Introduction to Materials and Mapping

To introduce materials, you will work with a scene that shows an army compound: a field headquarters that has been built around a farmhouse.

A rendering of the field headquarters after you have completed the tutorial

In this tutorial, you will learn how to:

■ Create basic materials.

■ Assign materials to objects in the scene.

■ Create and adjust mapping coordinates.

■ Use texture, opacity, and bump mapping.

■ Use 3D procedural materials.

Skill level: Basic to Intermediate

Time to complete: 1.5 hours

Applying Materials and Textures

You begin with a scene that has only a few materials in it.

Set up the lesson:

■   On the Quick Access toolbar, click the Open File button, navigate to *\scenes\materials_and_mapping\intro_to_materials* and open the scene file *army_compound.max*.

Except for the vehicles, the jeeps and helicopter, this scene contains no materials. The buildings and terrain have a featureless, plastic look to them that is typical of newly created geometry in 3ds Max.
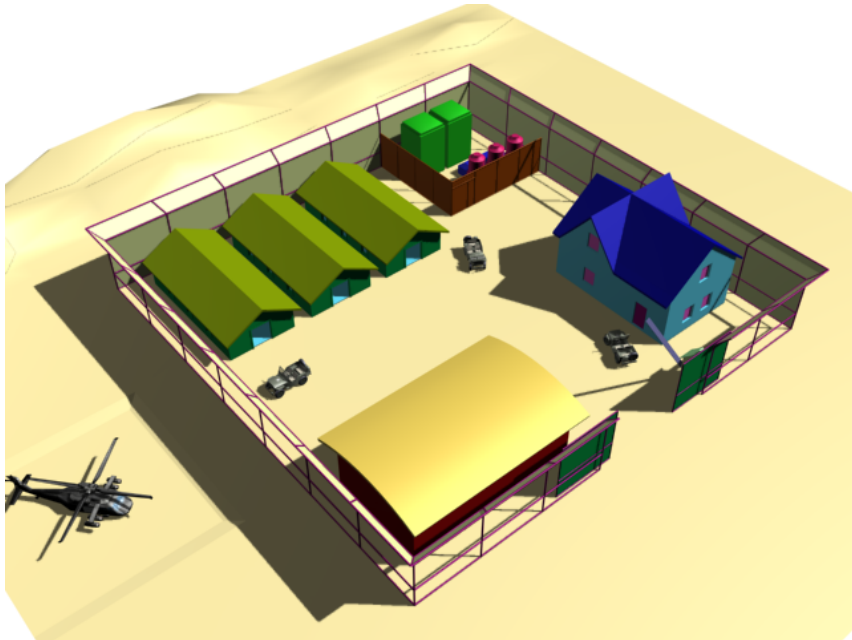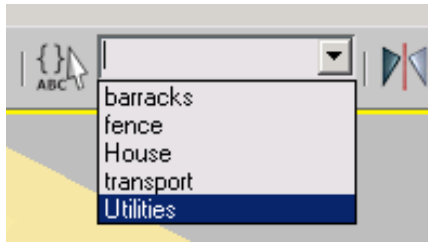

The field headquarters before you apply materials

You'll begin by adding textures to the utility containers in the fenced area at the rear of the compound.
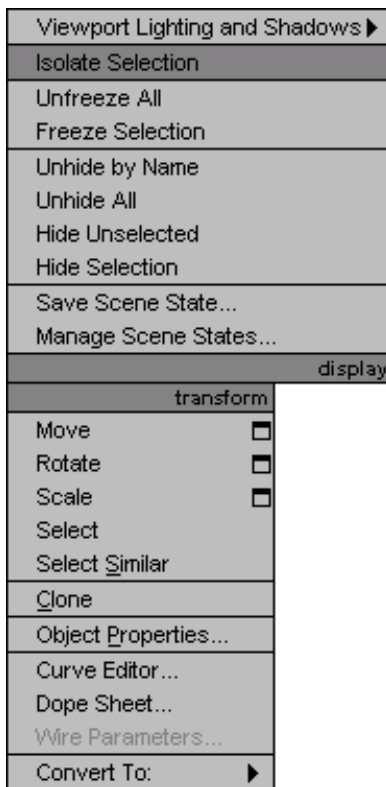
Isolate the utility containers:

1   On the main toolbar, open the Named Selection Sets drop-down list, and choose the *Utilities* selection set.

3ds Max selects the various containers.

