encloses only about the upper quarter of the texture.





- 4 Close the Specify Cropping/Placement dialog by clicking the X button at the upper right.
- 5 In the Material Editor, in the Bitmap Parameters rollout > Cropping/Placement group, click Apply to turn it on and apply the cropping. (Make sure Crop and not Place is the option chosen just below the Apply toggle.)



Now the terrain map fits the terrain object.

### Create a Material for the Vase

For the outdoor vase, you will use a stone material and a slightly different mapping.

Select the vase and isolate it:



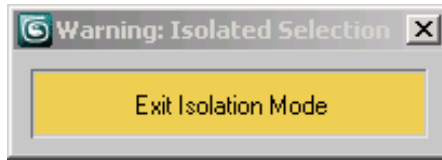
- 1 In the Camera-Terrace viewport, click to select the *Plant-Pot* object.
- 2 Right-click to display the quad menu, and choose Isolate Selection.
- 3 Click the Point Of View (POV) viewport label (it now shows “Camera-Terrace”), and choose Perspective.

This helps you get a better view of the vase.

---

**TIP** You might have to move the Warning: Isolated Selection dialog to see the viewport labels.

---



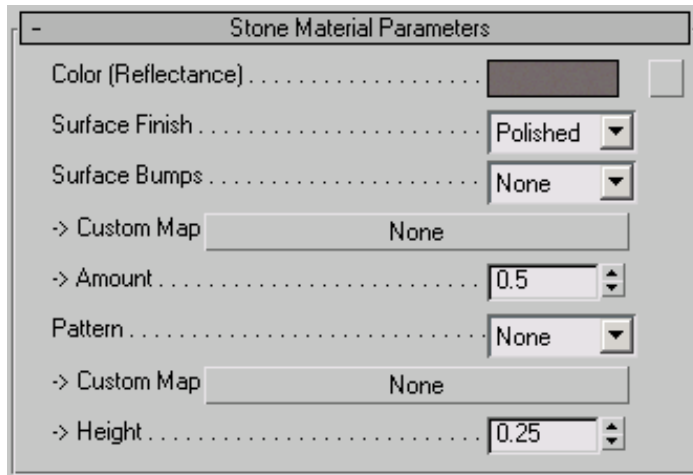
- 4  Click Zoom Extents All.

You can find this button among the navigation buttons at the lower right corner of the 3ds Max Design window.

Now the viewports show a closeup of the vase (except for Camera-Hi-Point, which retains the camera's point of view).

### Create the stone material:

- 1 In the Material Editor, click the next unused sample slot to make it active. Name this material **Plant Pot**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Stone from the list of materials, and then click OK.  
The Material Editor displays the Stone ProMaterial controls.




- 3 On the Stone Material Parameters rollout, change Surface Finish to Matte.
- 4 Click the Color (Reflectance) map button (the gray button to the right of the color swatch).

3ds Max Design opens a Material/Map Browser. In the Browser, choose Bitmap as the map type, and then click OK.

3ds Max Design opens a file dialog. In the file dialog, navigate to the `\sceneassets\images` folder, choose the file *travertn.jpg*, then click Open.



Travertine texture for the vase

- 5  In the Material Editor, click Assign Material To Selection.

- 6  Click Show Standard Map In Viewport to turn it on.

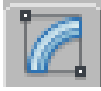
---

**NOTE** This button is enabled at the map level but not at the material level.

---

In viewports, the vase turns brown, but doesn't show the map. The vase is an editable poly object, and like editable mesh, this object type requires a mapping modifier.

### Map the vase and adjust the map settings:



- 1 On the Modify panel, apply a UVW Map modifier to the vase.
- 2 For the UVW Map modifier, turn off Real-World Map Size. Also turn off Use Real-World Scale on the map's Coordinates rollout.



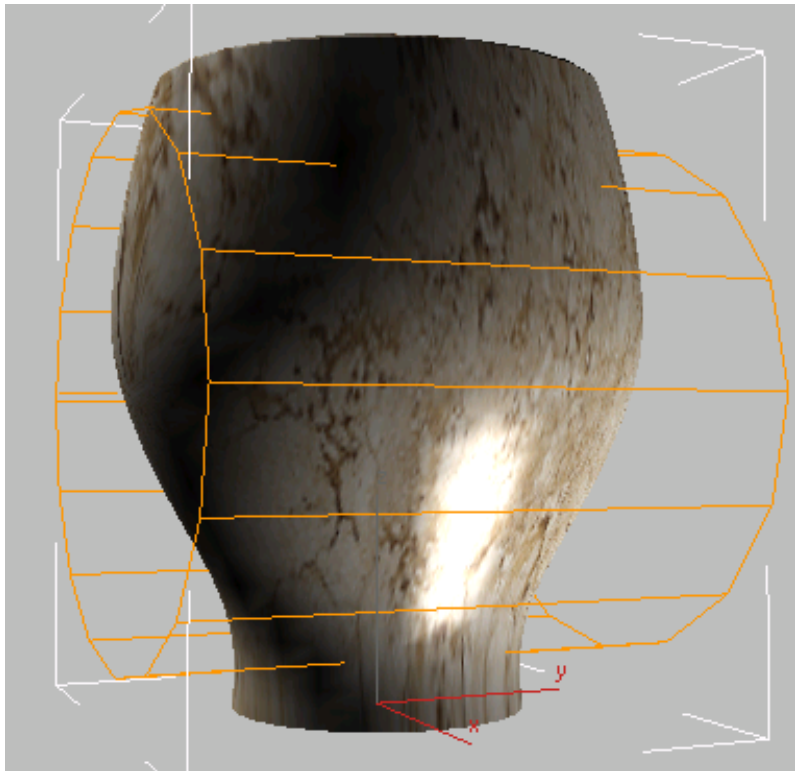
If you shade the Front viewport the mapping looks all right, but in the Perspective viewport you can see that the sides appear to be smeared.



- 3 Orbit the Perspective viewport to see how the map is smeared along the sides of the vase. When you're done, press Shift+Z to undo the rotation.

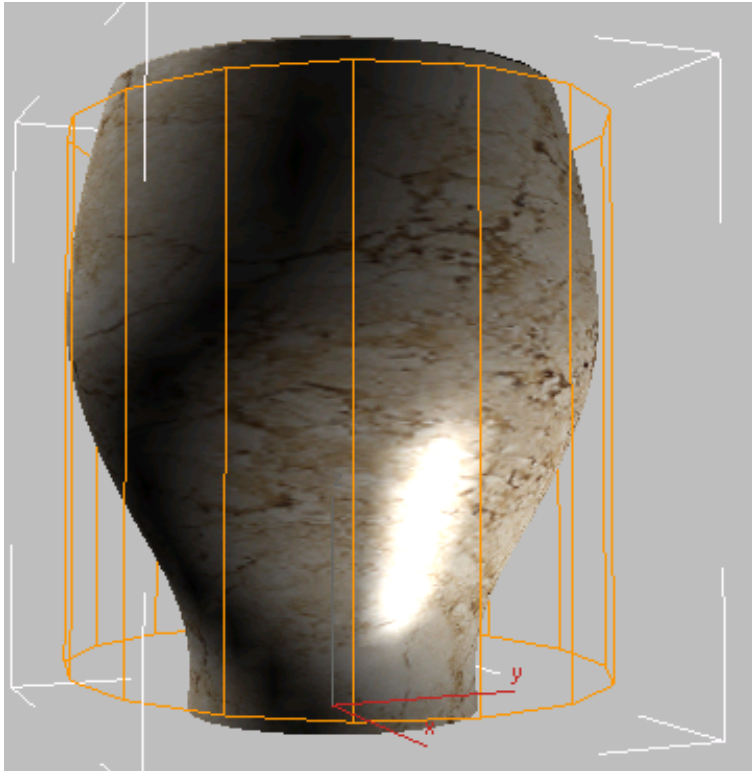
Planar mapping isn't appropriate for the vase.

- 4 On the UVW Map Parameters rollout, change the map projection to cylindrical.



A brown cylindrical “gizmo” shows the cylinder used to project the map. Unfortunately, the default orientation of the cylinder isn’t aligned with the vase, so you need to fix that.

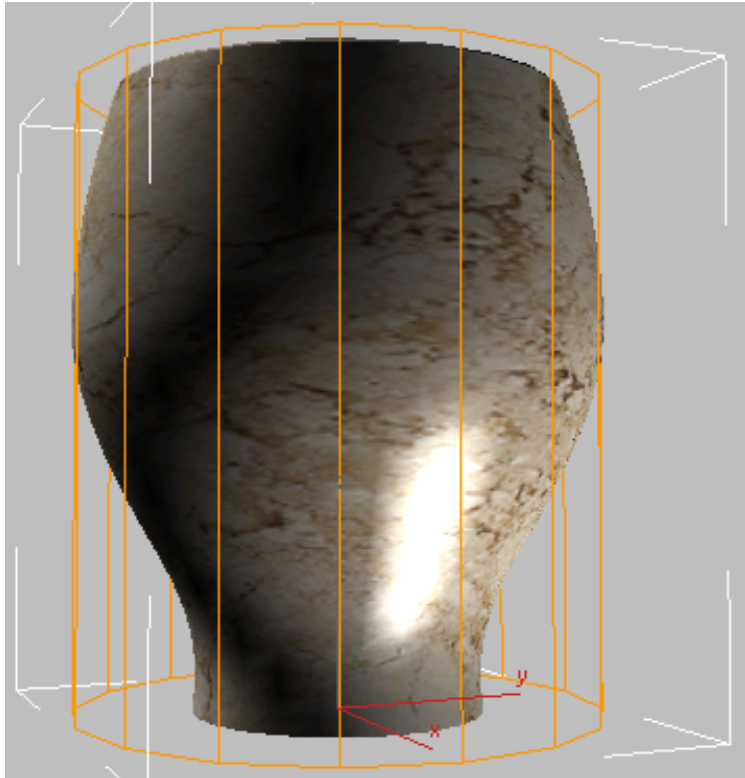
- 5 In the Parameters rollout > Alignment group, change the axis to X.



Now the projection cylinder (gizmo) is aligned with the vase.

- 6 Also in the Alignment group, click Fit.  
This fits the gizmo to the vase geometry, so there's no chance of tiling.





**Change the surface finish of the vase:**



- 1 In the Material Editor, click Go To Parent to return to the main Stone material level.
- 2 On the Stone Material Parameters rollout, change Surface Bumps to Polished Granite.  
This gives the vase a weathered look when you render it.





As with the bump map you applied to the terrace tiles, the detailed vase texture won't be apparent in long shots, but it might come in useful if you render the vase close up.

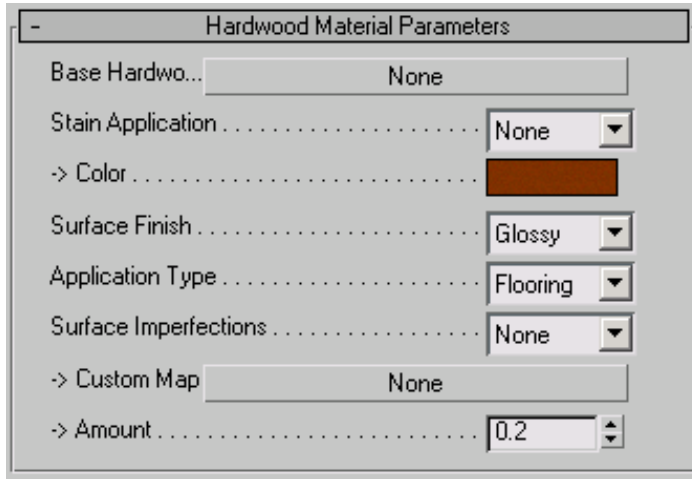
- 3 On the Warning: Isolated Selection dialog, click Exit Isolation Mode.
- 4 If a Select Camera dialog appears, choose Camera-Terrace, and then click OK; otherwise, click the Point Of View (POV) viewport label, and choose Cameras > Camera-Terrace to restore the long camera view.

### **Create a Material for the Trellis**

The last object to texture in this lesson is the arbor trellis on the balcony of the house. Its geometry is complicated, and requires a new mapping technique.

### Create the weathered wood material:

- 1 In the Material Editor, click the next unused sample slot to make it active. Name this material **Trellis**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Hardwood from the list of materials, and then click OK.  
The Material Editor displays the Hardwood ProMaterial controls.



- 3 On the Hardwood Material Parameters rollout, change Surface Finish to Unfinished, and Application Type to Furniture.
- 4 Also on the Hardwood Material Parameters rollout, click the Base Hardwood map button.  
3ds Max Design opens a Material/Map Browser. In the Browser, choose Bitmap as the map type, and then click OK.  
3ds Max Design opens a file dialog. In the file dialog, navigate to the \sceneassets\images folder, choose the file *oldwood.jpg*, then click Open.



**Weathered wood texture for the trellis**

**Apply the material:**

- 1 If the Layers toolbar isn't visible, right-click the gray area to the right of the main toolbar, and choose Layers to display this toolbar.



- 2 From the drop-down list of layers on the toolbar, choose *Vine*, and then click Select Objects In Current Layer.  
This selects the arbor trellis that can support a grapevine.



- 3 In the Material Editor, click Assign Material To Selection.



- 4 Click Show Standard Map In Viewport to turn it on.




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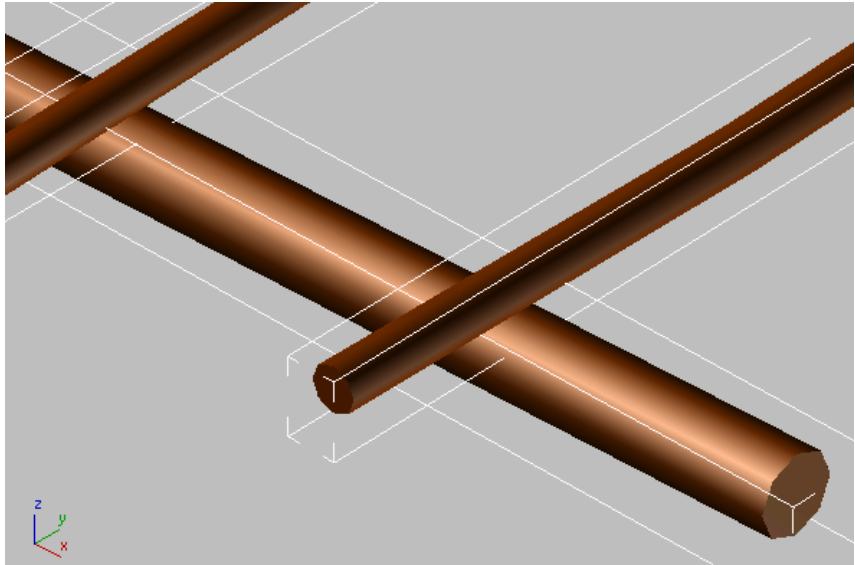
**NOTE** This button is enabled at the map level but not at the material level.

---

You can't yet see the texture in viewports, because the trellis is made of editable meshes.

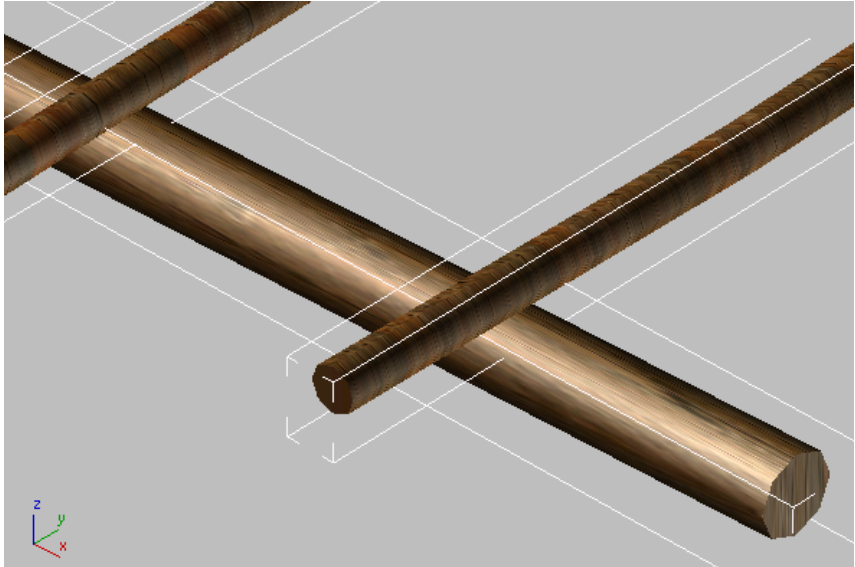
- 5 Right-click to display the quad menu, and choose Isolate Selection.
- 6 Click the Point Of View (POV) viewport label (it now shows "Camera-Terrace") and choose Perspective.

- 7    In the Perspective viewport, use Zoom, Pan, and Orbit to adjust the viewport so it shows a closer view of the trellis.



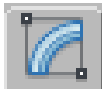
#### Map the trellis:

The trellis requires a mapping modifier, but UVW Map won't work. If you were to try (you don't have to go through the steps), you could see that none of the projection options work, because of the crosswise configuration of the trellis beams.



**Trellis close-up: poor mapping with UV Map**

The solution is to use a Mapscaler modifier instead of UVW Map.



- 1 On the Modify panel, choose Mapscaler from the Modifier List drop-down list.

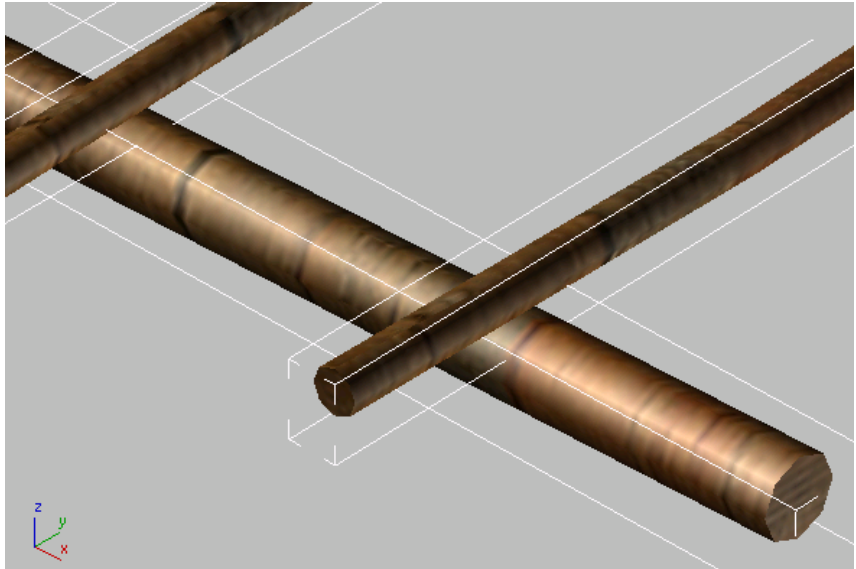
---

**NOTE** Be sure to choose “MapScaler” from the list, and not “MapScaler (WSM)”. The world-space (WSM) version of MapScaler has a similar effect, but is not quite the same.

---

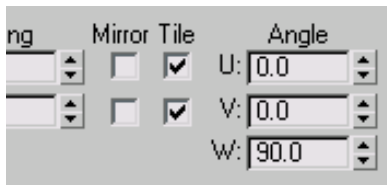
The MapScaler modifier maintains the map scale relative to each object (in this case, the cylindrical beams), and by default it wraps the texture so the wood grain wraps around each beam.

- 2 On the Mapscaler Parameters rollout, change the Scale to **1.0m** (meter).

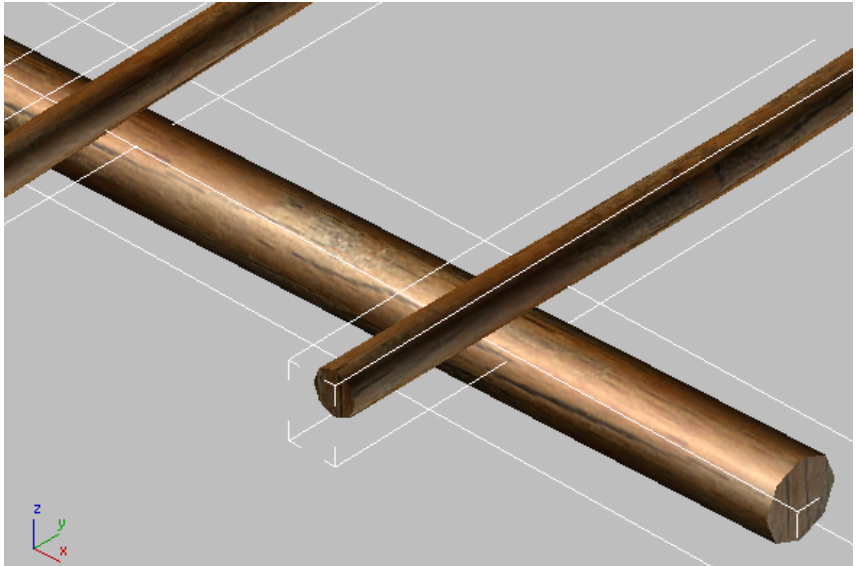


This effect is already good, but the grain should actually follow each beam. Adjusting the Mapscaler and map settings can fix this.

- 3 In the Material Editor, on the Coordinates rollout, change the W angle to **90.0** degrees.



Now the beams in the trellis look the way they should.



- 4 On the Warning: Isolated Selection dialog, click Exit Isolation Mode.
- 5 If a Select Camera dialog appears, choose Camera-Terrace, and then click OK; otherwise, click the Point Of View (POV) viewport label (it now shows “Perspective”), and choose Cameras > Camera-Terrace to restore the long camera view.

### Save Your Work

- Save the scene as **my\_villa\_textures.max**.

### Next

[Propagating Materials to Instanced Objects](#) on page 313

## Propagating Materials to Instanced Objects

Many architectural models include instanced objects, such as furniture or lighting fixtures. This lesson demonstrates a Material Editor option that improves ease of use when you texture instanced objects.

### Set up the lesson:

- Continue from the previous lesson, or open the file *med-villa-mat\_propagate.max*.

### Unhide the lounge chairs:

- 1 If the Layers toolbar isn't visible, right-click the gray area to the right of the main toolbar, and choose Layers to display this toolbar.



- 2 Open the drop-down list of layers on the toolbar, and click the Hidden icon by the *Chairs* layer to unhide the *Chairs* layer.  
Six lounge chairs are now visible on the terrace of the villa.

### Apply the railings material to the chair piping:

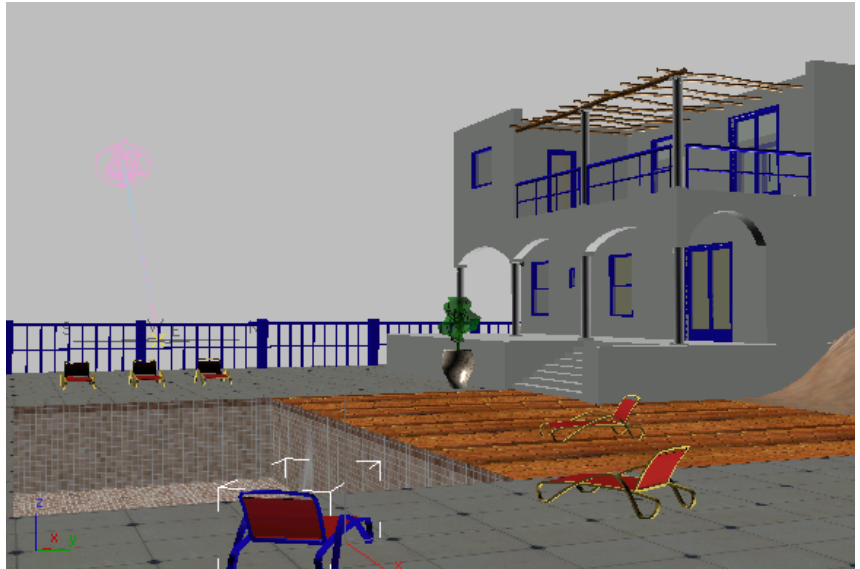
The chairs are instances. They contain two elements: a yellow frame and a red set of cushions (these colors are just 3ds Max Design object colors: the chairs don't have materials yet).