2 Right-click the viewport to display the quad menu, and choose Isolate Selection.

This command is in the upper-right, Display quadrant.
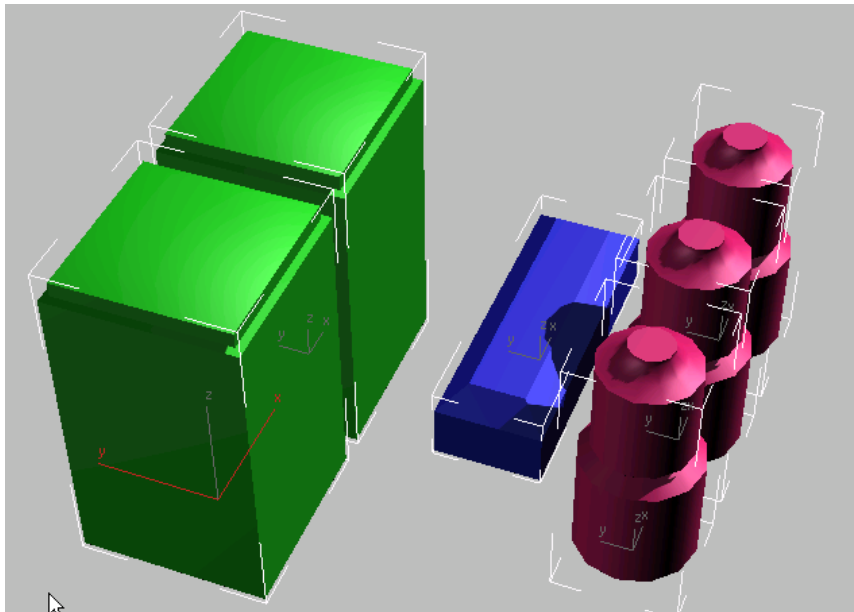

3ds Max displays the utility containers in the center of the viewport, and hides the other scene geometry.

TIP You might have to move the Warning: Isolated Selection dialog to see the geometry clearly.
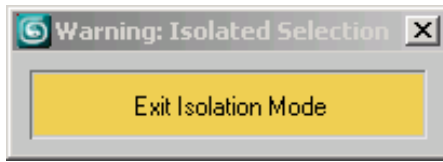
3 Use Orbit to adjust the view so you can see all five containers clearly.

The isolated set of containers

Now you're ready to begin creating materials for these objects.

Apply a basic material to the oil tanks:

1 Turn on Select Object.

2 Click an empty area of the viewport to deselect the *Utilities* set, and then click *OilTank01* (the front cylindrical object on the right) to select it.

**3** Ctrl+click *OilTank02* and *OilTank03* to select them as well.

4 On the main toolbar, click Material Editor to display the Material Editor.

The Material Editor is a sort of workbench for creating materials, adjusting them, managing them, and applying them 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.*

Sample slots in the Material Editor

**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.
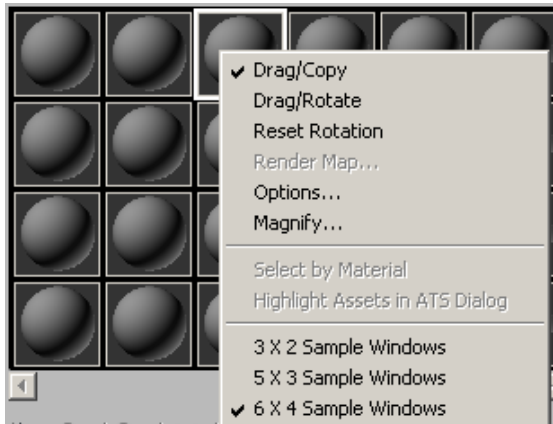
Below and to the right of the sample slots are buttons for various controls, and below this area are rollouts with detailed controls for specific

materials. We will describe controls when you need to use them, without going into detail at this point.