- 1 In the Camera-Terrace viewport, click to select the frame of the nearest chair, *Chair Struc02*.



- 2 In the Material Editor, click the Blue Railings sample slot to make it active, and then click Assign Material To Selection.  
The chair's frame turns blue, but the other chairs are not affected.

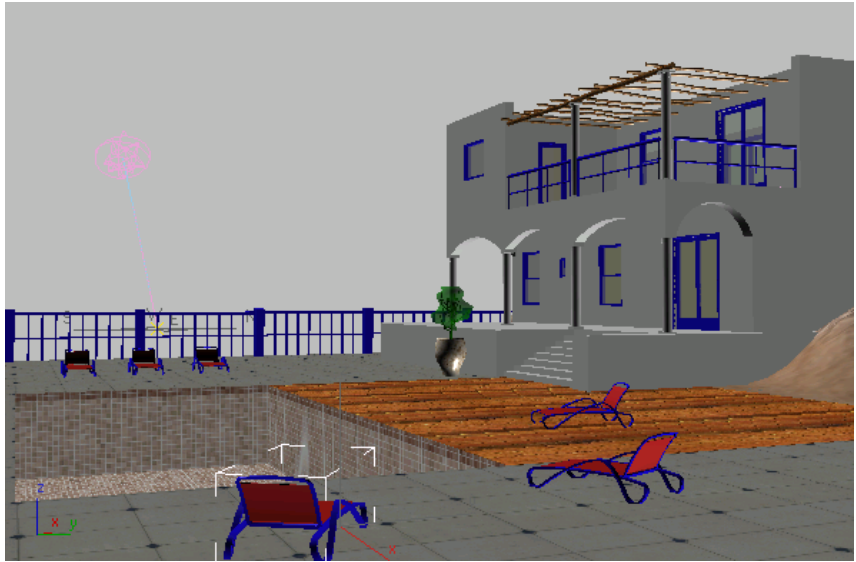




- 3 Press Ctrl+Z to undo the material assignment.
- 4 From the Material Editor menu, choose Options > Propagate Materials To Instances.



- 5 Click Assign Material To Selection once again.  
This time, all the chair frames turn blue at once.



Although Propagate Materials To Instances is off by default (when it is on, there is a check mark next to its name in the menu), if you work with instanced objects, it is usually a good idea to turn it on.

#### Create a material for the chair fabric:

- 1 In the Material Editor, click the next unused sample slot to make it active. Name this material **Fabric**.
- 2 Click the Material Type button. In the Browser, choose ProMaterials: Generic from the list of materials, and then click OK.  
The Material Editor displays the Generic ProMaterial controls.
- 3 On the Generic Material Parameters rollout, set Reflectivity Perpendicular To Surface, Reflectivity Parallel To Surface, and Surface Glossiness all equal to **0.0**.
- 4 Also on the Generic Material Parameters rollout, click the Diffuse Color map button (to the right of the color swatch).  
3ds Max Design opens a Material/Map Browser. In the Browser, choose Bitmap as the map type, and then click OK.  
3ds Max Design opens a file dialog. In the dialog, navigate to the `\sceneassets\images` folder, choose the file *fabric-stripes.jpg*, then click Open.



Fabric pattern for the chairs



- 5 Click Show Standard Map In Viewport to turn it on.

---

**NOTE** This button is enabled at the map level but not at the material level.

---

- 6 In the Camera-Terrace viewport, click to select the fabric of the nearest chair, *Chair Fab02*.



- 7 In the Material Editor, click Assign Material To Selection.

All the chairs now have the fabric material applied.

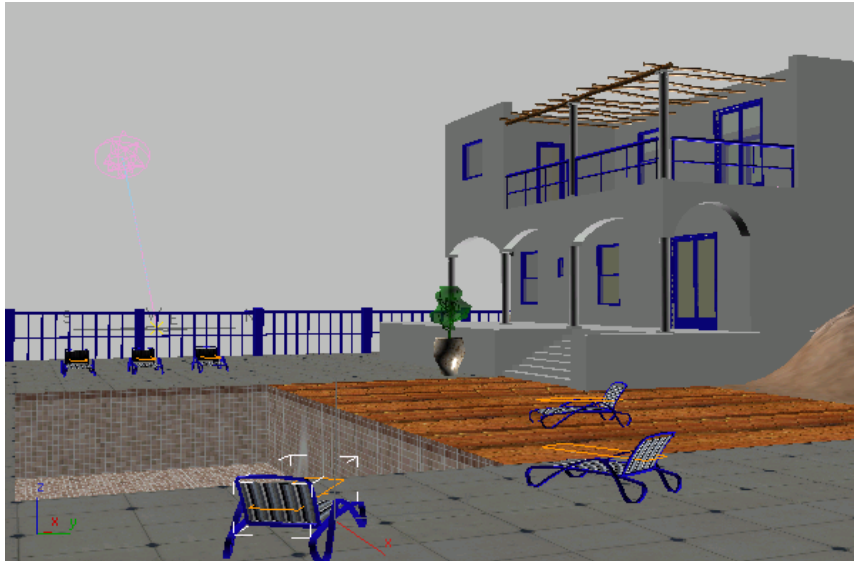


- 8 On the Modify panel, choose UVW Map from the Modifier List drop-down list.

Turn off Real-World Map Size. In the map Coordinates rollout, also turn off Use Real-World Scale.

- 9 In the UVW Map modifier Parameters rollout > Alignment group, choose Y as the active axis.
- 10 In the Material Editor, on the Coordinates rollout, change the W angle to **90.0** (degrees).

Now the all the chairs are striped lengthwise.



### Save Your Work

- Save the scene as **my\_villa\_deck\_furniture.max**.

### Summary

You can see a final version of the scene by opening *med-villa-mat\_done.max*.



**A rendering of the villa after you have completed the tutorial**

This tutorial has shown you how to:

- Apply simple ProMaterials and adjust their settings
- Apply a Multi/Sub-Object material and use its material IDs to apply sub-materials to objects that have multiple material IDs
- Add maps to a material
- Use the UVW Map or MapScaler modifiers to set mapping coordinates for objects that don't have default coordinates
- Use the Propagate Materials To Instances option when assigning materials to instanced objects

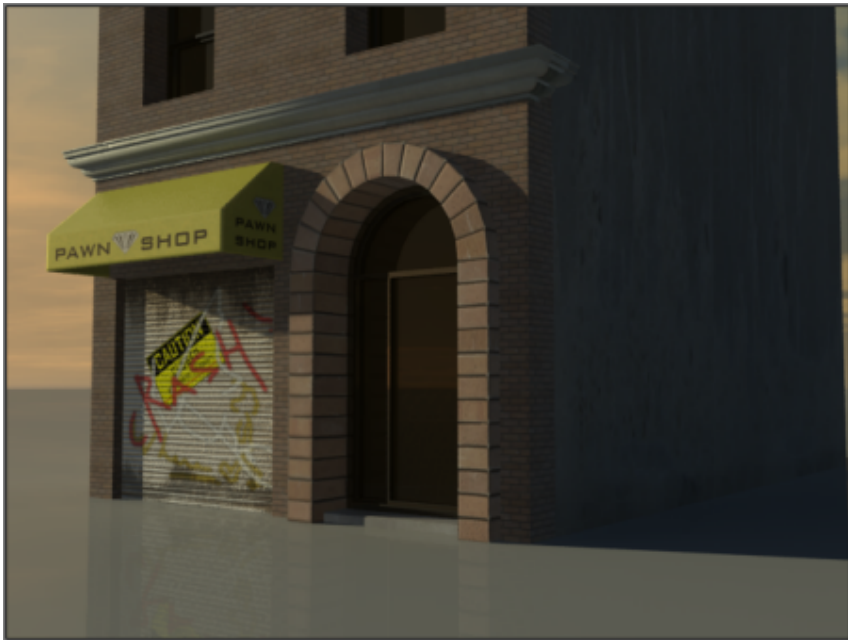
The final rendering for this tutorial still lacks a little drama, but you will correct that when you use this villa model again in some of the lessons on lighting, which follow. Some of the rendering tutorials also use the villa model to demonstrate how you can further enhance the realism of a scene.

## Composite Mapping

A composite map is two or more texture maps which have been layered onto one another to produce a more detailed image.

The end result is determined by the level of transparency defined for each layer. Transparency can be global (applied to the entire surface of the layer), derived from the layer's alpha channel, or based on a mask. The pixels of each layer can also be blended with one another in a number of different ways to fine-tune the image.

In this tutorial, you will create a complex texture map of a steel shutter for a pawn shop. The map will consist of five layers of images composited together using various transparency settings and blending techniques.



**A render of the steel shutter composite map after completing this tutorial**

In this tutorial, you will learn how to:

- Create a composite layer
- Color correct a layer

- Define layer transparency and contrast
- Create a layer defined by a mask
- Rearrange the order of layers
- Blend layers
- Add bump information to layers


Skill level: Intermediate

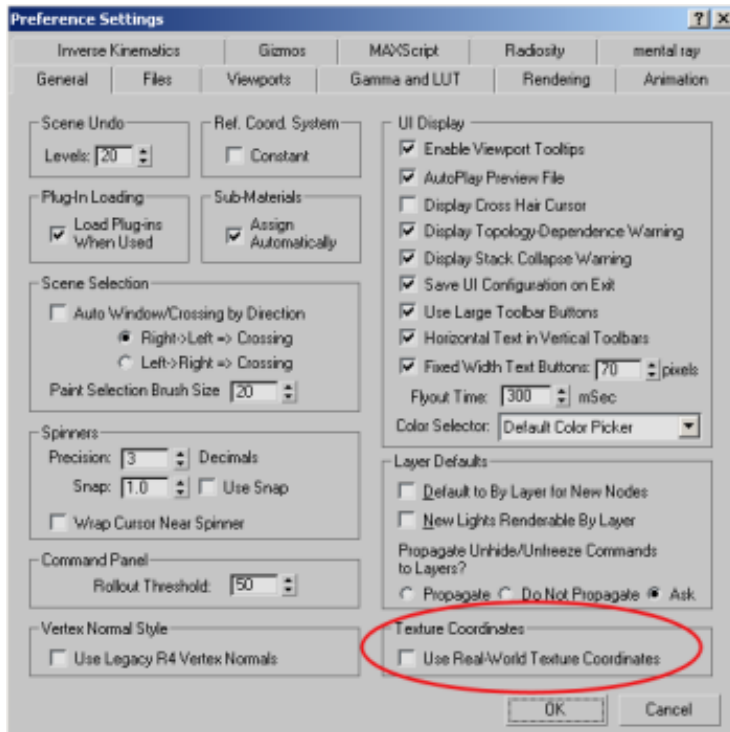
Time to complete: 45 minutes

## Creating a Composite Map with Alpha Values

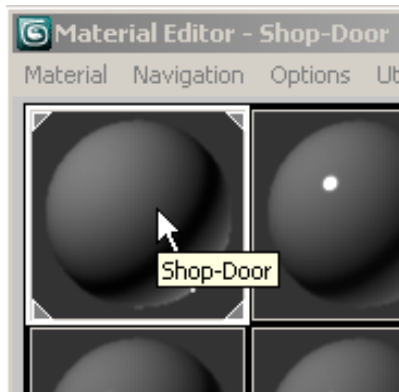
You will create the base layer of the composite map by choosing a bitmap of a steel shutter, then assigning its diffuse, or color, values to an Arch+Design building material. You will then add two more image layers, using alpha values to define how each are superimposed over the base layer.

**Create a base layer and color correct it:**

- 1  On the Quick Access toolbar, click the Open File button, navigate to `\scenes\materials_and_mapping\composite_mapping\` and open the scene file *composite-start.max*.  
  
The scene consists of a pawnshop located in a rough part of town. The storefront is missing one important element: a steel shutter that protects a plate-glass window. Your task is to create a convincing composite map of the shutter.
- 2 From the main menu, go to the Customize > Preferences > General panel > Texture Coordinates group and turn off Use Real-World Texture Coordinates, if it is not already off.





- 3 Press M to open the Material Editor.



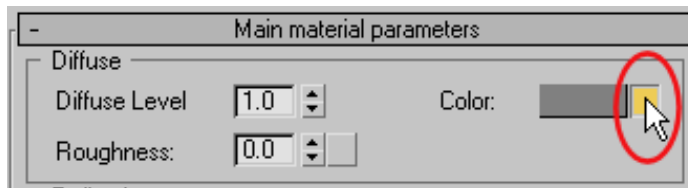
The top left sample slot contains an Arch+Design material called Shop-Door.



- 4  Click Show Standard Map In Viewport so you will later be able to view the composite map in the viewport.

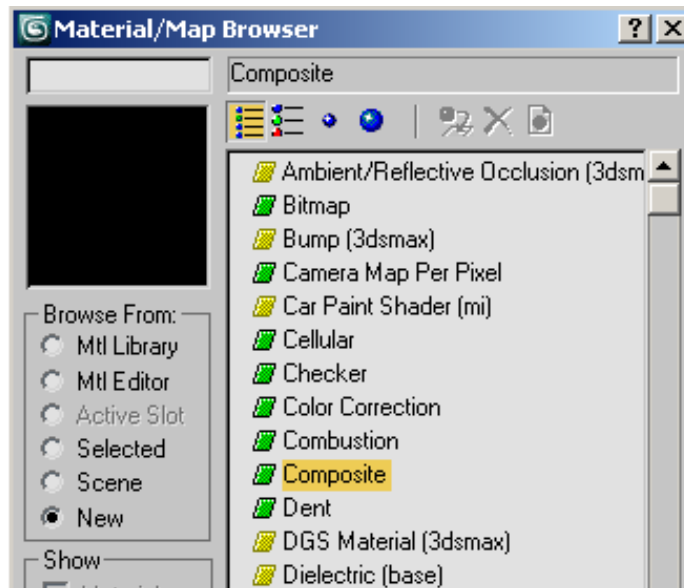
- 5  Maximize the Orthographic view.

- 6 In the Material Editor > Main Material Parameters rollout > Diffuse group, click the Diffuse Color map button.

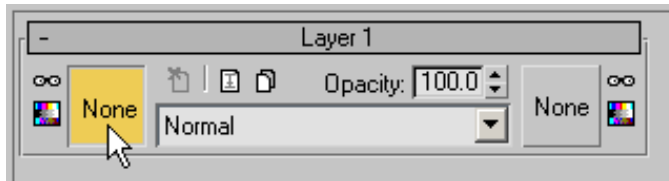


You will now add a composite map to the material's diffuse color channel.

- 7 On the Material/Map Browser, double-click Composite.



- 8 On the Material Editor > Layer 1 rollout, click the left-hand Assign Material button (initially labeled "None").



- 9 On the Material/Map Browser, double-click Bitmap.
- 10 On the Select Bitmap Image File dialog, double-click *shutters.jpg*.  
The bitmap, which simulates a corrugated metal surface, is automatically applied as a texture map to the sample slot in the Material Editor and will form the base layer of your composite map.



- 11 Click Go To Parent to view the texture as a composite map.  
At this level, you can monitor the appearance of the map as you add more layers of images and make further adjustments.

---

**NOTE** Any sample image you display at this level will be larger and may take more time to render.

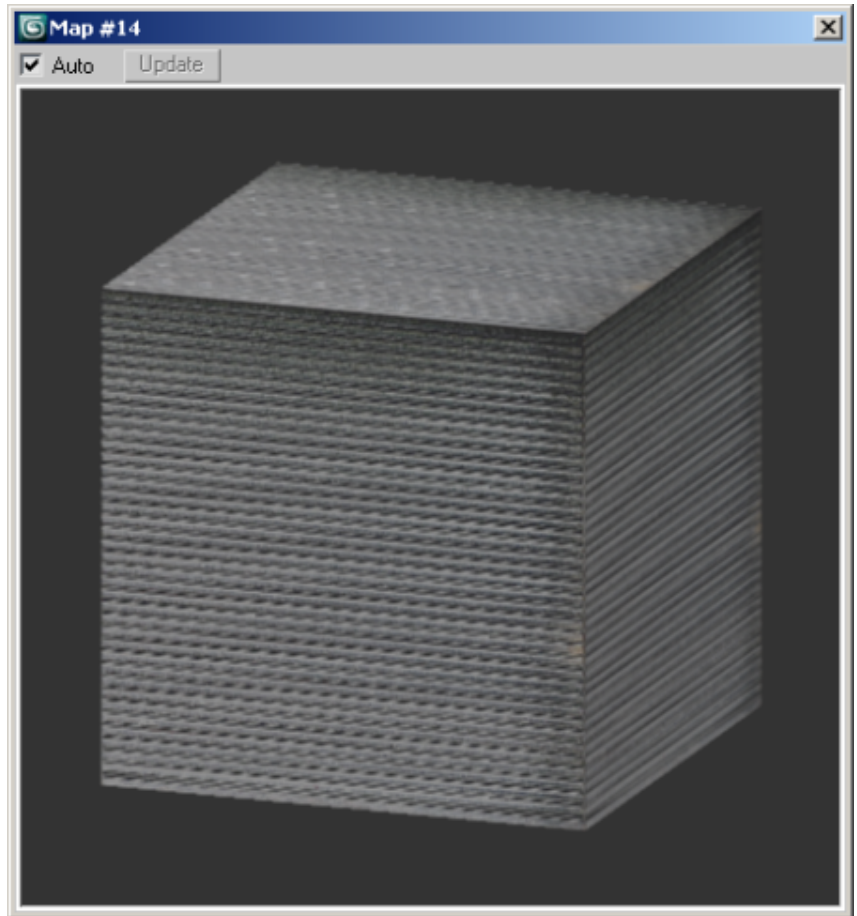
---

- 12 Click the Sample type button, then from the flyout, choose the cube option.




The sample slot sphere converts to a cube, which is a closer representation of the shutter geometry.

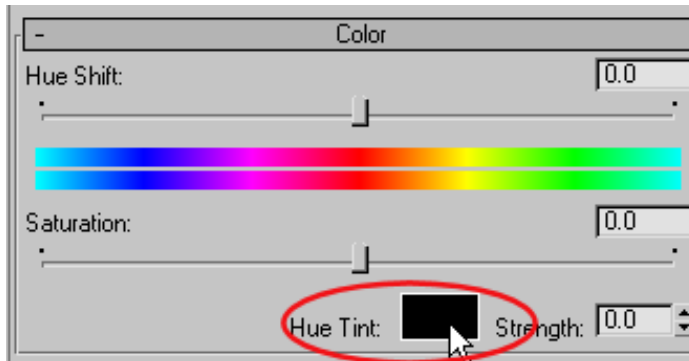
- 13 Double-click the Shop-Door material sample slot to display the map in a viewer. Resize the viewer if required.



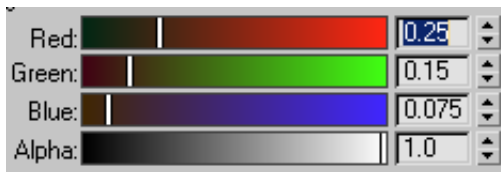
**Shutter bitmap image as the base layer in the composite map**

Notice how the generic material is uniformly gray in color. Let's add a little rust to give the shutter a more run-down appearance.

- 14  On the Layer 1 rollout, click the left-hand Color Correct button.
- 15 On the Color rollout, click the Hue Tint color chip.



- 16** Using the color controls, choose a dark brown color. Alternatively, type the following values in the RGB spinner boxes: **0.25**, **0.15**, and **0.075**.



- 17** Drag the Saturation slider to **17.0** and in the Strength box, type **100.0**.



The Shop-Door material shows a brownish tint.

### Add a layer defined by alpha values:

Next, you will add a second layer to your composite map, one that contains the bold strokes of a graffiti artist.

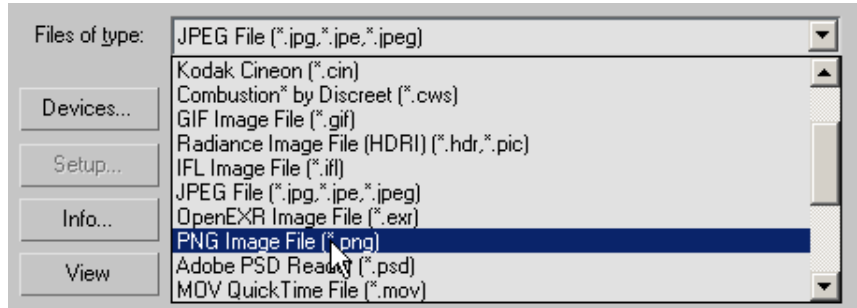


- 1** Click Go To Parent to view the texture at the composite level.



- 2** On the Composite Layers rollout, click the Add A New Layer button.

- 3 On the Layer 2 rollout, click the Assign Material button (initially labeled “None”) to the left.
- 4 On the Material/Map Browser, double-click Bitmap.
- 5 On the Select Bitmap Image File dialog, click the Files Of Type list box, then choose PNG Image File.



From the file list, choose *graffiti.png*. Click View to display the image in a viewer.



Graffiti bitmap used as the second layer in the composite map

In addition to red, green, and blue (RGB) information, the bitmap includes alpha channel information in its *.png* file format. This channel provides the level of opacity needed to superimpose the graffiti image over the base image.

- 6  Click the Display Alpha Channel button.

A black and white version of the image displays, showing the file's alpha information.



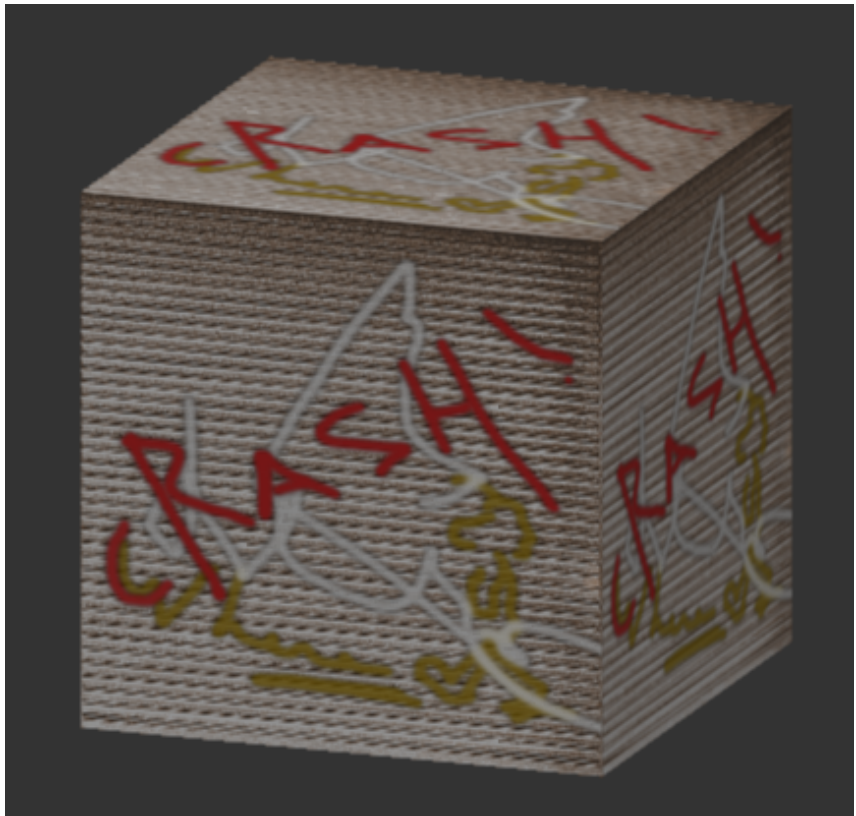
Alpha channel of the graffiti bitmap

Black regions of the bitmap will be completely transparent in the composite map. White regions, representing the graffiti strokes, will be completely opaque and fully visible in the composite map. Gray regions will be semi-transparent and provide partial visibility, giving a blurred edge to the graffiti.

Other formats that include alpha channel information are *.tif*, *.tga*, and *.exr*.

- 7 Close the *graffiti.png* viewer and click Open to activate the bitmap.

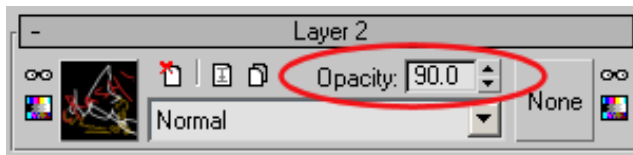
The second image layer is now composited according to its alpha channel values onto layer 1.



Composite map with the graffiti layer composited on the shutter layer




- 8 Click Go To Parent to return to the composite level.
- 9 On the Layer 2 rollout > Opacity box, type **90.0** and press Enter.

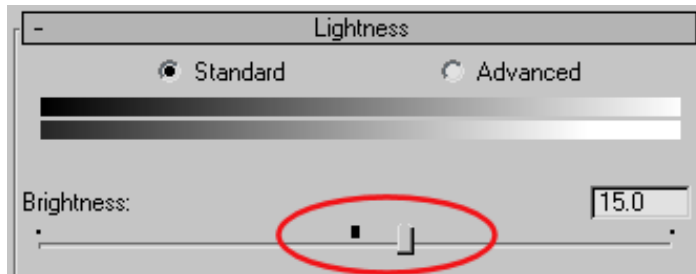




This slightly increases the global transparency of layer 2, so that a small portion of layer 1 remains visible. The result is a more convincing blending of the graffiti onto the shutter surface.

The graffiti layer still needs to stand out a little more: you will use the color correction tools to achieve this effect.

- 10  On the Layer 2 rollout, click the Color Correct button to the left and on the Lightness rollout, drag the slider to the right until the Brightness box shows a value of **15.0**.



The brightness change affects the alpha channel in the semi-transparent portion of the layer as well, creating an unwanted halo effect around the graffiti strokes.



**Halo surrounding graffiti strokes**

You will correct this problem by increasing the contrast level.

- 11 Drag the Contrast slider to the right until the box displays a value of **25.0**.

**Add a layer defined by a mask:**

You will now add a third layer to your composite map, one that features a poster.



- 1 Click Go To Parent to return to the composite level.




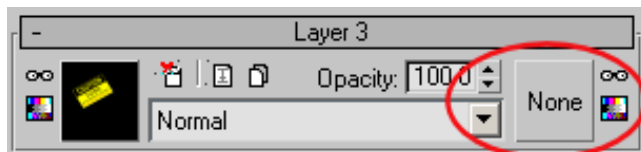
- 2 On the Composite Layers rollout, click Add A New Layer.
- 3 On the Layer 3 rollout, click the Assign Material button (initially labeled “None”) to the left.
- 4 On the Material/Map Browser, double-click Bitmap.
- 5 On the Select Bitmap Image File dialog, click the Files Of Type list box, then choose All Formats.
- 6 From the list of images, double-click *c-sign.jpg*.



The c-sign bitmap applied as a top layer in the composite map

Bitmaps saved in *.jpg* format have no alpha channel information, so by applying the *c-sign.jpg* image directly as a top layer, you have completely obscured all layers beneath it.

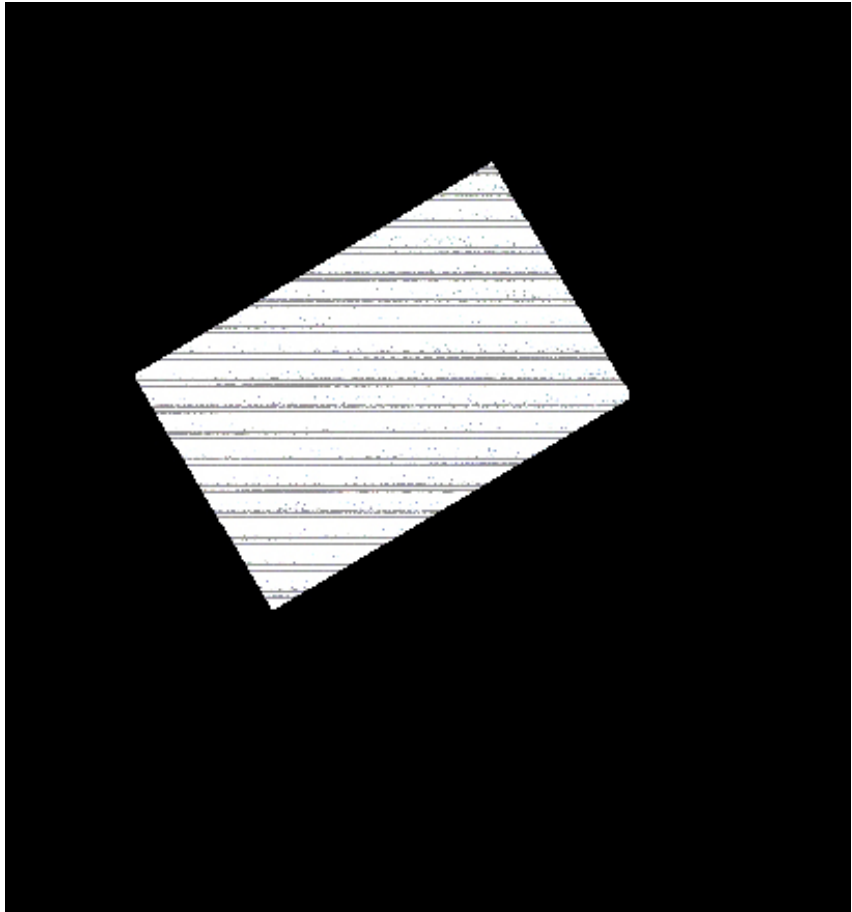
- 7  Click Go To Parent and on the Layer 3 rollout, click the Assign Mask button (initially labeled “None”) to the right.



This button opens a browser containing images that you can use to mask out any unwanted regions in the third layer. In this case, this includes all regions outside the poster.

While you could easily create your mask in a paint program, a mask image has already been prepared for you.

- 8 On the Material/Map browser, double-click Bitmap and on the Select Bitmap Image File, choose *c-sign-msk.jpg*. Click View to display the image in a viewer.



Bitmap used to create a cutout of the poster for layer 3

The mask is made up of black and white information. All black regions of the mask image will be completely transparent in layer 3, all white areas will be opaque, and gray regions will be semi-transparent.

The mask will act as a “custom” alpha channel to the color map.

- 9 Close the image viewer, then click Open to apply the layer to the composite texture map.

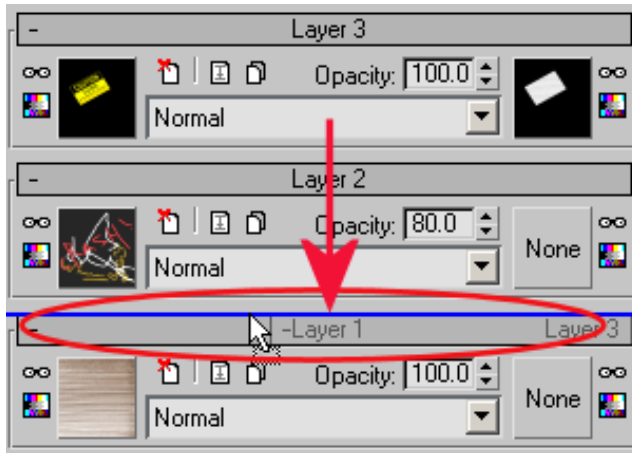


**Layer 3 with the mask applied**

The alpha values from the mask have created a cutout for the poster. The grey, or semi-transparent regions within the cutout have permitted some of the base layer to show through and blend effectively with the top layer. One small problem remains. You want the graffiti to cover the poster, not the other way around.



- 10 Click Go To Parent to return to the composite level.
- 11 Click and drag the Layer 3 rollout label downward to a point just above the Layer 1 label.
- 12 Release the mouse when a blue line displays above the Layer 1 label.



The layers are reordered and renumbered accordingly. (Layer 3 becomes Layer 2, and vice-versa.)

## Blending Layers

In the previous lesson you added layers to the composite map while in Normal mode. In this mode, no blending between layers takes place: visibility is determined solely by each layer's alpha channel.

In Blending mode, you can produce interesting composite effects by choosing how pixels in the top layer interact with those underneath. In this lesson, you will use two blending techniques to add several more layers to the composite map.

**Use blending mode to add more textures to the composite map:**



- 1 On the Material Editor > Composite Layers rollout, click Add A New Layer.
- 2 On the Layer 4 rollout, click the Assign Material button (initially labeled "None") to the left.
- 3 On the Material/Map Browser, double-click Bitmap.
- 4 On the Select Bitmap Image File dialog, choose *dirt-bottom.jpg*.

- 5 Click View to display the image in a viewer.



**Bitmap used in the first blend operation**

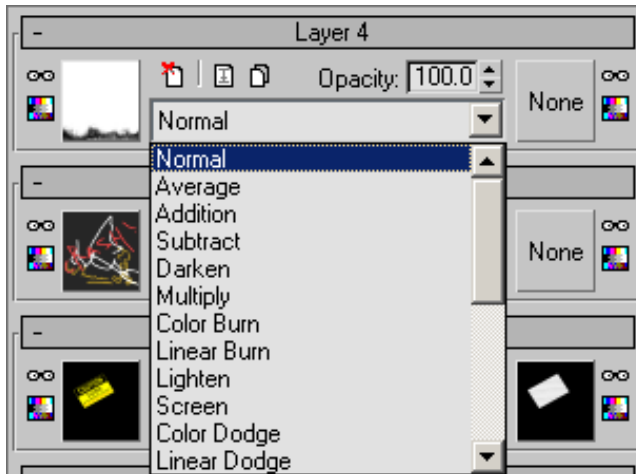
You will overlay this black and white image onto the composite map.

- 6 Close the viewer and click Open to activate the image.

Because the *.jpg* image has been applied to the composite as a texture with no alpha channel present, it completely obscures all layers beneath it. You will now use a blending option, rather than alpha information, to merge this image with other layers in the composite.



- 7 Click Go To Parent and on the Layer 4 rollout, click the Normal list box.



- 8 Experiment with various blending techniques by choosing a few options from the list.  
The options resemble those available in such paint programs as PhotoShop and Combustion. Refer to the 3ds Max Design Help for a description of what each blending option does.
- 9 Choose Multiply from the list.





**First blend operation using Multiply**

This option multiplies the color value of all layers in the composite. The non-white color channels have a value of less than 1.0, so the multiplication tends to produce darker colors, a condition you will now correct.

- 10 On the Layer 4 rollout, go to the Opacity box and type **80.0**.  
The reduced opacity of the top layer results in a lighter overlay of grime.



- 11 On the Composite Layers rollout, click Add A New Layer.
- 12 On the Layer 5 rollout, click the Assign Material button (initially labeled "None") to the left.

- 13 On the Material/Map browser, double-click Bitmap.
- 14 On the Select Bitmap Image File dialog, double-click *dirt-top.jpg*.



- 15 Click Go To Parent and on the Layer 5 rollout, choose Linear Burn from the blend mode drop-down list.








Second blend operation using Linear Burn

This colorizes the darker pixels of layers 1 to 4 with color from pixels in the top layer. The result, however, is too dark.

- 16 In the Opacity box, type **70.0**.

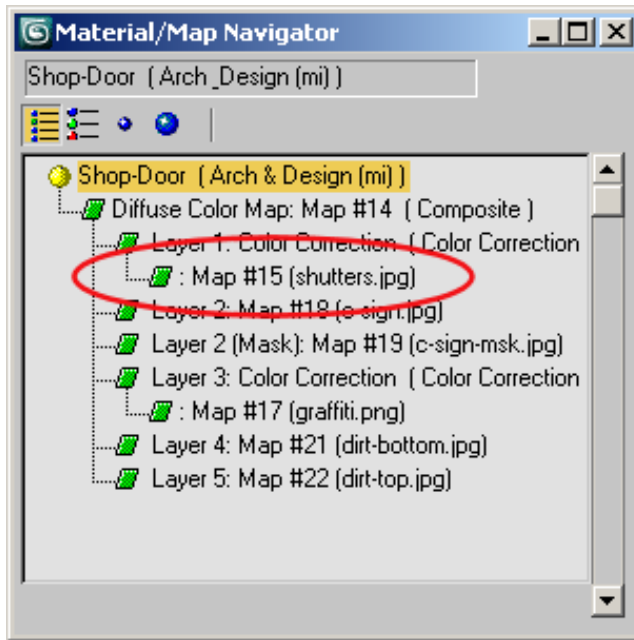
### Add bump information to the composite:

- 1   Click Maximize, activate the Camera01 view, then from the main toolbar, click Render Production.  
The shutter shows good detail, but its corrugated surface lacks depth. You will correct this by adding bump information from the *shutter.jpg* image.
- 2  On the rendered frame window, click Clone Rendered Frame Window.
- 3  On the Material Editor, go up one level, then scroll down to the Special Purpose Maps rollout.
- 4 On the Bump spinner box, type **3.0**.
- 5  Click Material/Map Navigator.
- 6 On the Material/Map Navigator dialog, click and drag Map #15 (shutters.jpg) over the Special Purpose Maps rollout > Bump > None button as an instance.

---

**NOTE** Do *not* release the mouse button after you click on Map #15, otherwise the Material Editor will update to show the Map #15 parameters.

---



- 7 Close the Material/Map Navigator.
- 8 Render the Camera01 viewport again and compare the result with the cloned rendered frame.



Rendered composite without bump map (left) and with bump map (right)

The shutter has lost its flat look and appears more three dimensional.

- 9 If you like, open *composite\_completed.max* and compare your work with a completed scene file of this tutorial.
- 10 If you turned off Use Real-World Texture Coordinates option at the beginning of the tutorial, from the main menu, go to Customize > Preferences > General panel > Texture Coordinates group and turn the option back on.

## Summary

In this tutorial, you learned how to create a composite map consisting of multiple layers of images. You used alpha channel information to control image transparency, then used blending options to further define how the source images are composited onto one another.

## Spline Mapping

This tutorial shows you how to map material to a curved surface, such as a road or a garden hose.

You will start with the same pawnshop model featured in the Composite Map tutorial and use a spline to map a brick-like material onto the building's arched entrance.



In this tutorial, you will learn how to:

- Choose a mapping method for an object
- Create a spline and use it as a guide when mapping texture to the object
- Adjust the mapping through manipulation of the object's UVW coordinates



Skill level: Intermediate

Time to complete: 1 hour

## Prepare the Scene

In this lesson, you will choose a brick material to map to the building arch and specify the UVW Unwrap Modifier as the mapping method. You will then create a spline object and use it as a guide in the mapping process.

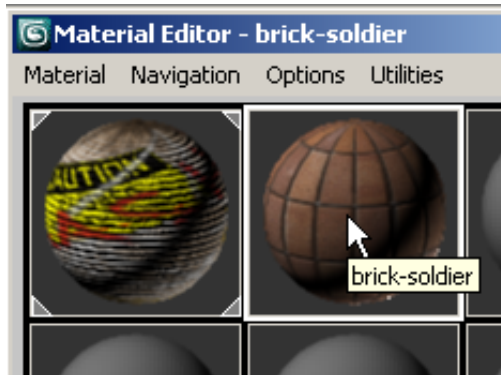
**Choose the material and apply the mapping method:**

- 1  On the Quick Access toolbar, click the Open File button, navigate to `\scenes\materials_and_mapping\spline_mapping\` and open the scene file `splinemap-start.max`.
- 2  Maximize the Orthographic viewport and select the *Arch-Door* object.

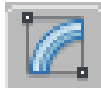


**Arch door object with no material applied**

- 3 Press M to display the Material Editor.  
A material called *brick-soldier* has already been prepared for the arch object.

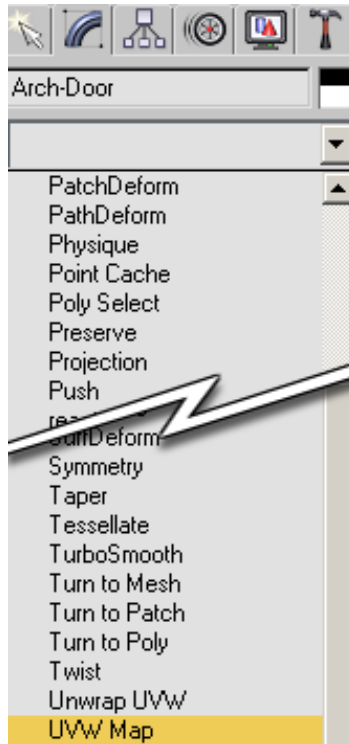


- 4 Click on the *brick-soldier* sample slot and drag it to the arch object.  
The arch turns a dark brown and shows no further detail because no mapping method has yet been specified for the material.



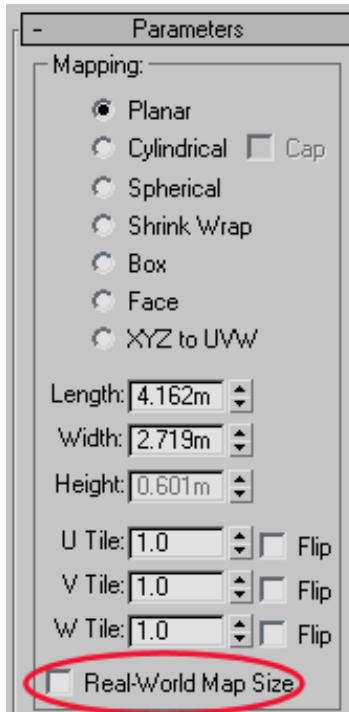
- 5 Go to the Modify panel, and from the Modifier List, choose UVW Map.



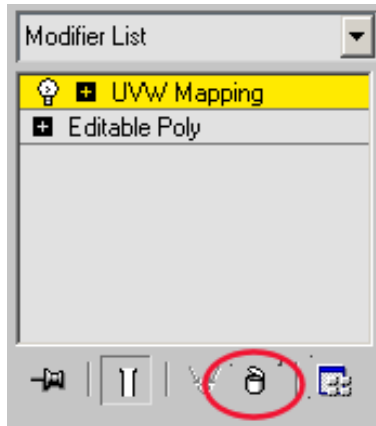


This mapping method is often used to project bitmap images onto the surface geometry of many types of primitive objects such as planes, boxes, and spheres.

- 6 In the Parameters rollout > Mapping group, make sure Real-World Map Size is turned off.



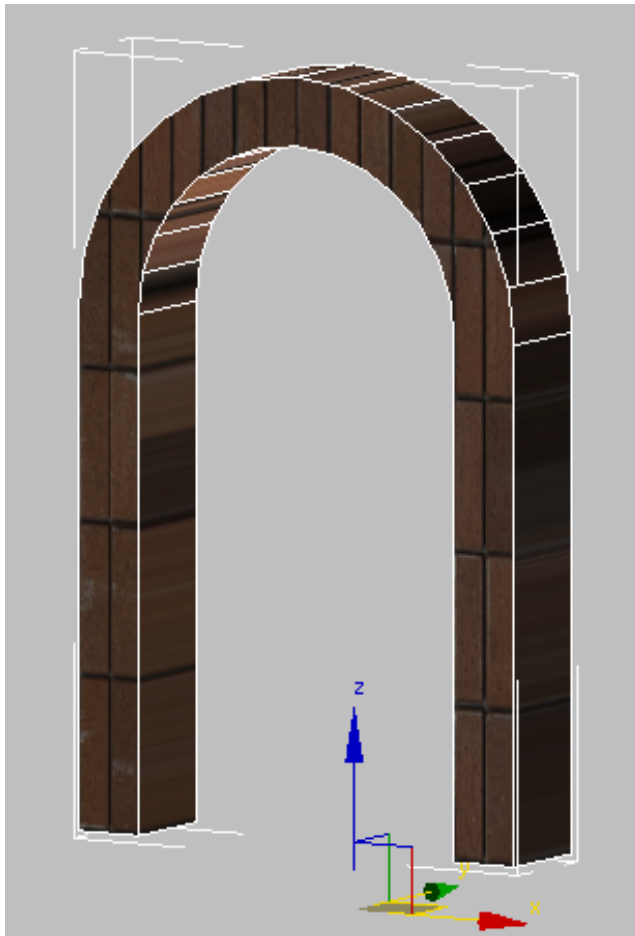
- 7 Choose Planar if it is not already chosen, then check the viewport to see how the mapping method attempts to project the brick material onto the arch object.
- 8 Choose Box, Face, and other mapping options to see how the mapping is projected differently.  
No option in the UVW Map modifier is able to map the material properly.
- 9 Click the UVW Mapping modifier, then click Remove Modifier (the button that look like a trash can) to remove the modifier from the arch object.



- 10** From the Modifier List, choose Unwrap UVW.

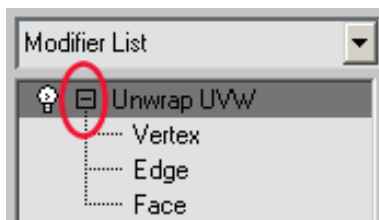
Unwrap UVW is better equipped to handle mapping of the arch object's complex geometry, because it breaks the arch object into sections, and applies the planar mapping technique to each component.

Unwrap UVW is often used to map images onto complex objects.
- 11** Right-click the arch object in the viewport and from the quad menu, choose Hide Unselected to isolate the object.



Arch object with brick material mapped to its surface

- 12 On the Modifier List, click the plus sign (+) next to the Unwrap UVW modifier to expand sub-object levels.

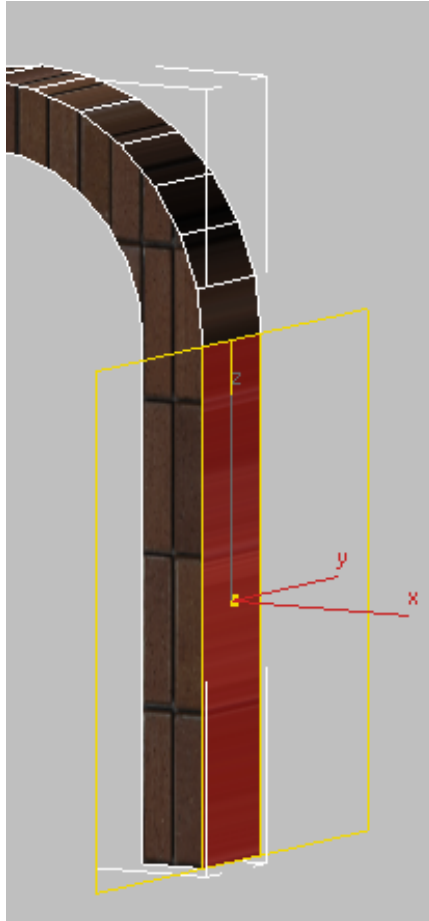


**13** Click Face.

At this level, you can map the brick material onto each selected face of an object.

**14** In the viewport, select a face on the arch object.

A yellow gizmo displays, representing a planar projection of brick material onto the selected face.



**Planar projection of brick material onto an arch face**

**15** Select another face on the arch object.

Notice how the yellow gizmo resets onto the newly selected face.

On the Map Parameters rollout, there are a number of controls available that can help you use the Unwrap UVW method to map specific types of objects. The Cylinder button, for example, displays controls used to map materials onto cylindrical objects, such as a human arm or a lamp post, while the Pelt button can be used to map material onto fabric such as a pair of trousers, or a curtain.

In this scene, you will use the Spline option, which is useful for mapping curved objects with a cylindrical or square cross-section such as a snake, or a ventilation duct.