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

6 In the material Name field, just below the sample slot array, enter **Oil Tanks** as the material name.
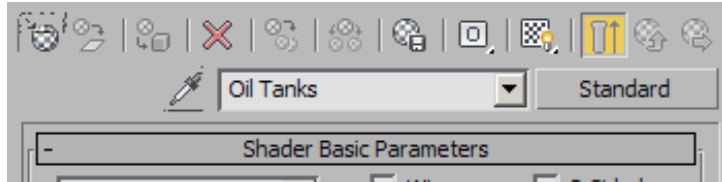
It is good to get in the habit of naming a material as soon as you create it. In a complex scene, intelligible material names are useful.

7 On the Blinn Basic Parameters rollout, below the sample slots, click the color swatch that is labeled Diffuse.

3ds Max displays a Color Selector dialog.
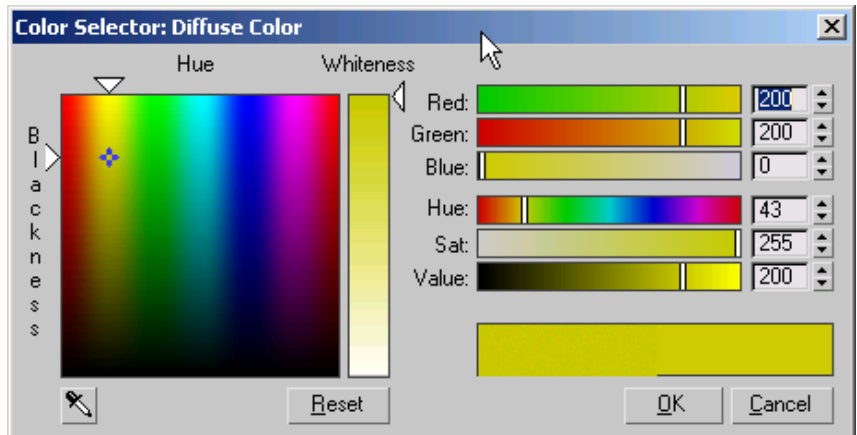
Use the Red/Green/Blue controls on the Color Selector to choose a yellow color. Set Red = **200**, Blue = **200**, and Green = **0**.

The *diffuse* color of a material is the color that appears under diffuse, or scattered, light. It is what we usually think of as "the" color of a material, and what you will set first, when you create a basic material such as this one.

8 Click OK to close the Color Selector.

9 Among the buttons below the sample slots, locate the button called Assign Material To Selection, and click it.

In the viewport, the oil canisters turn yellow.

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.

You will take advantage of adjusting a "hot" material in the next set of steps.

Make the oil tanks shiny:

Make sure that the three oil tanks are still selected, and that the Oil Tanks material sample slot is still active.
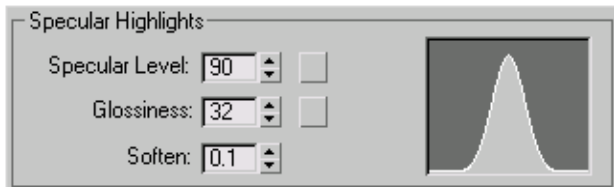
1 On the Blinn Basic Parameters rollout, in the Specular Highlights group, change the value of Specular Level to **90**.

Bright highlights appear on both the sphere in the sample slot, and the oil tanks in the viewport.