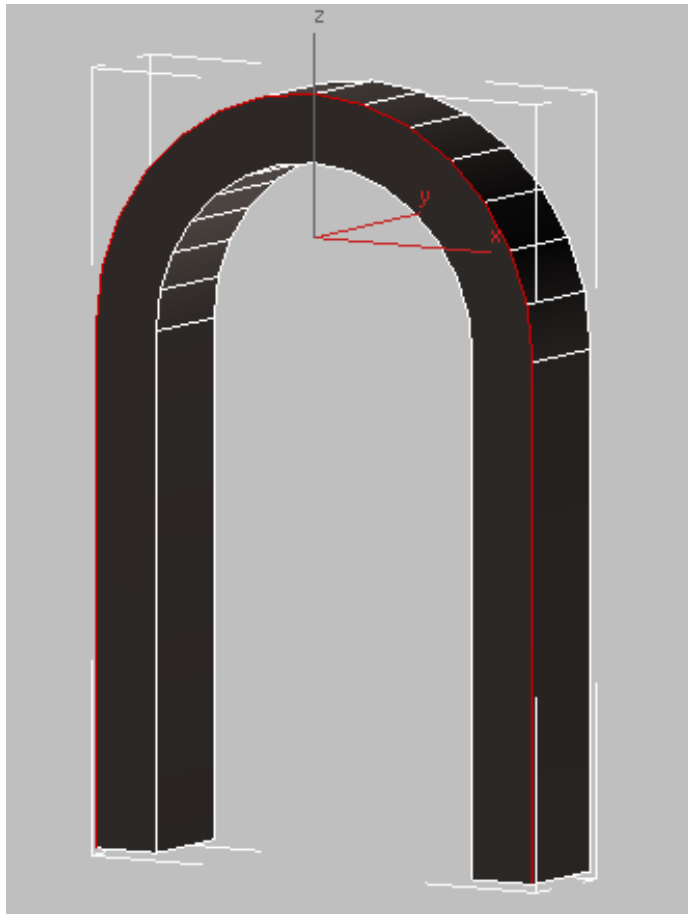
Before you use this option, you will create the spline object itself.

### Create the spline shape to use as a map path:

- 1 On the Modifier List, click Face to exit sub-object mode.  
The spline you create must be centered in the arch object. You can use the line tool or the rectangle tool to draw the spline, but you need to enter the precise arch object coordinate values to do so. A convenient alternative is using existing object geometry to derive the spline values.
- 2 In the stack, click Editable Poly, then click Yes to clear the warning message.
- 3 On the Selection rollout, click the Edge tool.

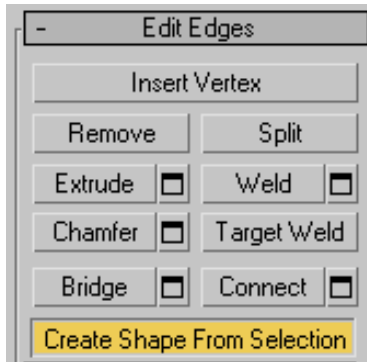


- 4 Ctrl+click to select all the outer edges of the arch object.  
Be sure to leave the bottom and inside edges unselected.

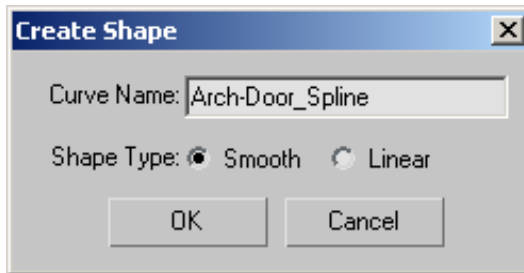


Arch object with all outer edges selected

- 5 On the Edit Edges rollout, click Create Shape From Selection.

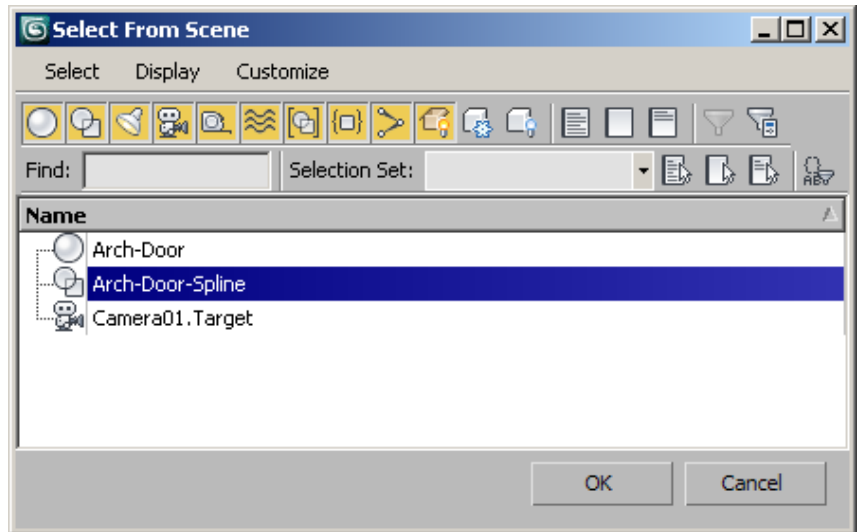


- 6 On the Create Shape dialog > Curve Name box, name the shape **Arch-Door-Spline**, make sure Shape Type is set to Smooth, then click OK.

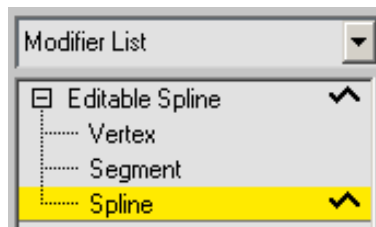


- 7 Click the Edge tool again to exit edge selection mode and press H to open the Select From Scene dialog.
- 8 Choose *Arch-Door-Spline* from the list to select the newly created spline.

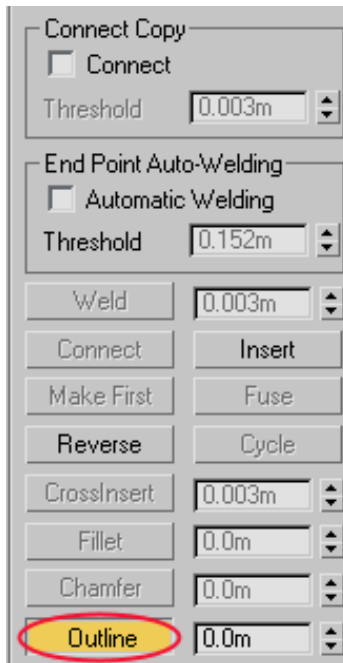




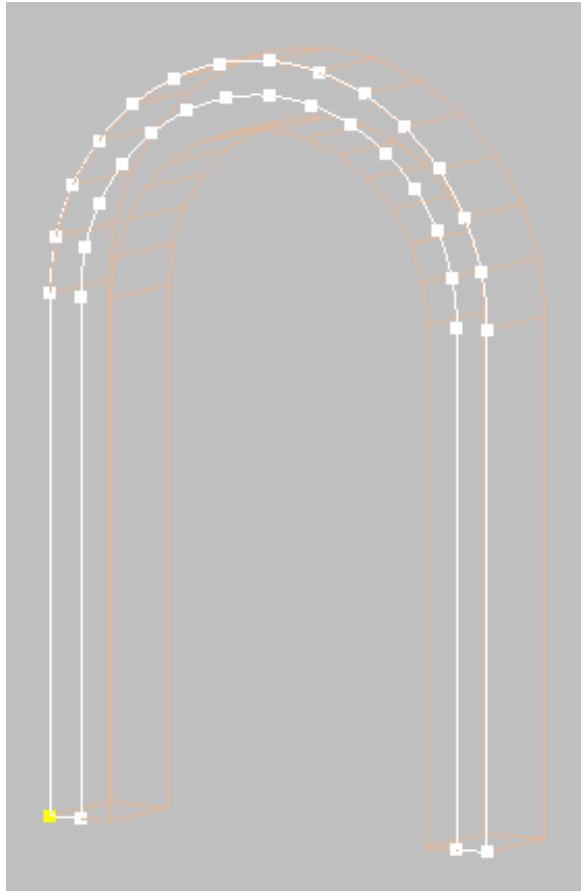
- 9 Press F3 to switch to wireframe mode.
- 10 From the Modifier List, expand the Editable Spline modifier and click Spline.



- 11 On the Geometry rollout, scroll down and click Outline.



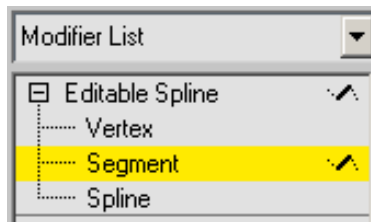
- 12 In the viewport, click and drag the spline until it is positioned roughly at the mid point between the outer and inner edges of the object's front face.



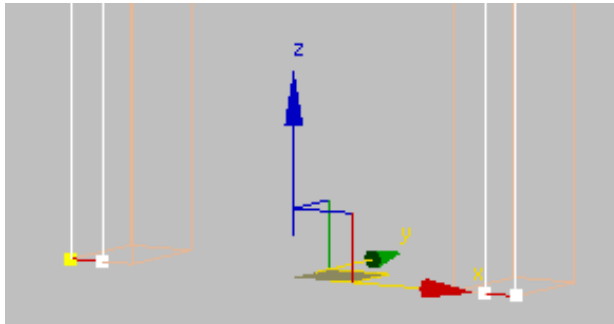
**Spline centered on the front face of the arch object**

The spline position does not have to be perfectly centered: you can adjust the spline later on when modifying the UVW parameters.

- 13** Under the Editable Spline modifier, click Segment.

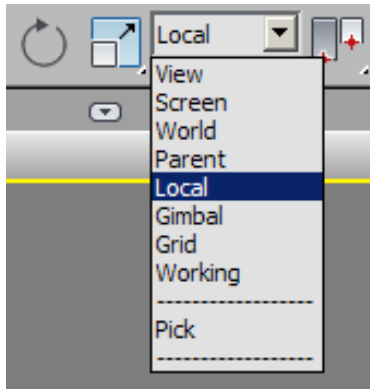


- 14 Ctrl+click the line segments at each arch object base, then press Delete.



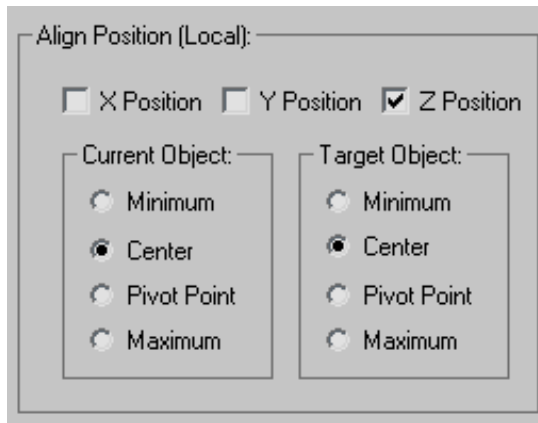
Spline base segments at the base of each arch column

- 15 Under the Editable Spline modifier, click Spline again, select the outer spline and press Delete.
- 16 Under the Editable Spline modifier, click Spline again to exit the sub-object level.
- 17 On the main toolbar, choose the Local coordinate system.



- 18 Make sure the spline is selected, then on the main toolbar click the Align tool and select the arch object.

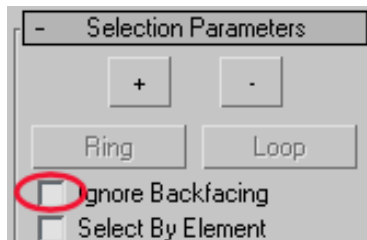
- 19 In the Align Selection dialog > Align Position group, turn on Z position and in both the Current Object and Target Object groups, choose Center. Click OK.



The spline is now properly placed in the center of the arch object, ready to be used as a guide to map the brick material.

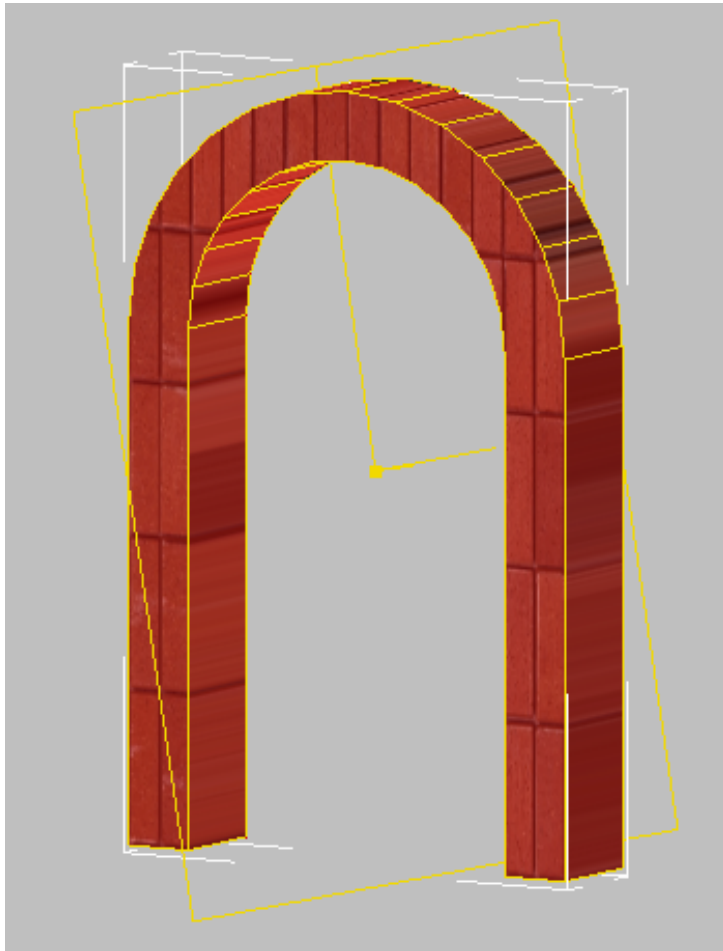
#### Apply the spline as a guide for the mapping:

- 1 Press F3 to return to shaded view and select the arch object.
- 2 On the Modifier Stack > Unwrap UVW modifier, click Face.
- 3 On the Selection Parameters rollout, turn off Ignore Backfacing.



If you leave Ignore Backfacing turned on, only the polygons facing you in the viewport will be included in a selection. Polygons hidden on the other side of the model will remain unselected.

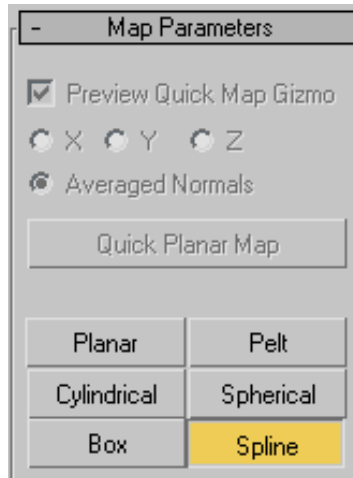
- 4 Starting just above the base column to the left, click and drag diagonally upward across the arch object to region-select all the faces except for those on the underside of each column base.



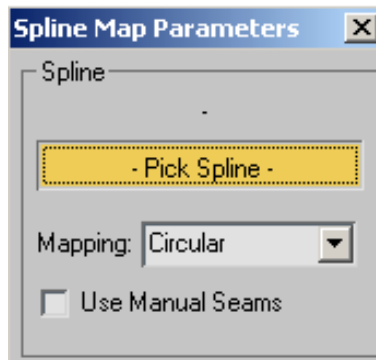
Arch faces selected



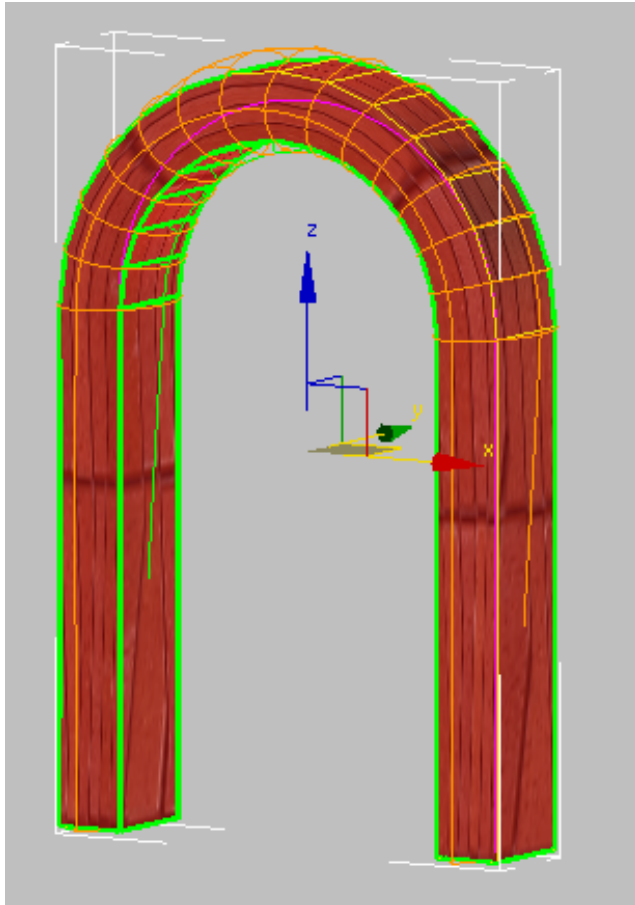
- 5 On the Modify panel, scroll down to the Map Parameters rollout and click Spline.



- 6 On the Spline Map Parameters dialog, click Pick Spline. For now, leave the Spline Map Parameters dialog open.



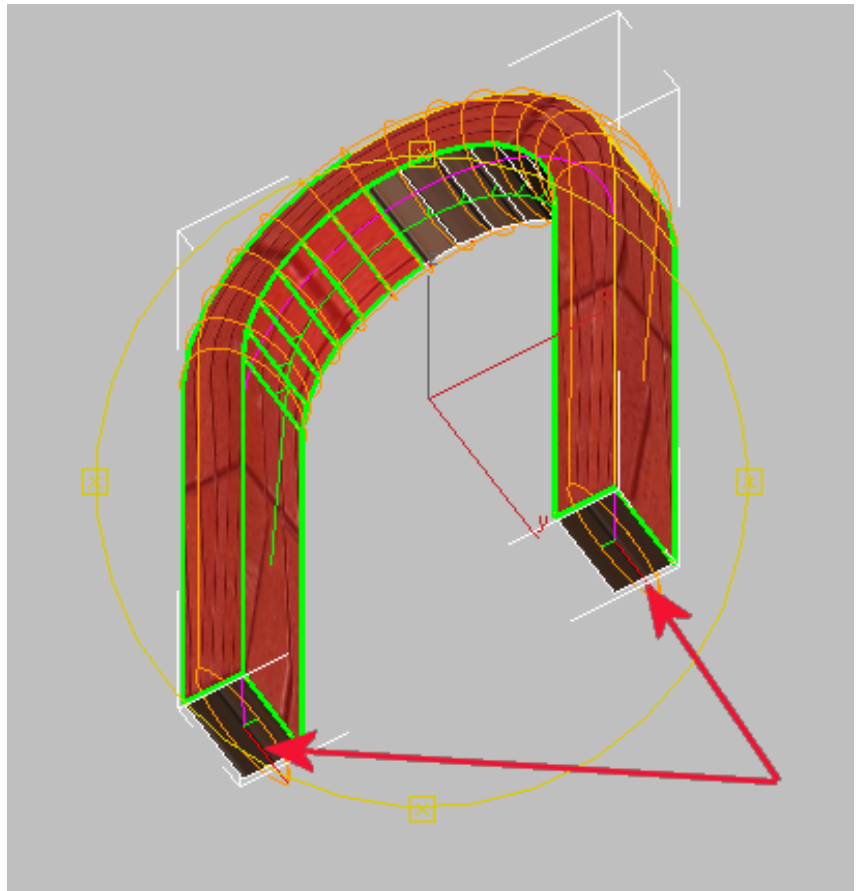
- 7 Press H and on the Pick Object dialog, choose the *Arch-Door-Spline* from the list, then click Pick.  
The arch object is enveloped by a cage gizmo, which shows the outline and cross sections of the mapping.



Arch object enveloped by the cage gizmo

- 8 Orbit the viewport until the underside of its base is visible.





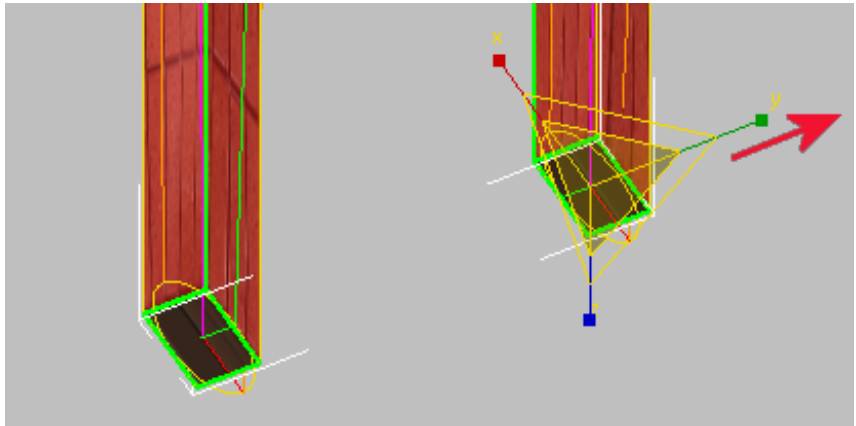
**Bottom of arch, showing deformation of cage gizmo**

You now need to correct the base of the cage gizmo, which is slightly deformed.

- 9 Ctrl+click the gizmo at each base.



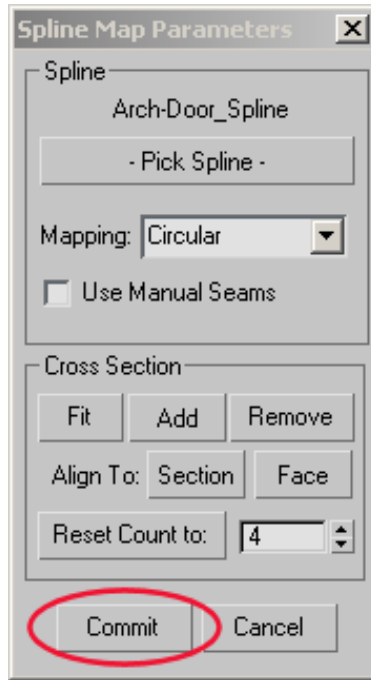
- 10 On the main toolbar, click Select And Uniform Scale, then drag a gizmo on its Y axis until the cage extends to the outer edges of the arch object.



**Cage gizmo after resizing**

You do not need to be precise at this point: you will define the cage in the next lesson using the unwrap controls.

- 11** On the Spline Map Parameters dialog, click Commit to accept the changes made to the spline so far.



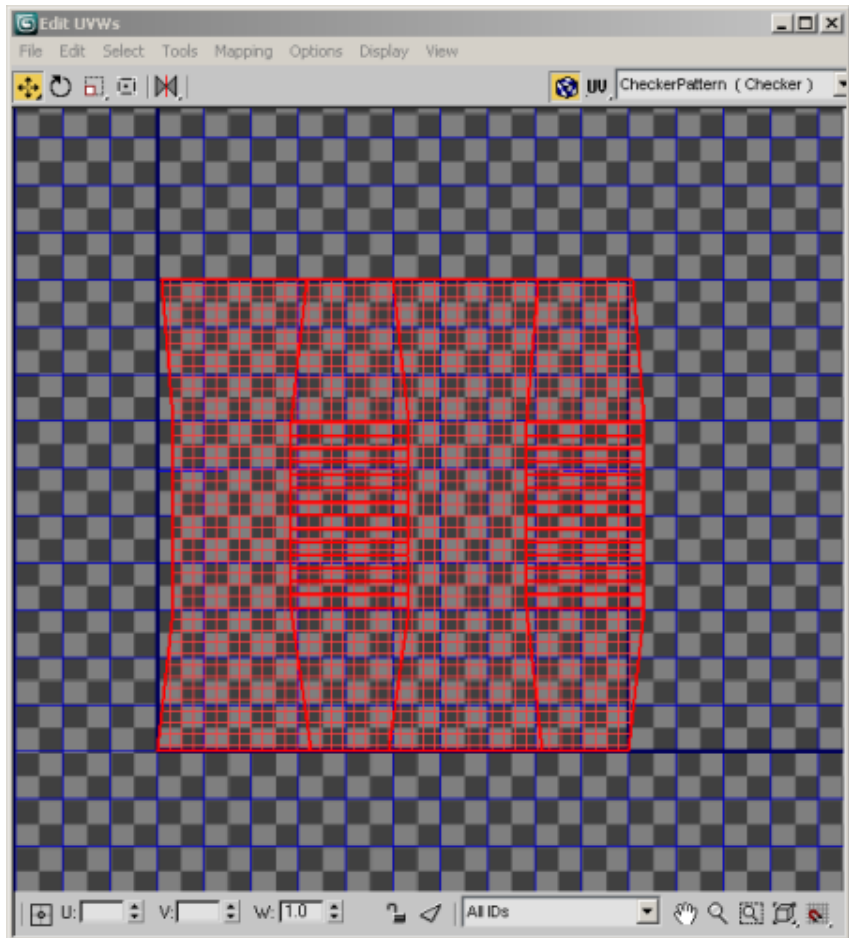
## Fine-Tune the Mapping

With the introduction of the spline as a guide, the brick material can now properly follow the contours of the arch object. However, the bricks in their present form are too large and are mapped vertically up the arch columns instead of horizontally across.

In this lesson, you will use the UVW editor to adjust the mapping so that the bricks map properly.

### Adjust the UVW vertices:

- 1 On the Parameters rollout, click Edit.  
The Edit UVWs window opens.



**Arch object displayed as grid of UVW faces and vertices**

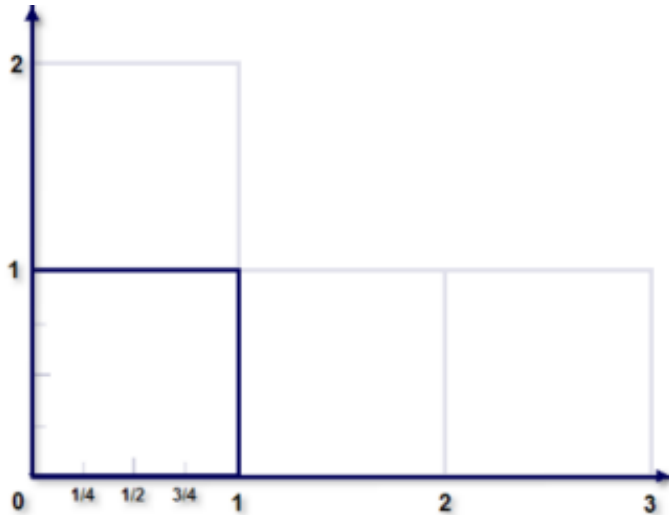
A flattened representation of the arch object displays, comprising four red vertical panels made up of UVW faces and vertices. Each panel represents the inner, outer, left, and right face of the arch.



- 2 Adjust the size of the window so you can see both the edit region as well as the arch object in the viewport. Use the Edit UVWs window zoom tool to zoom out slightly.

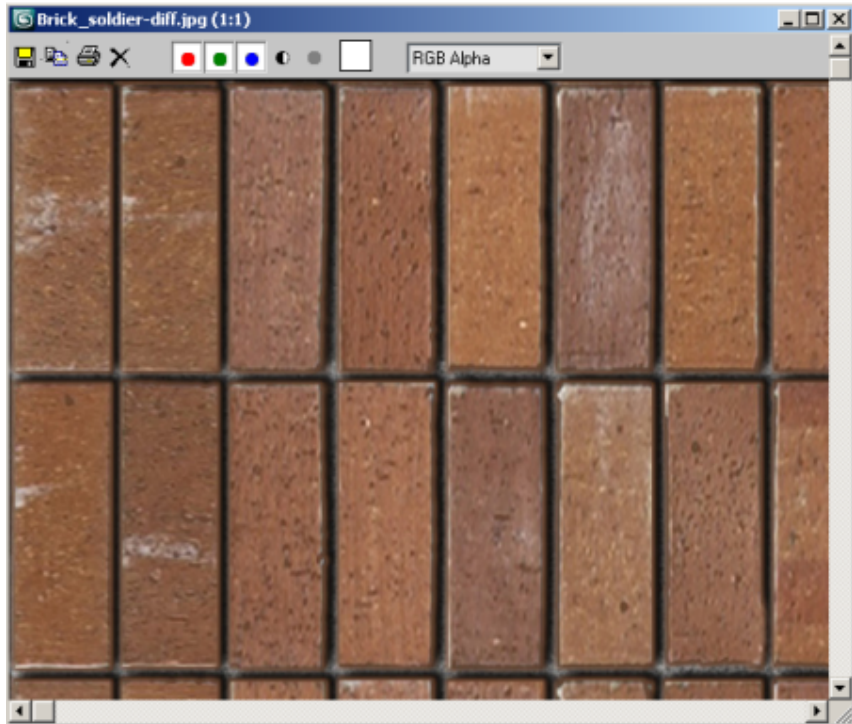
The surface of the arch object is currently mapped to a single tile of the brick-soldier material.

The black square occupied by the flattened arch object corresponds to the dark square in the next diagram, which shows the coordinate system of the Edit UVWs window.



The texture you apply to the arch object will be mapped to this area, whose coordinate system ranges from 0, 0 to 1, 1.

- 3 On the main menu, choose Rendering > View Image File, and on the View File dialog, navigate to the folder `\sceneassets\images\`, click to highlight *brick\_soldier-diff.jpg* and click Open.

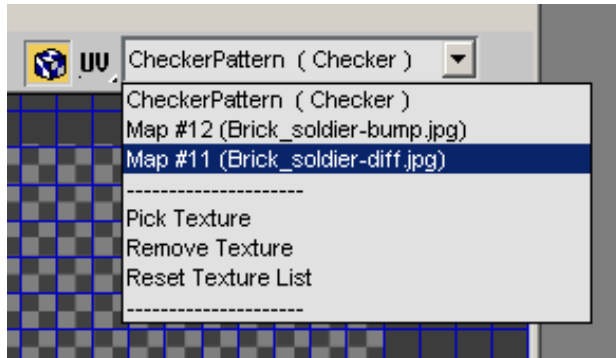


**Bitmap image mapped to the arch object**

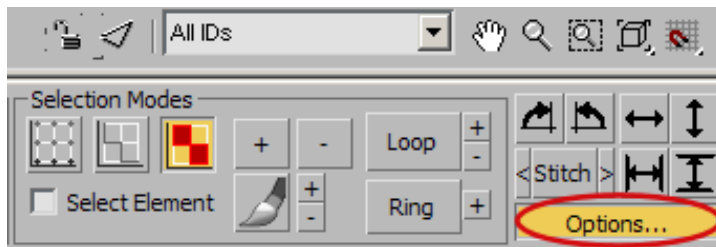
An image file window opens, showing the bitmap image currently mapped to the arch object. It is mapped on a one-to-one basis on using UVW coordinates ranging from 0 to 1.

Outside of the square bounded by the 0 to 1 values, the same image is tiled once in every direction to occupy the entire UVW window.

- 4 Close the image file window.
- 5 In the Edit UVWs window > CheckerPattern list box, choose Map #11 (brick\_soldier-diff.jpg) to display a diffuse map of the material in the window.

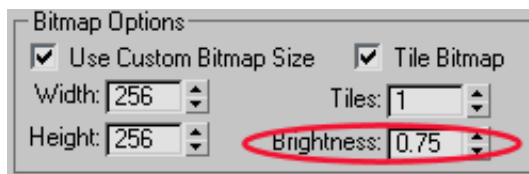


- 6 In the Selection Modes group, click Options.

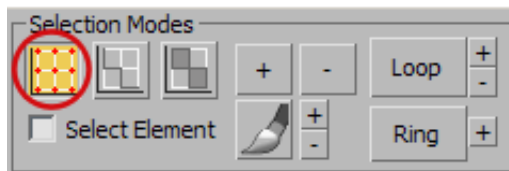


The Bitmap Options group displays below the Soft Selection group.

- 7 In the Bitmap Options group > Brightness spinner, type **0.75** and press Enter to increase the image tile visibility.



- 8 In the Selection Modes group, click Vertex Sub-object Mode.

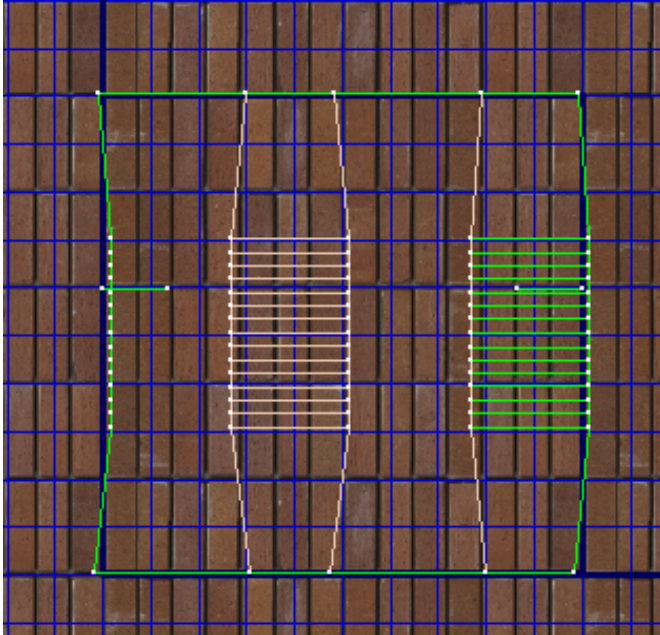


By switching to this mode, you can see how the unwrap modifier has slightly warped the contours of the arch object. These contours need to be straightened.

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**NOTE** The contours in your unwrapped arch object might be slightly different to the one shown in the next illustration, depending on how you resized the cage gizmo in the previous lesson.

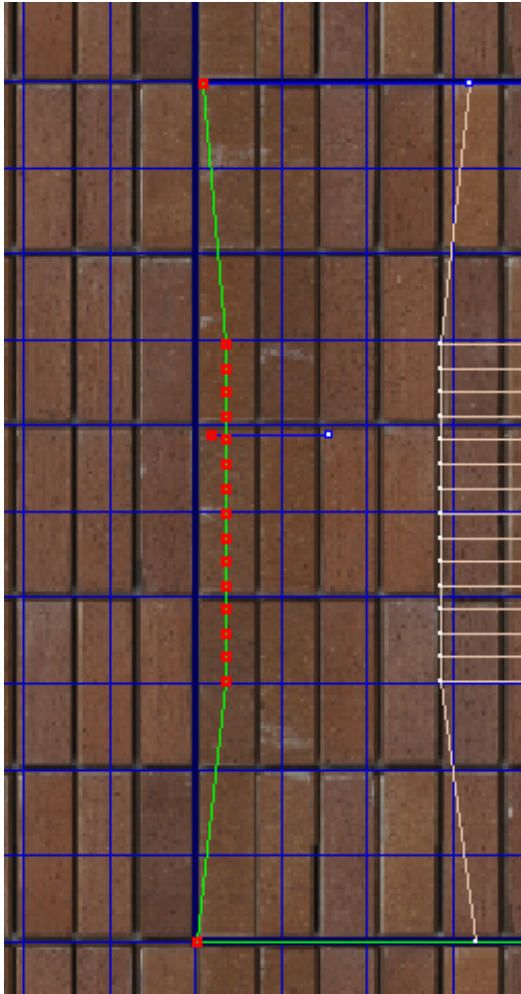
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Warped contours of the unwrapped arch object

- 9 Zoom in to the arch object, click Select And Move, and region-select all the vertices of the left outside edge.

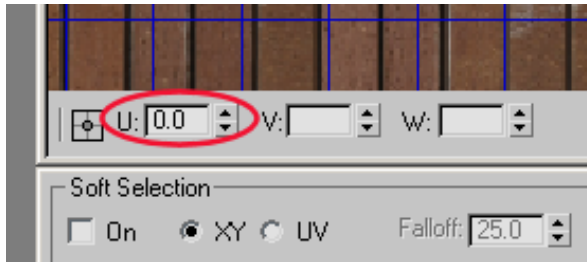




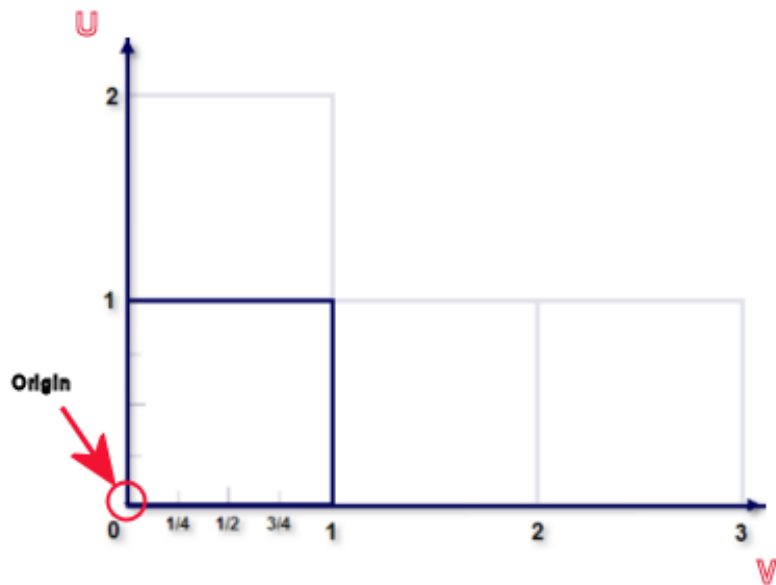
UVW vertices of left outside edge selected

For these vertices to be properly aligned with the image map, they must all have the same U value of 0.

- 10 On the U box, type **0.0** and press Enter.



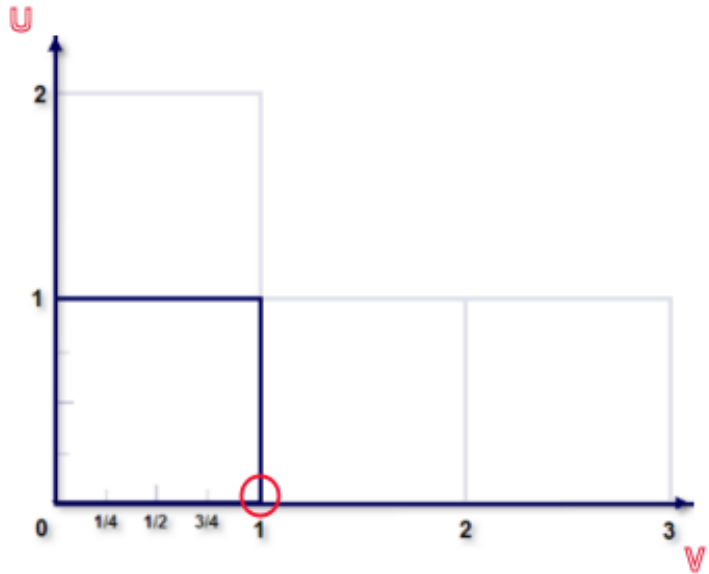
This gives the the horizontal map coordinate for each selected vertex a U value of 0, thereby aligning all the vertices vertically at their origin (0) as shown in the next diagram.



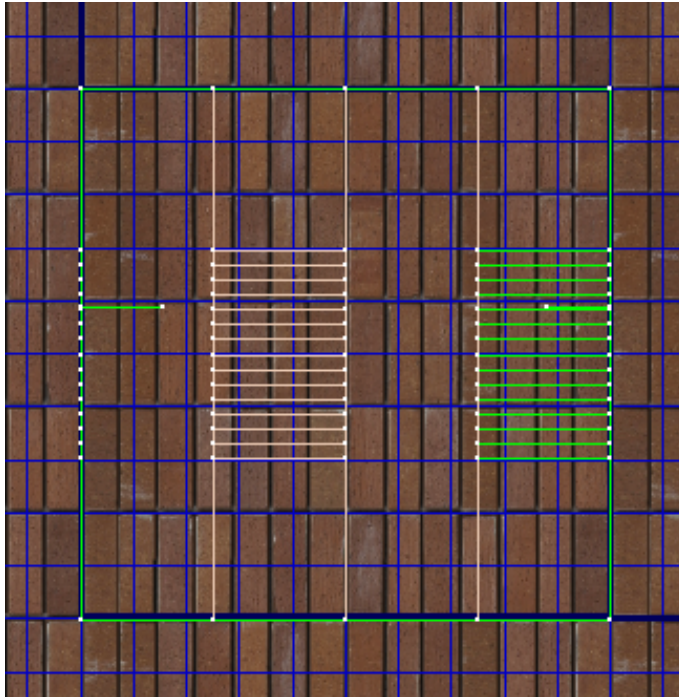
11 Region-select all the vertices at the right outside edge of the arch object.

12 On the U box, type **1.0** and press Enter.

This aligns each selected vertex vertically at a horizontal value of 1.



- 13 Select in turn, from left to right, the remaining columns of vertices for each inside edge. Give each edge a  $U$  value of **0.25**, **0.5** and **0.75** respectively.



UVW vertices after alignment

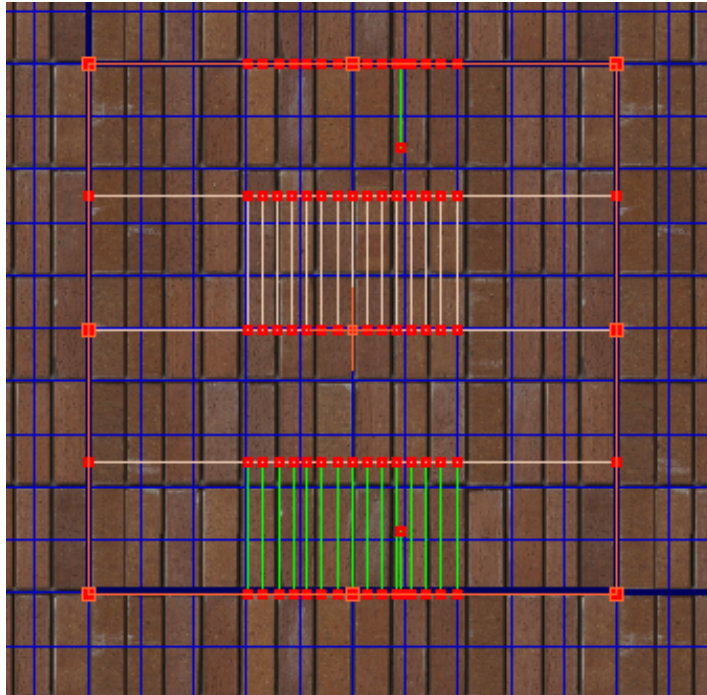
The UVW map now covers the surface of the arch object must better. But, as you can see in the viewport, there remains an obvious problem. The bricks are mapped vertically, whereas they need to be mapped horizontally. To make this change, you need to rotate the mapping by 90 degrees.

- 14 In the Edit UVWs window, select all the vertices and on the Edit UVW toolbar, click Freefrom Mode.





- 15 On the main toolbar, click Angle Snap, then position your cursor over a vertex at the mid point of any side and drag until the rotation indicator displays 90.



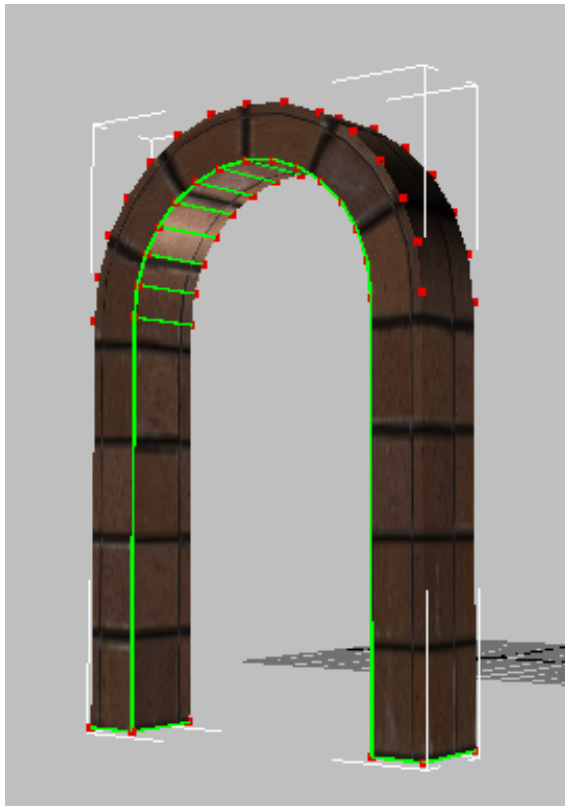
UVW grid after rotation

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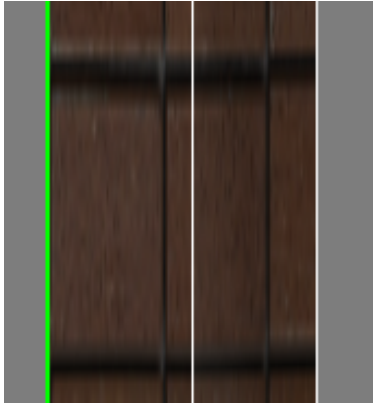
**NOTE** If you prefer, you can use the Edit UVWs window Rotate tool to rotate the UVW guides.

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The material on the arch object is now properly oriented. Notice, however, that you have five rows of bricks mapped to the four panels that represent each face of the arch object. This causes more than one brick to be mapped onto each face.



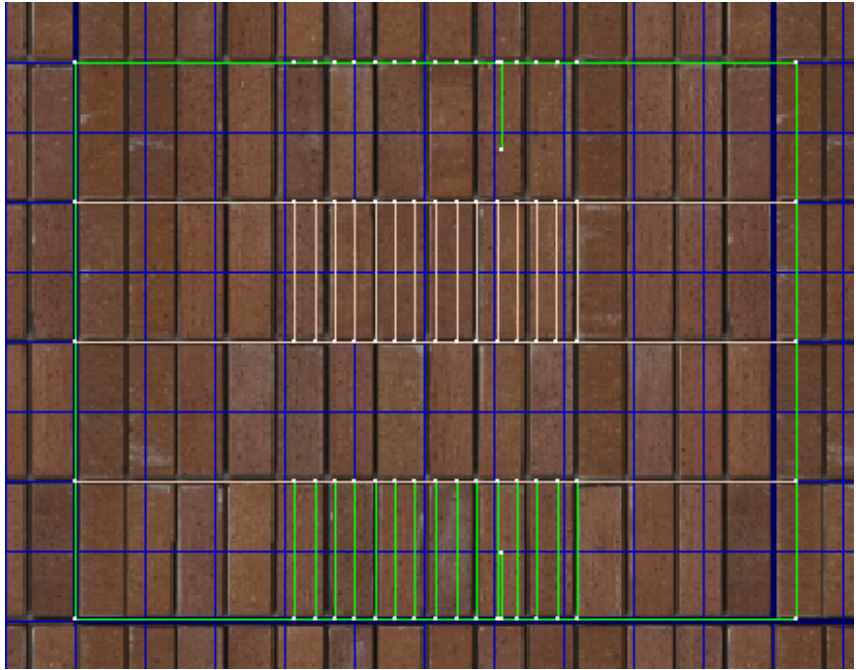
Arch object with more than one brick mapped to each face



**Close-up of arch object front and side face**

You need to resize the UVW grid over the map so that only one brick is mapped to each face.