2 Also in the Specular Highlights group, change the Glossiness value to **32**.
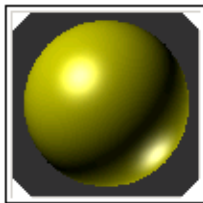
**Left: Sample slot with the oil tank material**

Right: Specular highlight controls with Glossiness = 32

As you can see the sample slot and in the graph to the right of the Specular Highlight and Glossiness controls, the highlight is now narrower. Specular Level controls how bright highlights are, while Glossiness controls highlight width. In general, shinier materials have smaller highlights.

You have used basic material controls, Diffuse color, Specular Level, and Glossiness, to create a simple material that has the appearance of a moderately shiny paint. This completes the material for the oil tanks.
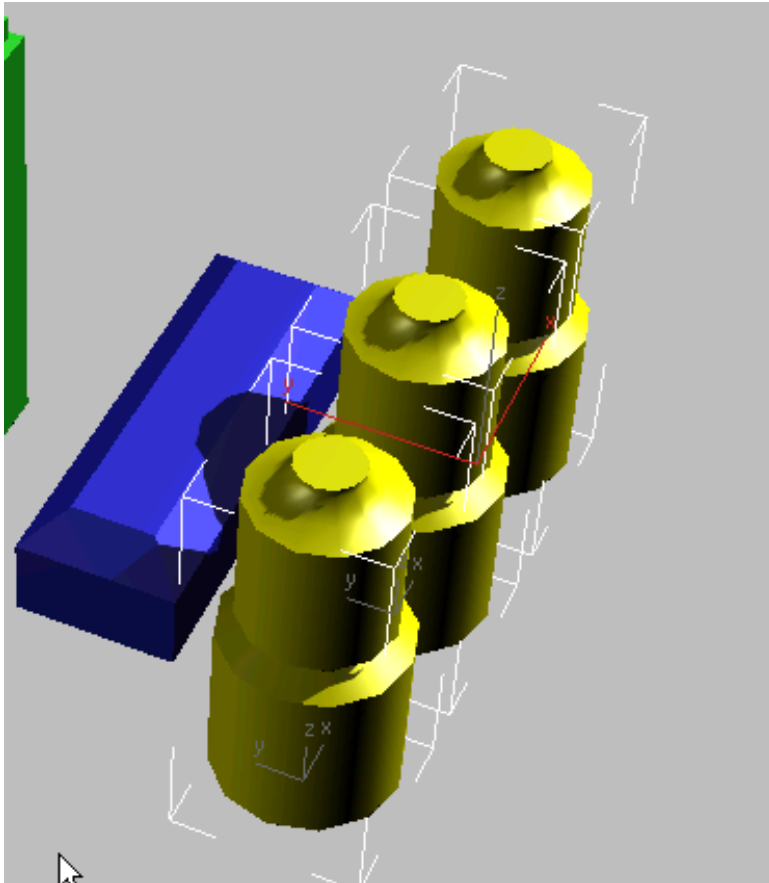
The oil tanks with their material

Apply a texture map to the ammunition canister:

For the ammunition canister, you will use a bitmap. Bitmaps are a versatile way to add visual detail to scenes, and we use them extensively in this scene. When a bitmap is used to provide an object's color, it is also known as a *texture map*. The texture map you apply to the canister shows a section of metal plating with a "checkered" pattern.
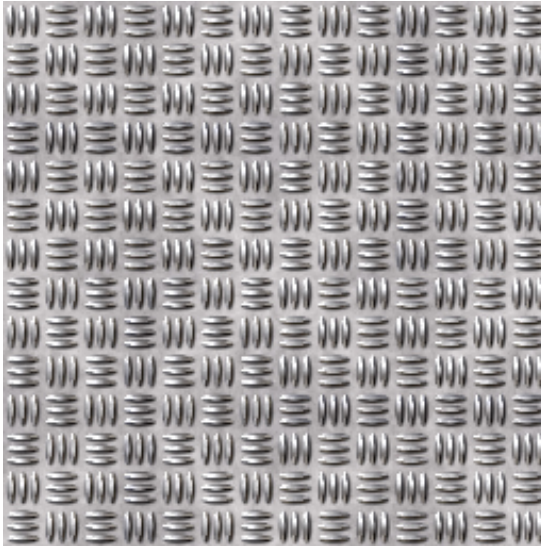
Texture map for the ammunition canister