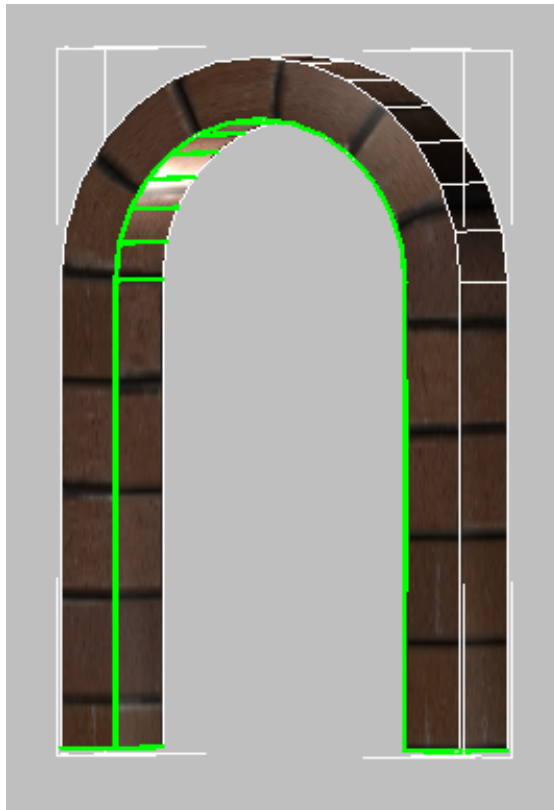
- 16** Hold down the Shift key, click on the left or right corner of the UVW grid and drag down until the grid is resized vertically to fit over the four rows of bricks. Zoom in to obtain a more precise fit.



**UVW grid resized vertically to cover four rows of bricks, one row per face**

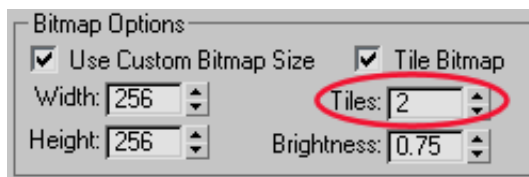
In the viewport, you can see that the number of bricks per face is now correct, but the bricks themselves are too large.



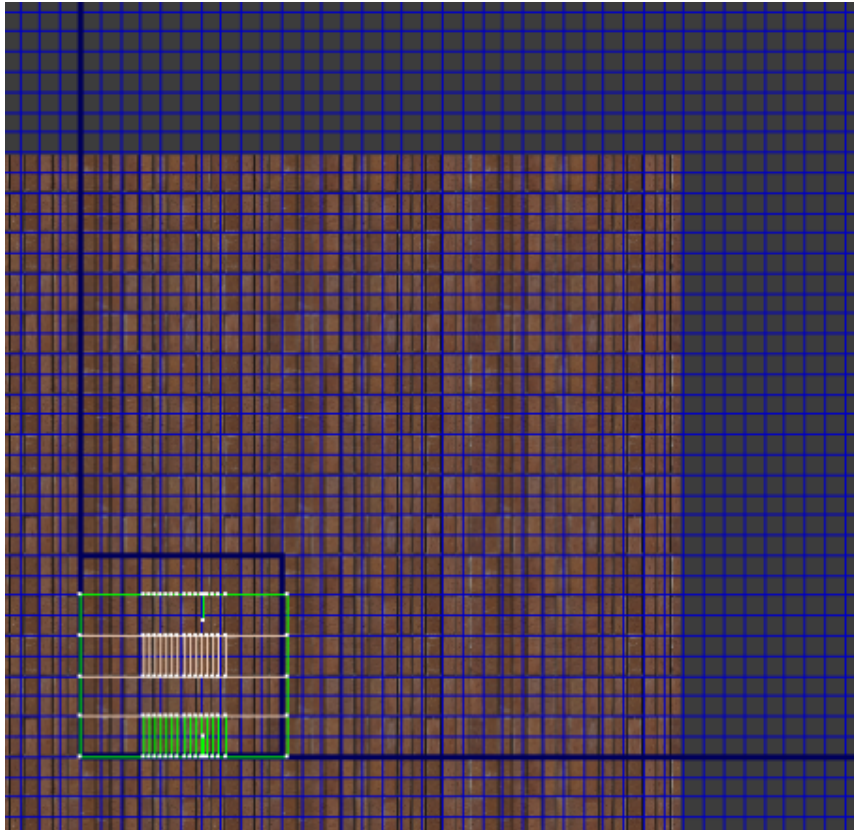


Arch object mapping, with one brick mapped per face

- 17 In the Edit UVWs window, zoom out and in the Bitmap Options group > Tiles box, type 2.



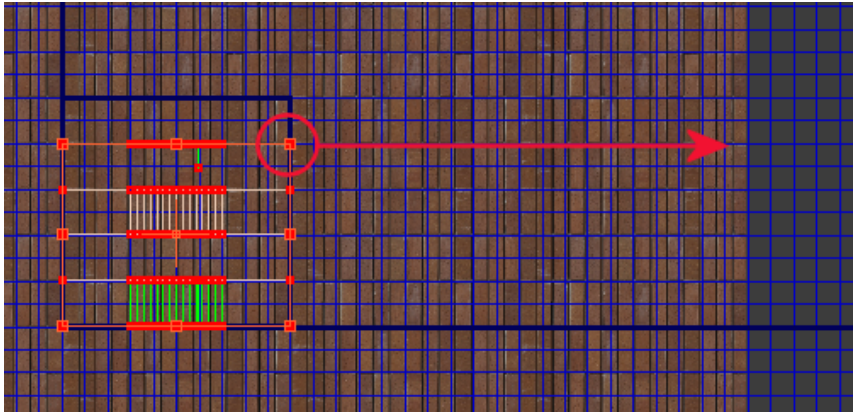
The number of tiles surrounding the UVW guides is increased from one to two in every direction.



**Two image tiles surround the UVW grid in every direction**

You will now take advantage of the added tiles to increase the number of bricks mapped to the arch object.

- 18** With all the vertices still selected, Shift+click the top right corner vertex and drag the UVW guides to the right-most edge of the map.



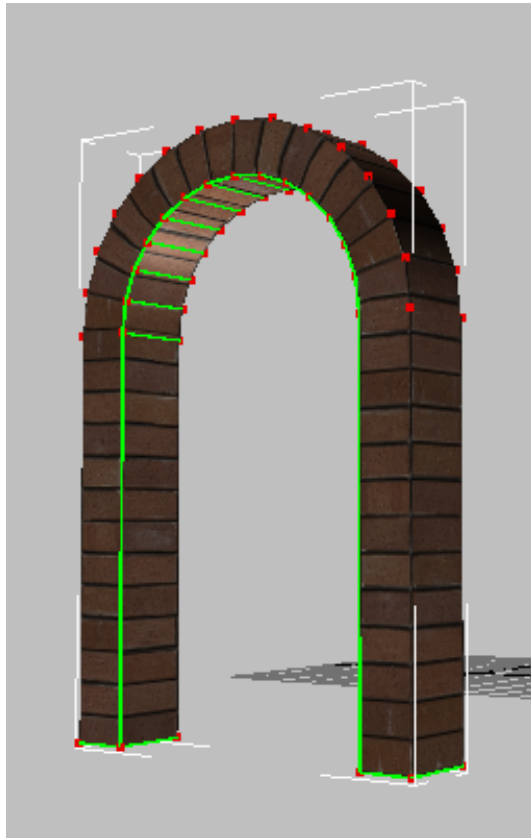
Drag the top right corner of the UVW grid to resize it horizontally

- 19 Zoom in to make sure the right-most vertices are properly positioned at the edge of the map.



**Right edge of UVW grid aligned with the edge of the far right tile**

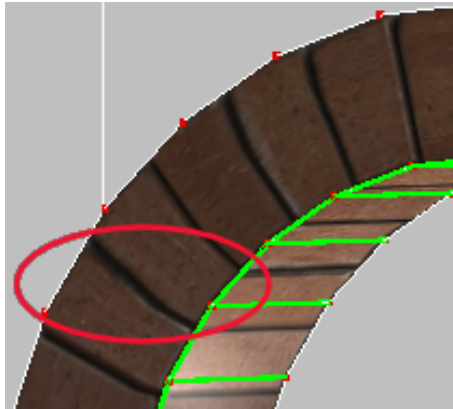
Because the UVW guides have been stretched horizontally to cover three image map tiles, three times as many bricks are now mapped to the arch object.



Three times as many bricks now mapped to the arch object

**Make final adjustments to the map:**

- 1 In the Orthographic viewport, zoom in to the arch.

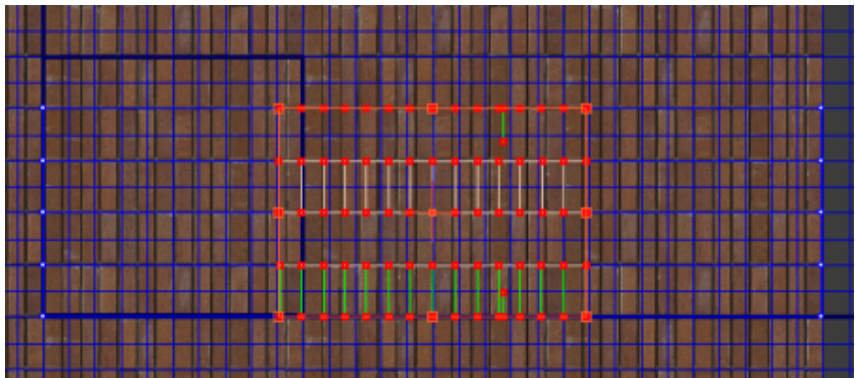


**Bricks in arch show deformation**

Notice how some of the bricks seem to bulge out. This deformation is because the number of divisions in the arch object's polygon mesh do not match the number of bricks mapped onto them.



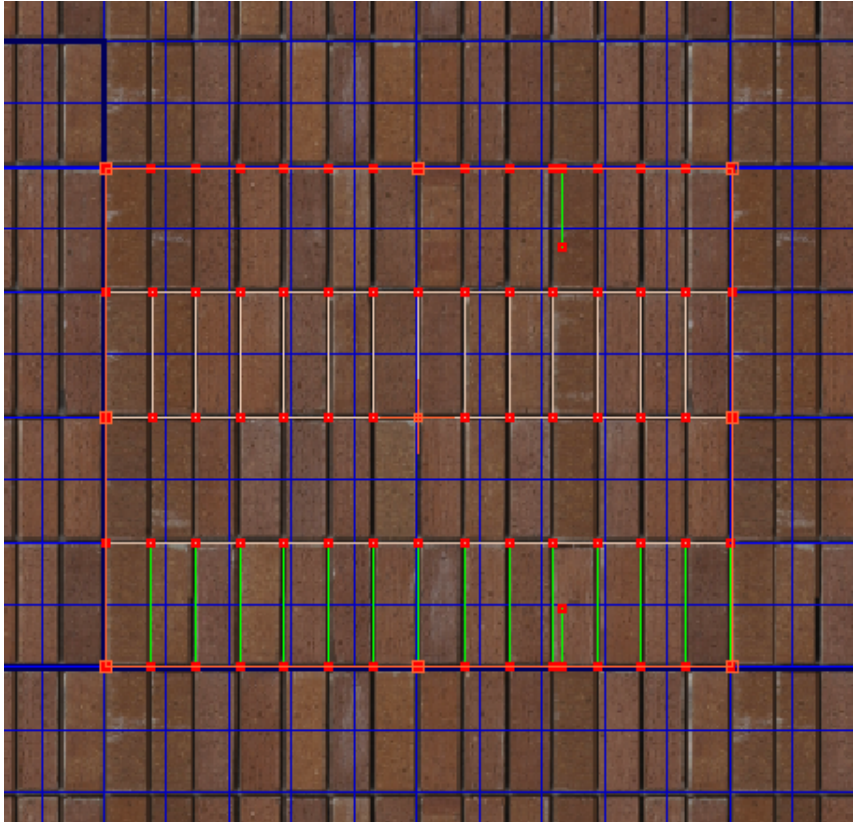
- 2 In the Edit UVWs window, use Zoom Extents to zoom in to the UVW guides, then select only the vertices in the center that correspond to the arch.



**UVW grid with arch vertices selected**

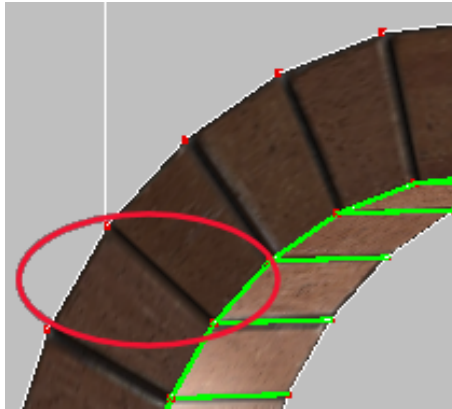
There are 14 divisions in the polygon mesh that define the arch, but there are 16 bricks in the underlying map. You need to resize the UVW guides so that the mesh divisions match the number of bricks in the map.

- 3 With the Freeform tool still active, Shift+click the top left corner vertex and drag the UVW guides to the right by one brick.
- 4 Shift+click the top right corner vertex and drag the UVW guides to the left by one brick.



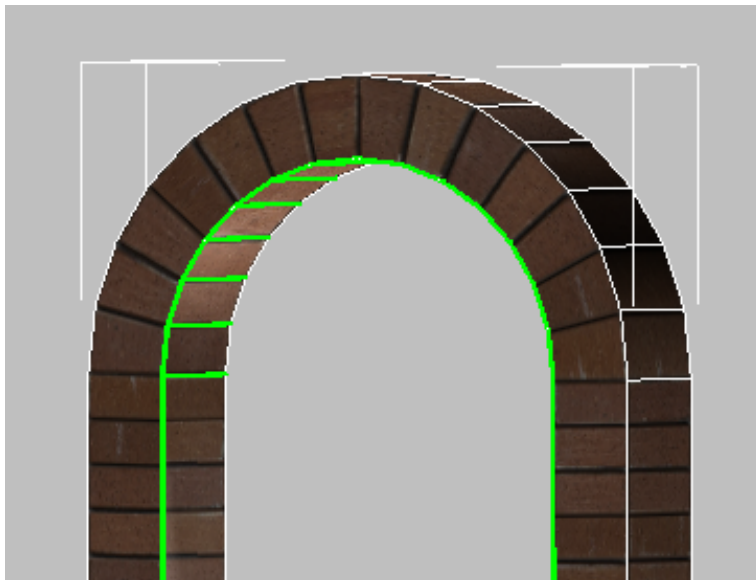
Number of arch polygons now match the number of bricks in the map

- 5 In the Orthographic viewport, take another look at the arch.



**Brick deformation eliminated**

The bricks are now properly mapped, but the steps you just took to correct their deformation have caused the archway bricks to appear slightly larger than those below them.

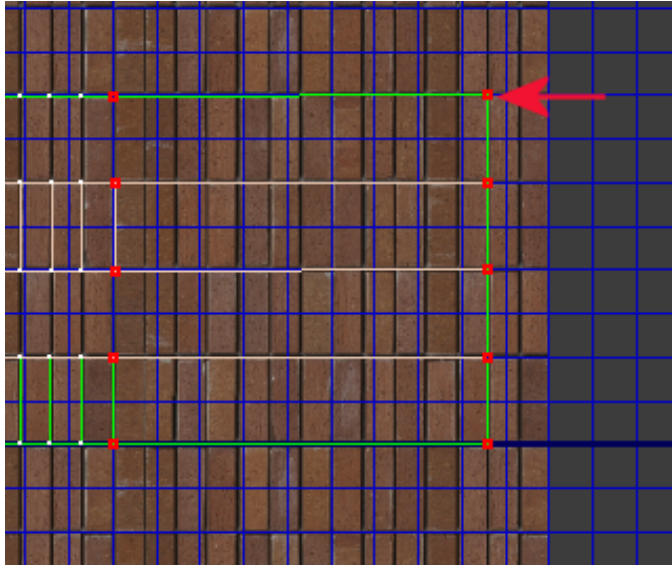


**Arch bricks are larger than the column bricks**



- 
- The diagram illustrates a grid of blue lines. A red line runs horizontally across the top, with red square markers at its ends and a red circle marker in the middle. A green line runs horizontally across the bottom, with green square markers at its ends and a green circle marker in the middle. A white line runs horizontally across the middle, with white square markers at its ends and a white circle marker in the middle. A vertical red line runs down the left side, with red square markers at its ends and a red circle marker in the middle. A vertical green line runs down the right side, with green square markers at its ends and a green circle marker in the middle. A vertical white line runs down the center, with white square markers at its ends and a white circle marker in the middle. The grid is overlaid on a dark, textured background.

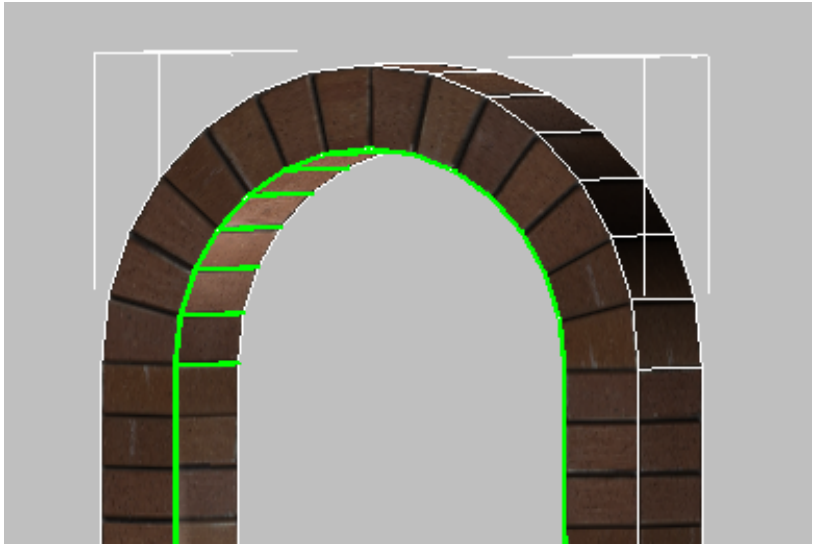
- 7 Shift+click the top right corner vertex and drag the UVW guides to the left by two bricks.



Left column after being resized two bricks to the left

- 8 Repeat the previous step for the arch object's right-hand column, dragging the UVW guides to the right by two bricks.

All bricks mapped to the arch object, both on the columns and the arch, now appear to be equal in size. The result is a properly mapped archway, with the bitmap convincingly following the contours of the object's geometry.



Arch object with bricks of equal size

#### Render the arch:

- 1 Close the Edit UVWs window and from the Modifier List, click Vertex to exit vertex selection mode, then click on any empty part of the viewport to de-select the object.



- 2 Minimize the Orthographic viewport.

- 3 Right-click the Camera01 viewport and choose Unhide All.



- 4 On the main toolbar, click Render Production to render your work.



**Rendered view of brick material mapped to the pawnshop entrance**

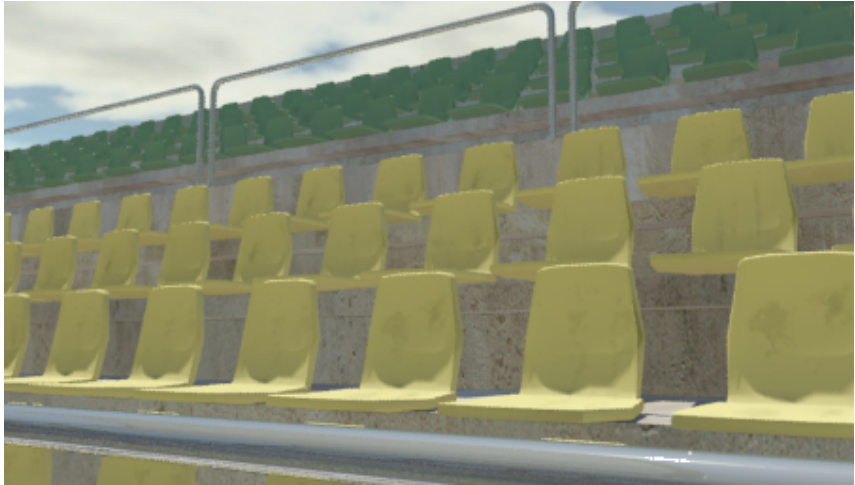
Your brick material is now properly mapped to the archway.

### **Summary**

In this tutorial, you learned how to use the UVW Unwrap modifier combined with a spline object to map material onto a curved object. You also learned how to manipulate the object's UVW lattice in the Edit UVWs window to determine how the material's bitmap image is projected onto the target surface.

## **Using the Multi/Sub-Map**

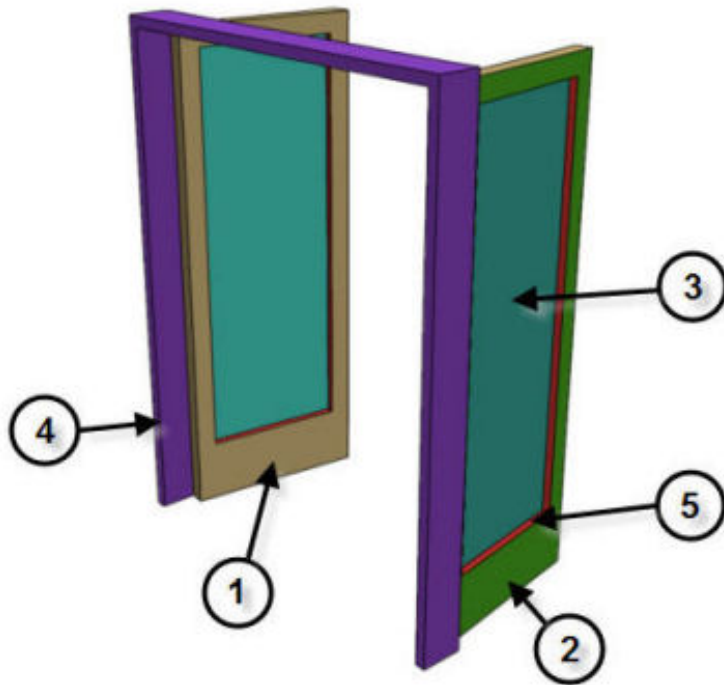
You can apply multiple sub-maps to objects in a scene whenever you need to give a group of similar objects their own unique identity. In this tutorial, you will assign an assembly of stadium seats a common material, then use a variety of sub-maps to assign each seat its own set of stains and discolorations.



You can distribute sub-maps among objects randomly, by object, or by material ID. Each sub-map can be based on a color, a bump map, or an image, among other components. You can distribute sub-maps individually, or composited with other maps to produce a more nuanced effect.

Multiple sub-mapping differs from mapping at a sub-object level, where you apply a material on a one-to-one basis to individual components of a single object.

The next illustration provides an example of sub-object mapping where five materials have been mapped to a door consisting of five sub-objects. In this technique, you select the polygon of each component, assign it a material ID, and apply a unique material to each ID.



**Material IDs for a door or window**

- 1. Front of door**
- 2. Back of door**
- 3. Inner bevel**
- 4. Door frame**
- 5. Inner door**

The next illustration provides an example of multi/sub-mapping where multiple sub-maps have been applied to a material. The jeep surfaces are a composite of two layers: a layer of army green material and a layer of three sub-maps. Each sub-map is a bitmap image of a serial number, and is assigned to a jeep according to the vehicle's object ID number.



You can use any map channel in a sub-map. The next illustration shows three objects whose materials share the same diffuse color and specular highlights, but a sub-map with a slight variation of the bump channel has been assigned to each material to give each urn a unique surface texture.



In this tutorial, you will learn how to:

- Assign material ID numbers to objects in a scene
- Create sub-maps based on multiple diffuse values
- Create sub-maps based on multiple bitmap images
- Create a material from two composited layers of sub-maps

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**NOTE** In this tutorial, you will be creating composite maps. If you are not familiar with this technique, it is recommended that you complete the [Composite Mapping tutorial](#) on page 320 first.

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Skill level: Intermediate


Time to complete: 30 minutes



# Create the Multi/Sub-Map Material

In this lesson, your objective is to divide the seating in the stadium scene into four distinct groups, and use multi/sub-mapping to assign each group its own color, with red representing the most expensive seats and green the cheapest.


**Choose mental ray and group objects by ID number:**

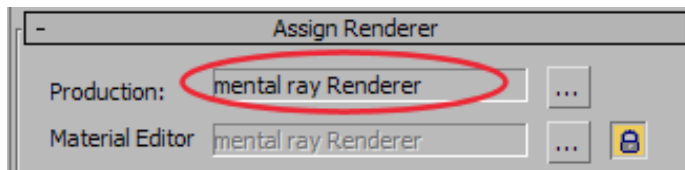
- 1  On the Quick Access toolbar, click the Open File button, navigate to `\scenes\materials_and_mapping\multi_maps\` and open the scene file `multi-maps_start.max`.

---

**NOTE** If a dialog asks whether you want to use the scene's Gamma And LUT settings, accept the scene Gamma settings, and click OK. If a dialog asks whether to use the scene's units, accept the scene units, and click OK. If a Missing External Files dialog opens, click Continue.

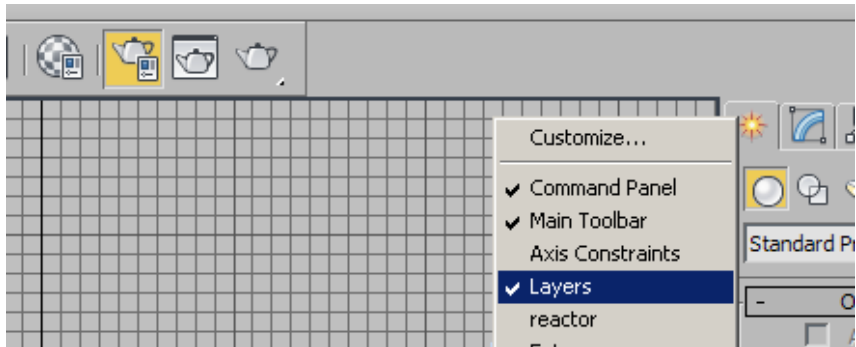
---

- 2  On the main toolbar, click Render Setup.
- 3 On the Render Setup dialog > Common tab > Assign Renderer rollout, make sure the Production box is set to mental ray Renderer.

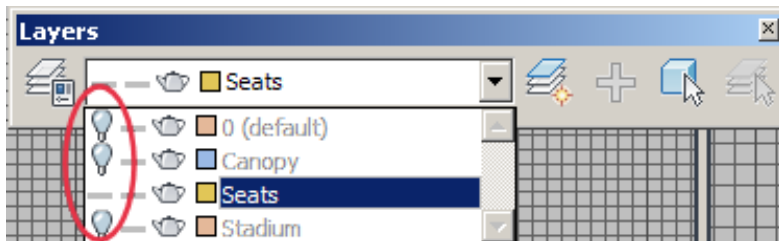


The multi sub-map is a mental ray feature. It is available only when you choose mental ray as your rendering engine.



- 4 Right-click an empty area of the toolbar and choose Layers.

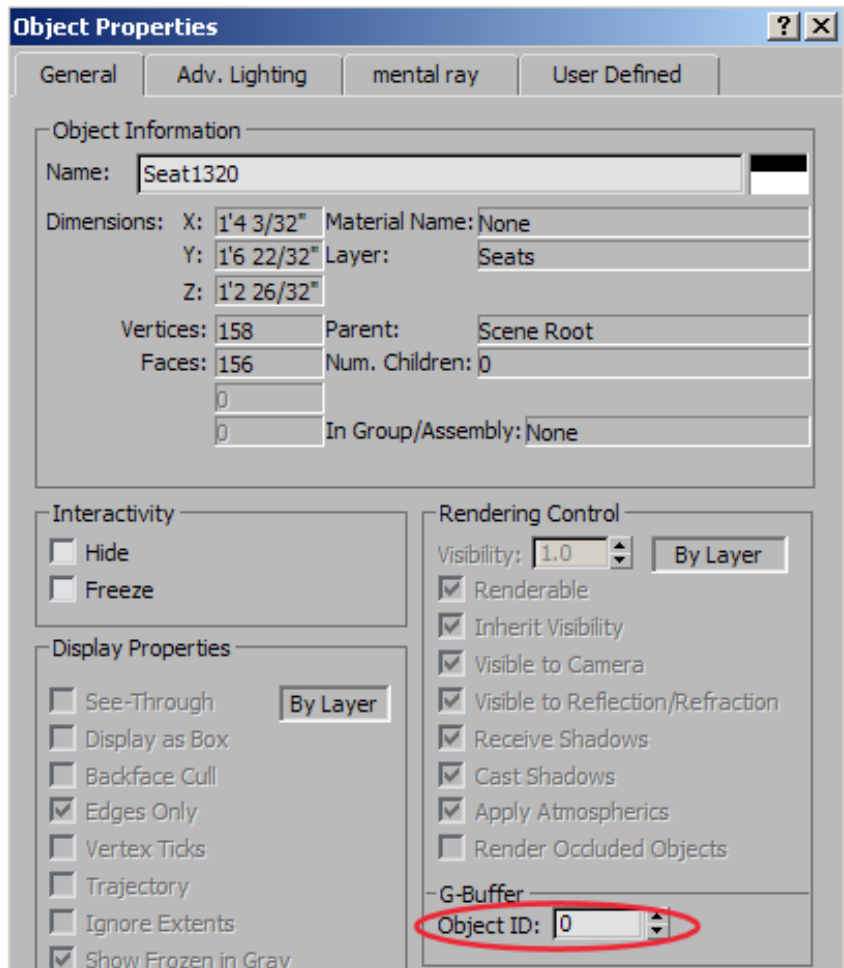


- 5 Open the layers list and click to hide all layers except Seats.



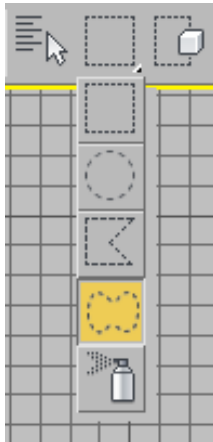
Now only the seats objects are visible, making their selection much easier.

- 6  Close the Layers toolbar and maximize the Top viewport.
- 7  Select any seat object, right-click and from the quad menu, choose Object Properties.

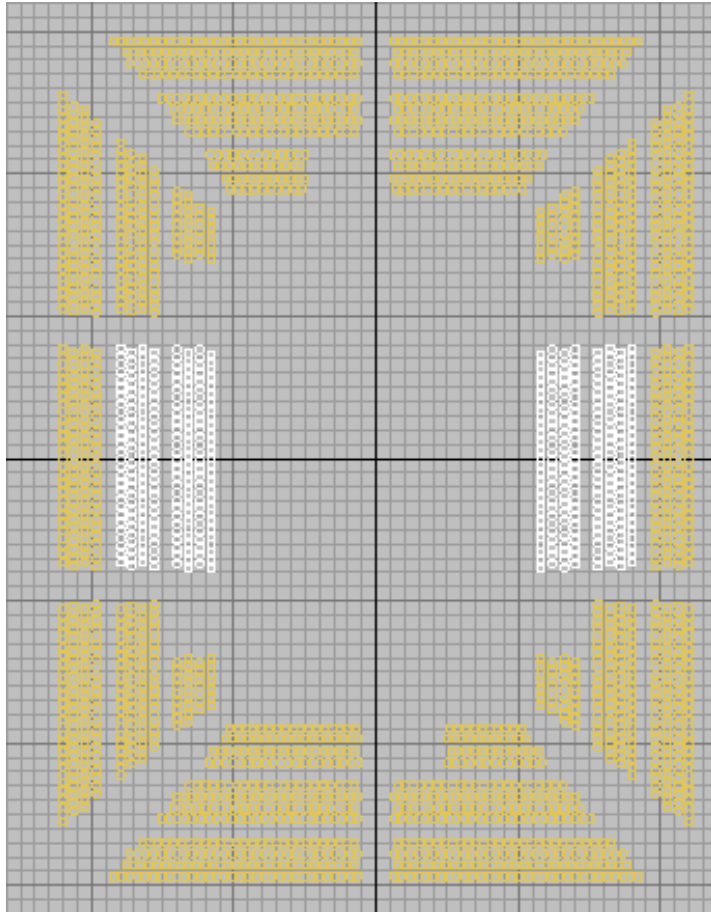


Notice that in the Object Properties dialog > General tab > G-Buffer group, the Object ID displays as 0. All objects when they are first created are assigned an ID of 0. Later on, you will change this number in order to assign certain groups of seat objects their own material variations.

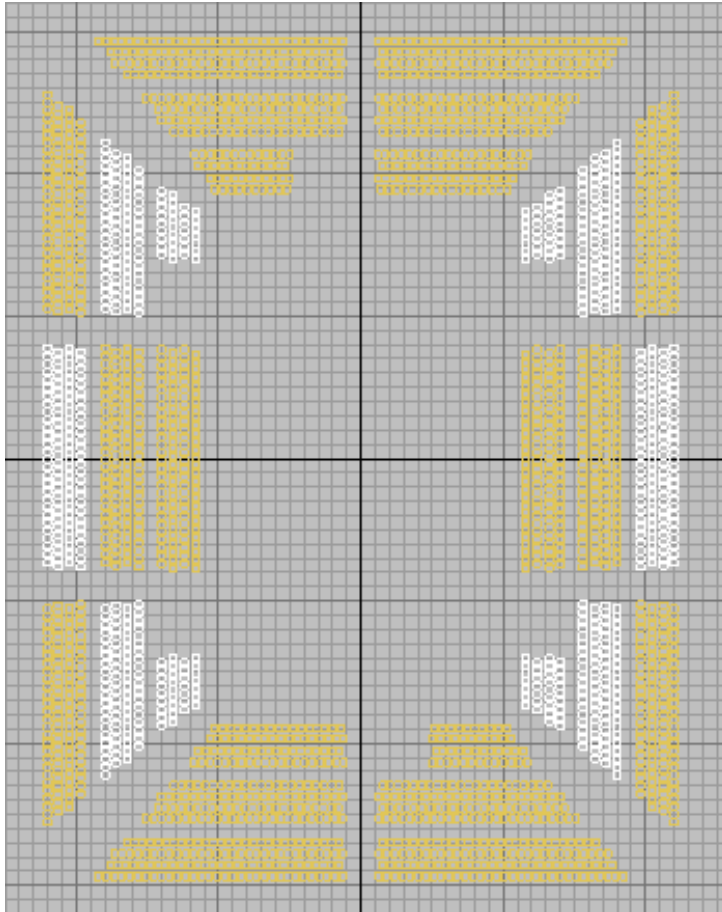
- 8 Click Cancel to close the dialog, then on the main toolbar, choose the Lasso tool from the Select Object flyout.



- 9 Use the Lasso tool to select the seats shown in white in the next illustration.
- Be sure to hold down the Ctrl key as you select the seats.

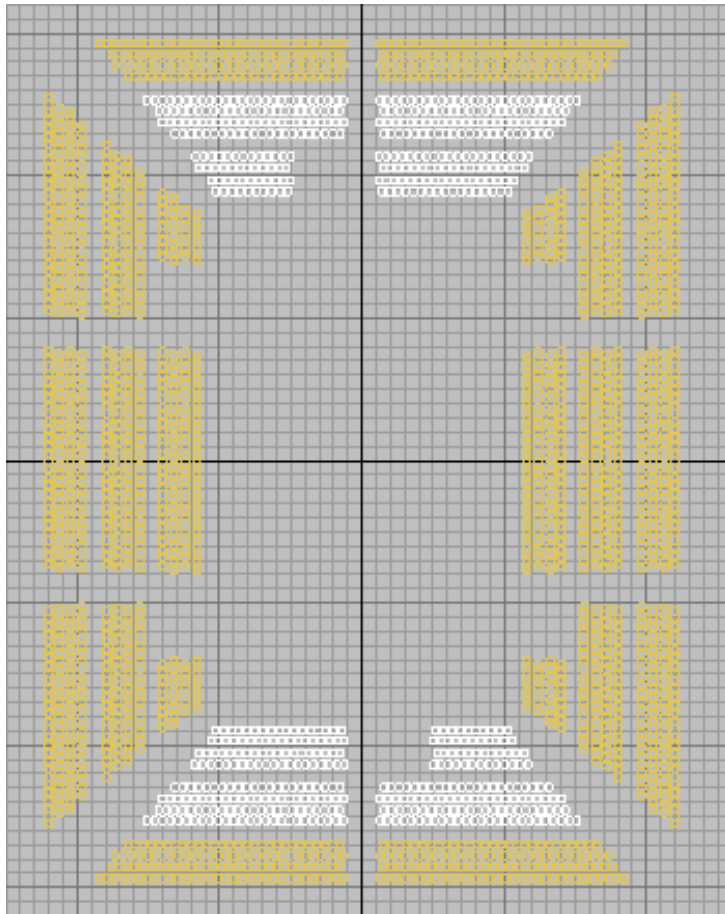


- 10** Right-click any seat in a selected group, choose Object Properties from the menu, and in the Object Properties dialog > General tab > G-Buffer group, change the Object ID to **1**. Click OK.
- 11** Use the Lasso tool to select the seats shown in the next illustration.

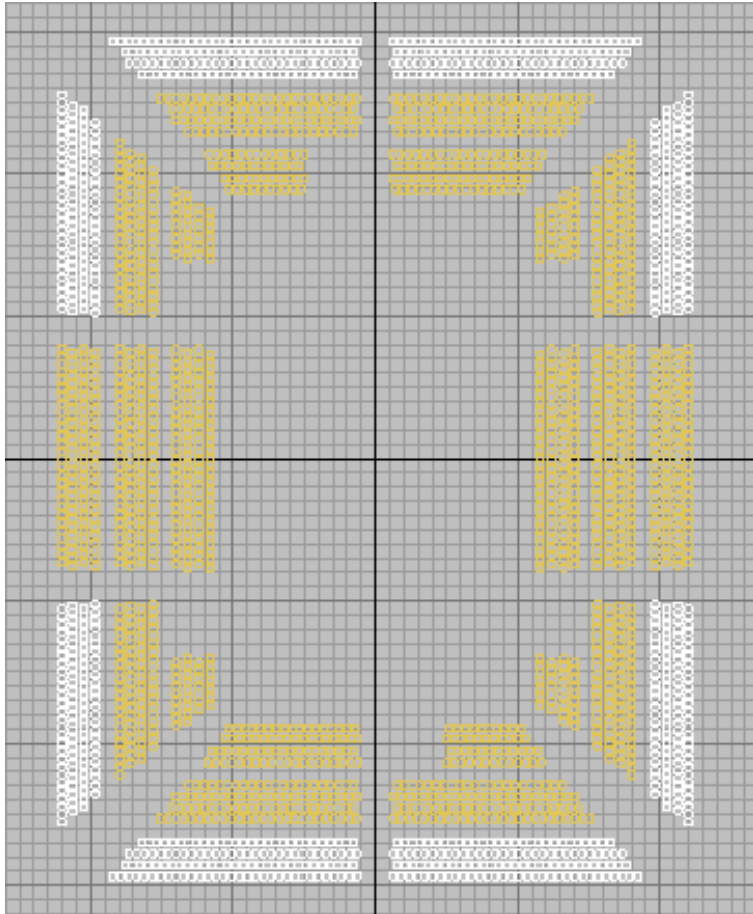


Be sure to hold down the Ctrl key as you select the seats.

- 12 Right-click any selected seat, choose Object Properties from the menu, and in the Object Properties dialog > General tab > G-Buffer group, change the Object ID to **2**. Click OK.
- 13 Select the seats shown in the next illustration as you did in step 9.



- 14 Right-click any selected seat and in the Object Properties dialog > General tab > G-Buffer group, change the Object ID to **3**. Click OK.
- 15 Repeat steps 13 and 14 for the seats shown in the next illustration, giving them an object ID of **4**.



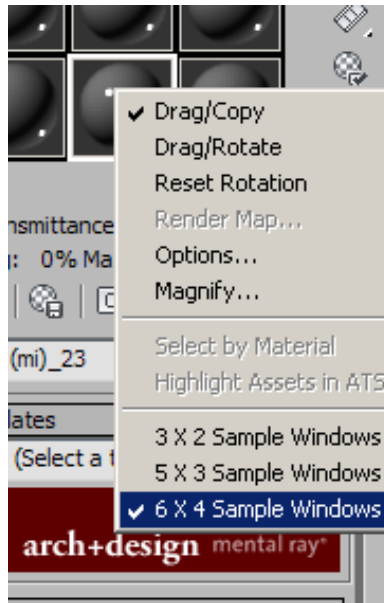
All the stadium seats should now have an object ID of 1, 2, 3, or 4. With this in place, each seat is ready to receive its own material variation and sub-object maps.

#### Create a material for the seats:

- 1 Continue from the previous procedure, or open the file *multi-maps\_01.max*.
- 2 Activate the Camera-Blimp viewport, then press M to open the Material Editor.

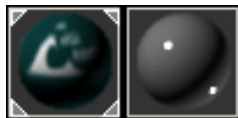


- 3 On the Material Editor, right-click a sample slot and choose 6 x 4 Sample Windows, if your Material Editor is not already set to this display option.



- 4 Activate any unused slot.

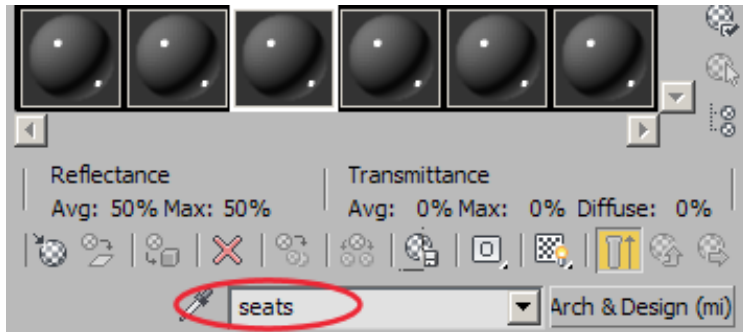
If a slot displays a white triangle at each corner, that slot's material is used in the scene.



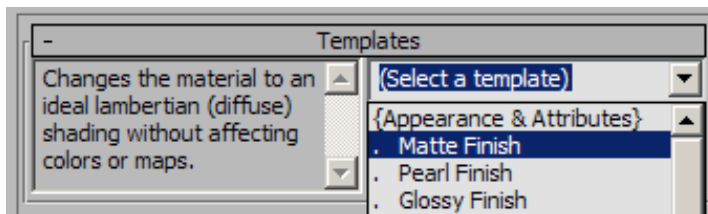
**Left: Slot with a material used in the scene**


**Right: Unused slot**

- 5 Change the slot name to **seats**.



- 6 On the Templates rollout list box, choose Matte Finish.



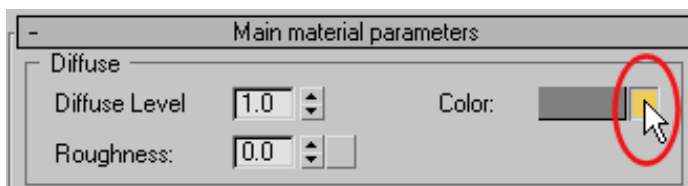
- 7  In the Top viewport, select all the seats, then In the Material Editor click Assign Material To Selection.

The matte finish material is assigned to all the seats.

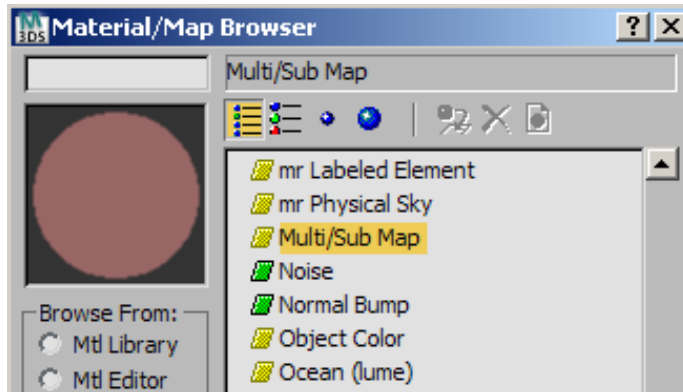
You will now add multiple sub-object maps to the seat material's diffuse color channel.

#### Define a multi/sub-map for the seats:

- 1 In the Main Material Parameters rollout > Diffuse group, click the Diffuse Color map button.

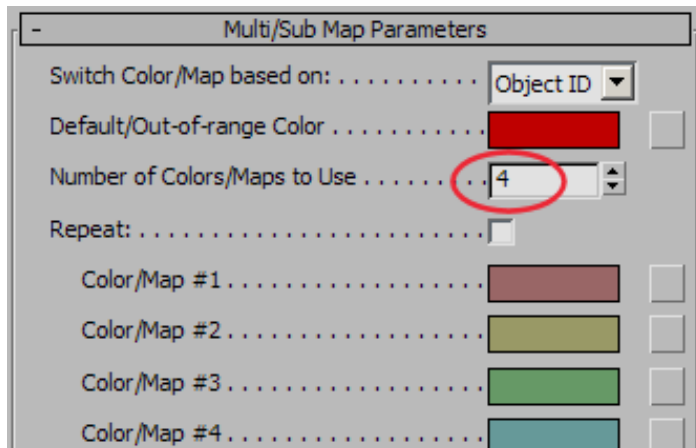


- 2 On the Material/Map Browser, double-click Multi/Sub-Map.



**NOTE** This option is available only if you have set mental ray as your rendering engine.

- 3 On the Material Editor > Multi/Sub-Map Parameters rollout, set the Number Of Colors To Use to 4.

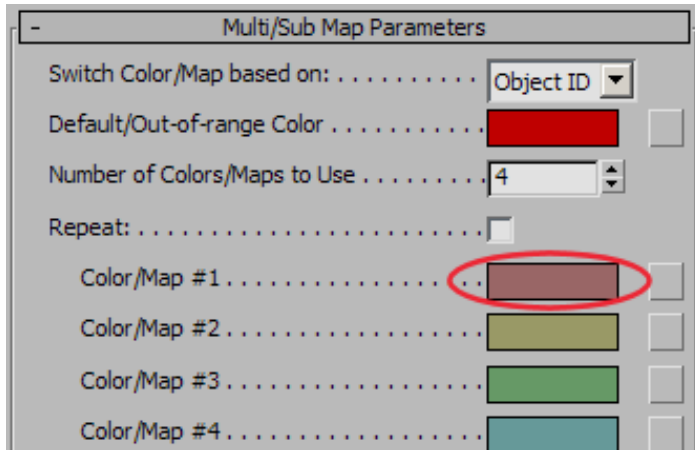


Switch Color/Map Based On is set by default to Object ID, meaning that the sub-maps will be distributed among the objects by their ID number.

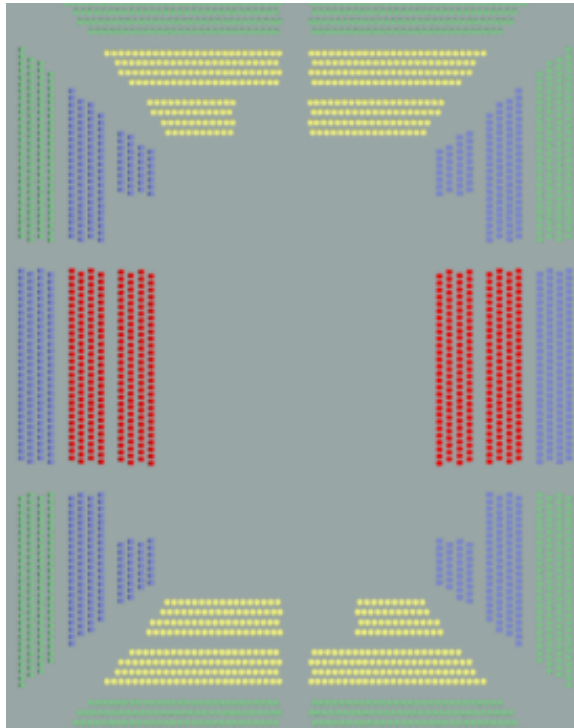
The Out-Of-Range Color box is set to red. This means the material of any object in the scene with an ID other than 1 to 4 will display in red.

If you turned on the Repeat option, all objects with IDs higher than 4 would display the color sequence assigned to objects with IDs 1 to 4.

- 4 Click the color swatch labeled Color/Map #1.

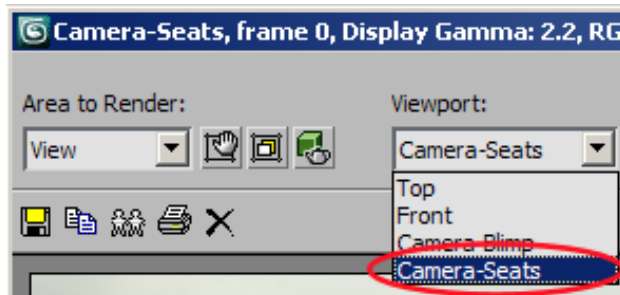


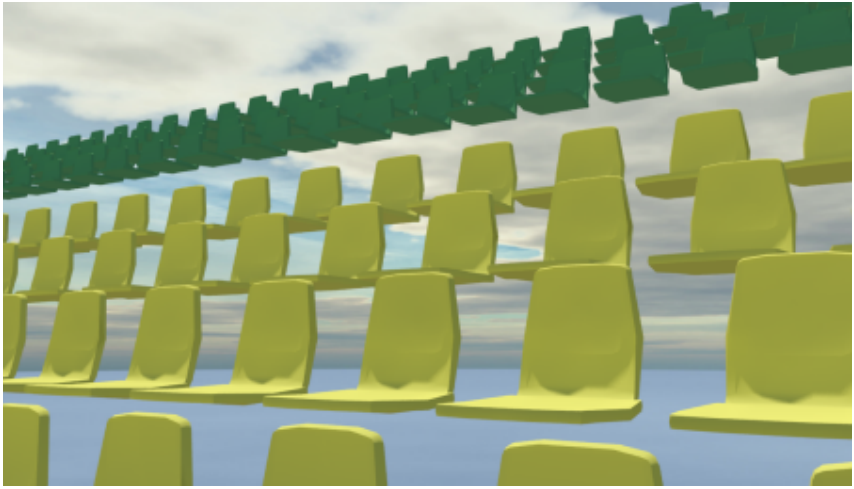
- 5 On the Color Selector, change the color to a bright red: Red = **0.8**, Green = **0.0**, Blue = **0.0**, then click OK.
- 6 Click the color swatch labeled Color #2 and change the color to a blue: Red = **0.275**, Green = **0.534**, Blue = **0.814**, then click OK.
- 7 Click the color swatch labeled Color #3 and change the color to a yellow: Red = **0.867**, Green = **0.808**, Blue = **0.231**, then click OK.
- 8 Click the color swatch labeled Color #4 and change the color to a green: Red = **0.158**, Green = **0.583**, Blue = **0.141**, then click OK.  
These colors will not show up in the viewports, but they will be visible when the image is rendered.
- 9 Press F9 to render the scene. Keep the rendered frame open.



The rendered image shows seats with their sub-map material clearly visible. Seats with an object ID of 1 show the red sub-map applied, seats with an object ID of 2 show the blue sub-map applied, and so on.

- 10 Activate the Camera-Seats viewport.
- 11 In the rendered frame window's Viewport list, make sure Camera-Seats is chosen, then click Render to render the scene again.





12 Close the rendered frame.

### Next

[Composite Sub-Maps Onto Objects](#) on page 408

## Composite Sub-Maps Onto Objects

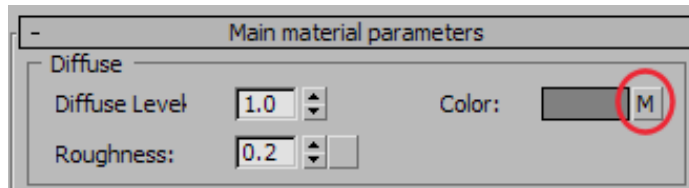
The seats you mapped in the previous lesson appear too uniform: they lack individual signs of wear and tear. Now you will introduce another level of randomness to the seat material by adding sub-maps that contain blemishes and other discolorations.

To accomplish this, you will composite two layers of sub-maps onto one another. One layer will contain the four diffuse colors you specified in the previous lesson, the other layer will contain sub-maps with a mixture of image maps of dirt patterns.

### Create the composite layers:

- 1 Continue from the previous lesson, or open the file *multi-maps\_02.max*.
- 2 Press M to open the Material Editor, if it is not already open, and make sure the *seats* material sample slot is active.

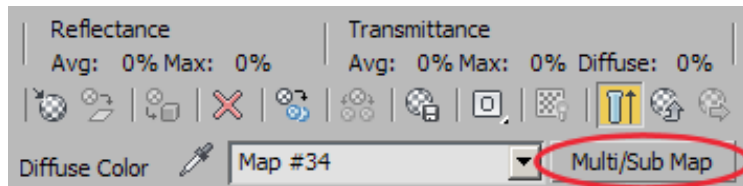
- 3 In the Main Material Parameters rollout > Diffuse group, click the Diffuse Color map button.



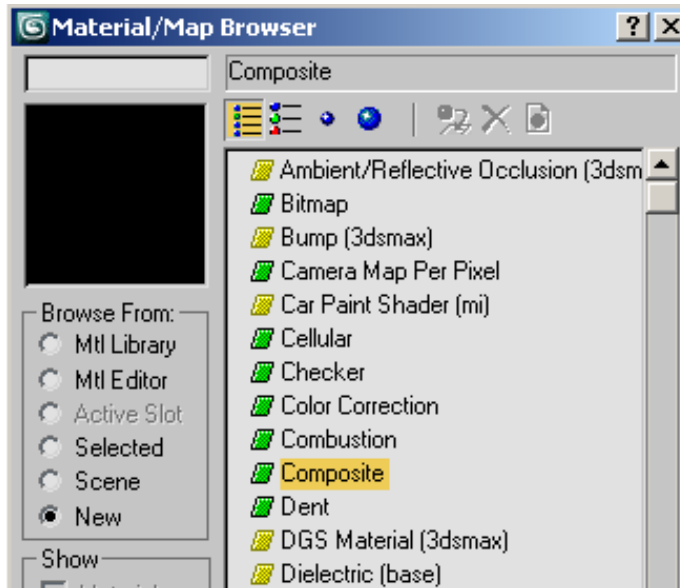
The M on the map button indicates that a map has been applied to the material.

This is the multi sub-map you created in the previous lesson, and will now form the base layer of the composite.

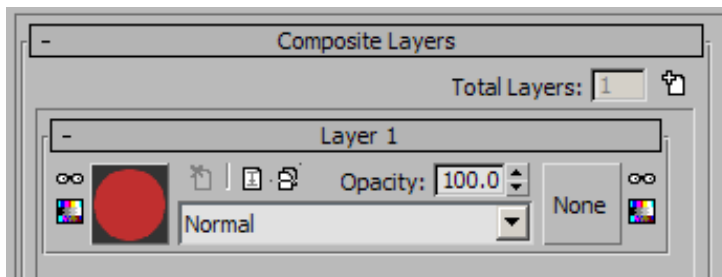
- 4 Click Multi/Sub-Map.




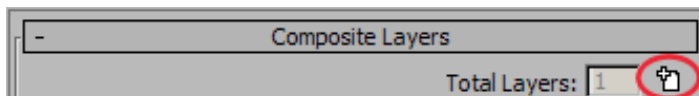
- 5 On the Material/Map Browser, double-click Composite.



- 6 On the Replace Map dialog, click OK to keep the map as the base layer of the composite.



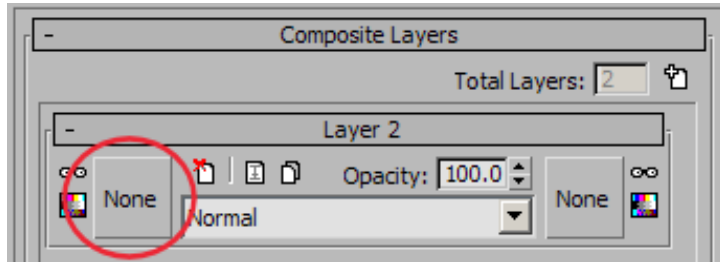
- 7  On the Composite Layers rollout, click Add A New Layer.



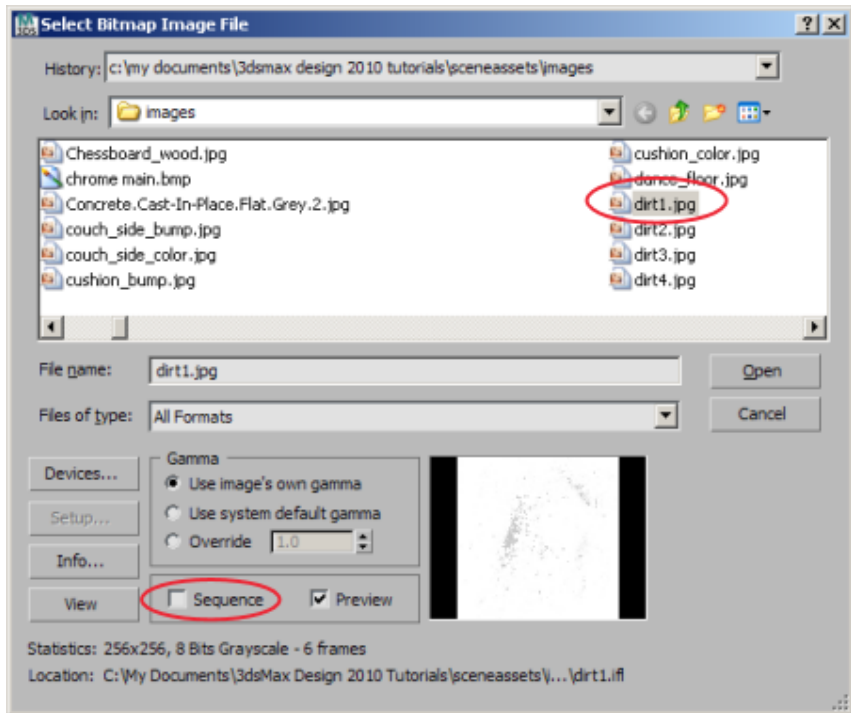


### Define the sub-maps for Layer 2:

- 1 On the Layer 2 rollout, click the left-hand Assign Material button (initially labeled “None”).



- 2 On the Material/Map Browser, double-click Multi/Sub-Map.
- 3 On the Material Editor > Multi/Sub-Map Parameters rollout, set Number Of Colors To Use to **6**.  
This time, rather than add colors, you will add six bitmap images to the sub-map.
- 4 On the Color/Map #1 parameter, click the map button.
- 5 On the Material/Map Browser, double-click Bitmap.
- 6 On the Select Bitmap Image File dialog, highlight *dirt1.jpg* and make sure Sequence is off (otherwise, all the dirt files would also be selected for the layer).

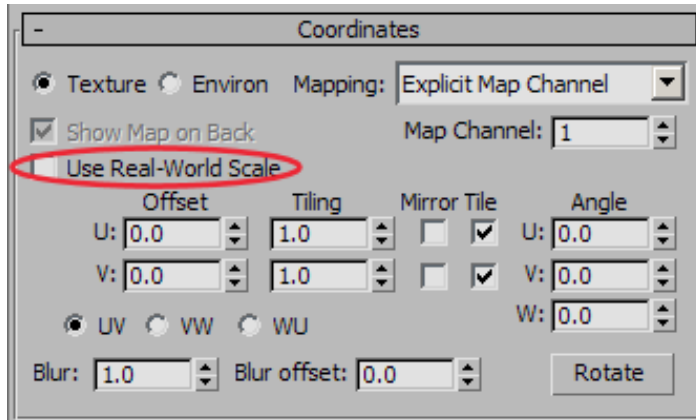


The thumbnail at the bottom right of the dialog gives you an idea of what the *dirt1.jpg* image looks like.

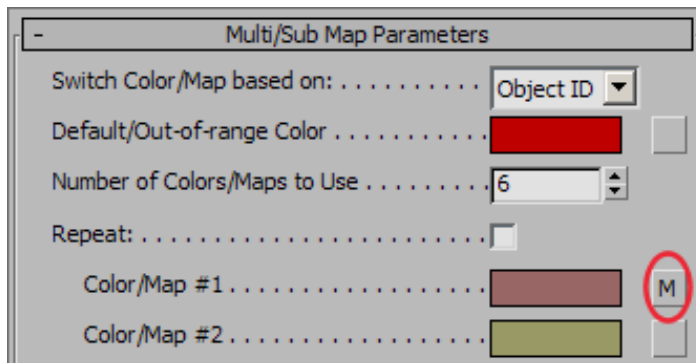
**7** Click Open.

The bitmap, which consists of a black and white dirt pattern, is applied as a texture map to the base layer of your composite map.

**8** On the Material Editor > Coordinates rollout, make sure Use Real-World Scale is turned off.



- 9 Click Go To Parent once to view the composite map parameters.



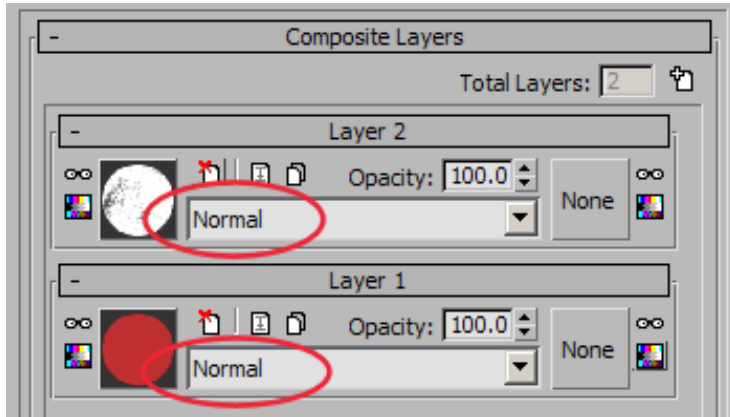
The Color/Map #1 parameter now has an M displayed on its button, indicating that it is based on a bitmap image rather than a color.

- 10 For the Color #2 parameter, click the map button and repeat steps 4 to 9. Choose *dirt2.jpg*.
- 11 Repeat steps 4 to 9 for the Color #3 to Color #6 parameters, choosing the maps *dirt3.jpg* through *dirt6.jpg*, in order.
- The sub-map now has six channels of dirt maps available.

Define how the two layers composite together:

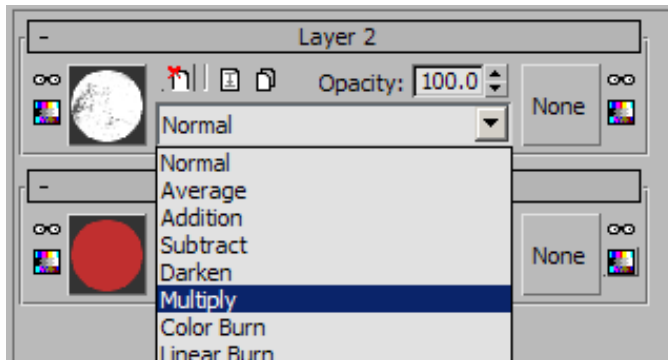


- 1 Click Go To Parent to view the composite layers that make up the material.



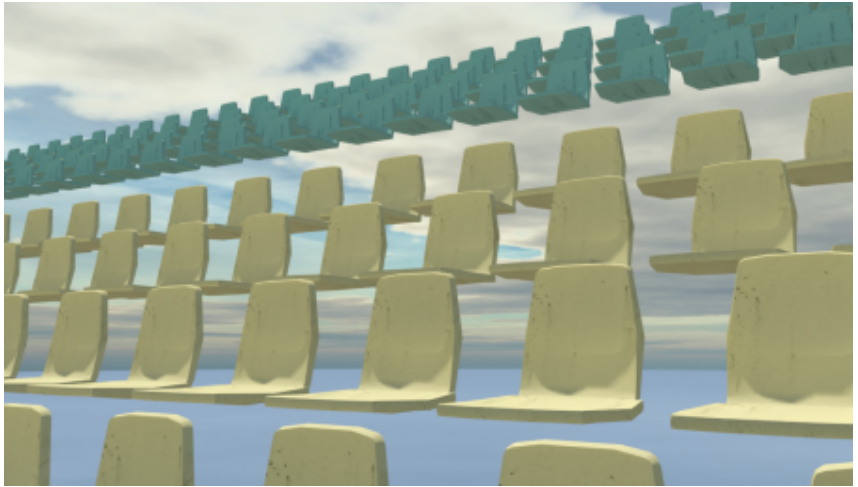
The Operations drop-down list for each layer is set to Normal, which means that the layer with the highest number obscures all layers beneath it. You need to add an operation that will blend the layers together.

- 2 On the Layer 2 rollout, click to open the Operations drop-down list, and choose Multiply.



Now the Composite map combines the color and dirt map layers.

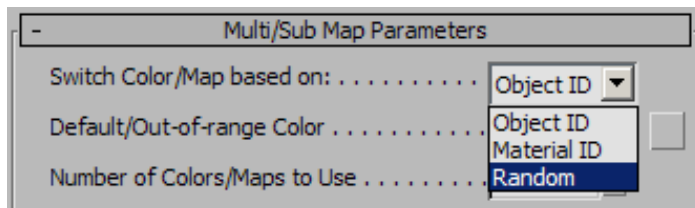
- 3 Make sure the Camera-Seats viewport is active, then press F9 to render the scene.



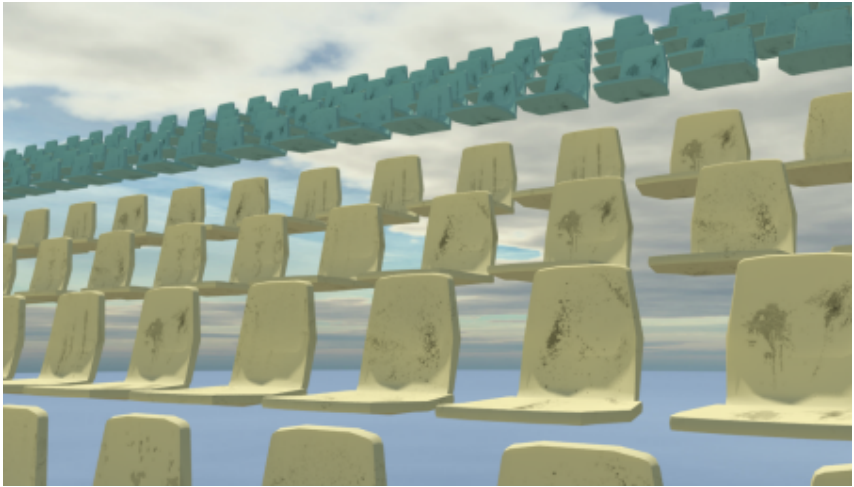
Notice how each group of seats shows the same dirt map. The *dirt1.jpg* map is applied to all objects in the scene with an ID of 1. The *dirt2.jpg* map is applied to all objects in the scene with an ID of 2, and so on. You now need to distribute a random mix of all six dirt maps for all seats groups in the stadium.

**Define the sub-map distribution method and fine tune the composite image:**

- 1 On the Material Editor > Layer 2 rollout, click the texture map thumbnail, and then on the Multi/Sub-Map Parameters rollout, open the Switch Color/Map Based On drop-down list, and choose Random.



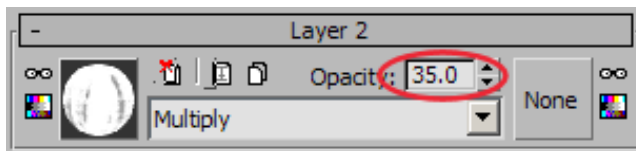
- 2 Press F9 to render the scene.



Now, all six dirt maps appear at random for all seats groups in the stadium. The dirt patterns, however, stand out too clearly.

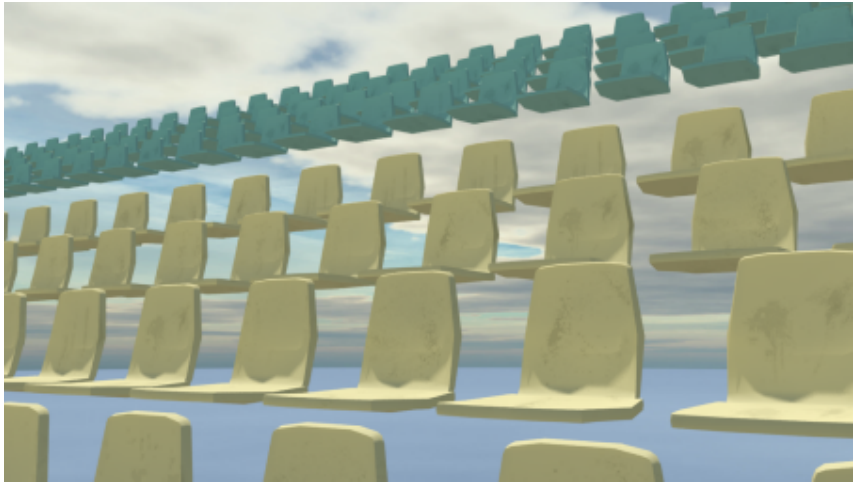


- 3 Click Go To Parent to view the parameters for layers in the composite map.
- 4 On the Layer 2 rollout, change the Opacity setting to **35.0**.



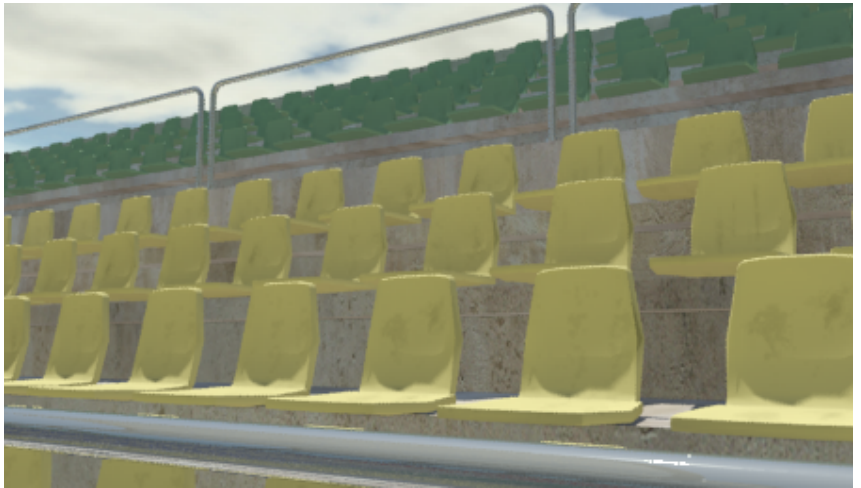
The dirt layer is reduced in visibility to 35% of its full opacity.

- 5 Press F9 to render the scene.



The dirt maps appear more faded, giving the seats a subtle variation that appear more realistic.

- 6 If you wish, open the file *multi-maps\_completed.max* and render the Camera-Seats viewport to see a finished version of the stadium scene.



## Summary

In this tutorial, you learned how to give similar objects their own character by adding sub-maps to their base material.