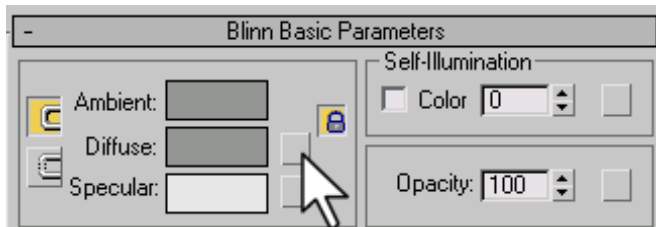1 In the Material Editor, click the second sample slot to activate it.

2 In the Name field, change the name of the material to **Canister**.

3 In the Blinn Basic Parameters rollout, click the gray button immediately to the right of the Diffuse color swatch.

This button assigns a map, rather than a plain color, to the Diffuse component of the material.

3ds Max displays the Material/Map Browser.

Material/Map Browser

None

- Bitmap
- Cellular
- Checker
- Combustion
- Composite
- Dent
- Falloff
- Flat Mirror
- Gradient
- Gradient Ramp
- Marble
- Mask
- Mix
- Noise
- Output
- Particle Age
- Particle MBlur
- Perlin Marble
- Planet
- Raytrace
- Reflect/Refract
- RGB Multiply
- RGB Tint
- Smoke
- Speckle
- Splat
- Stucco
- Swirl
- Thin Wall Refraction
- Tiles
- Vertex Color
- Waves
- Wood

Browse From:
- Mtl Library
- Mtl Editor
- Active Slot
- Selected
- Scene
- New

Show
- Materials
- Maps
- Incompatible
- Root Only
- By Object

- 2D maps
- 3D maps
- Compositors
- Color Mods
- Other
- All

OK   Cancel

4 In the Material/Map Browser list of map types, click Bitmap to highlight it, and then click OK.

5 3ds Max displays a file dialog. Click to highlight the file *metals.checker.plate.jpg* (it's *\sceneassets\images\,* like all the maps for the tutorials), and then click Open.

6 In the Material Editor, click Go To Parent.

This button is toward the right of the row of tool buttons below the sample slots.

Now you are at the top-level Canister material once again. Materials with maps 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 map, you can click Go To Parent to get back to the topmost, main material level.

7 Make sure that none of the utility objects is selected, then drag the sample slot from the Material Editor to the viewport, and release the mouse over the blue canister in the middle of the group.

The canister turns gray.

8 In the Material Editor, click to turn on Show Standard Map In Viewport.

Now you can see the material's texture in the viewport.

Adjust the metal plate mapping:

If you zoom in, you can see that the mapping is not as good as it could be. The top and sides of the canister look all right, but there is streaking where the top of the canister has beveled faces.
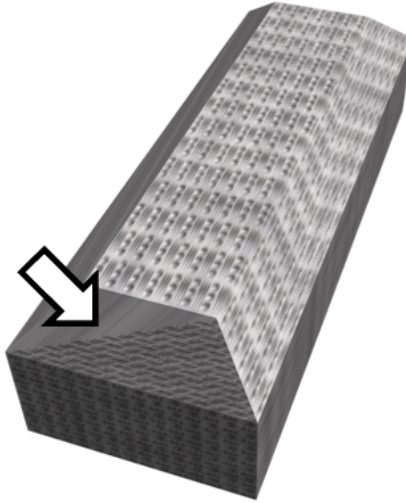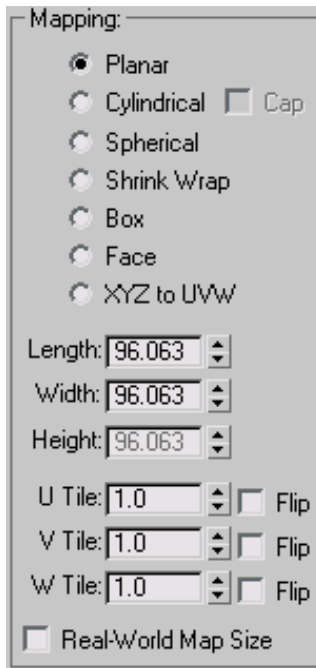
Streaks in the texture when using the default mapping

To fix this, you use a modifier called UVW Map.

1 Select the canister object, which is named *Ammo,* and go to the Modify panel.

2 Open the drop-down Modifier list, and choose UVW Map from the list.

> **TIP** Once you open the list, you can press U a couple times until the list highlights UVW Map, and then press Enter.

3 In the Parameters rollout > Mapping group, choose Box.

The radio buttons at the top of the Mapping group (Planar, Cylindrical, Spherical, and so on) tell the UVW Map modifier how to project the map onto the object. Box mapping projects the map from all six sides, so the texture display is more uniform.

4 Also in the Mapping group, set Length = Width = Height = **2.0m**.

Now the mapping is uniform and looks good from any angle.
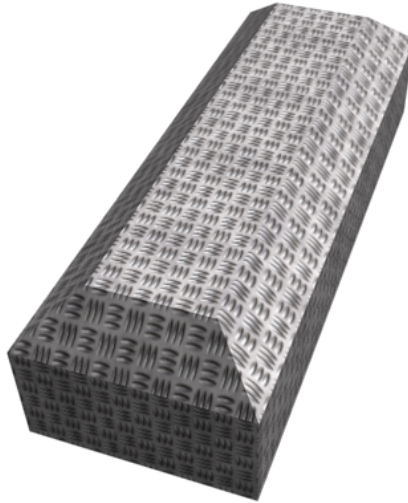
The texture corrected using UVW Map

Apply a 3D material to the generators:

Finally, for the generators, you will use a 3D procedural map. A bitmap is simply a digital image such as a scan or a photograph. A 3D map, on the other hand, is generated by 3ds Max.

1   Select *Generator01* and *Generator02,* the large boxy objects to the left.

2   In the Material Editor, click the next unused sample slot to make it active, then name the material **Camouflage**.

3   In the Blinn Basic Parameters rollout, click the small Diffuse map button. 3ds Max displays the Material/Map Browser.

4   In the list of map types, highlight Noise, and then click OK.

> **TIP** In the Browser, you can also double-click the Noise map to assign it without having to click OK.

5   In the Noise Parameters rollout, click the color swatch labeled Color #1.

3ds Max displays a Color Selector.

6 Change Color #1 to a dark green: Red = **0**, Green = **175**, Blue = **0**.

7 Click the color swatch labeled Color #2. In the Color Selector, change Color #2 to a tan: Red = **200**, Green = **155**, Blue = **0**, and then click OK.

8 Click OK to close the Color Selector.

9   Click Assign Material To Selection, and then click Show Standard Map In Viewport to turn it on.

The map appears in the viewport, but the camouflage pattern isn't very apparent.

10 In the Noise Parameters rollout, change the Noise Threshold values. Set High = **0.51** and Low = **0.49**. In addition, change the Size value to **18.0**.

Now the generator casings have a recognizable camouflage pattern. A bonus of the procedurally generated 3D Noise texture, is that the pattern is not quite the same on either generator. (This effect is apparent only when you render the scene: in viewports, both generators look the same.)
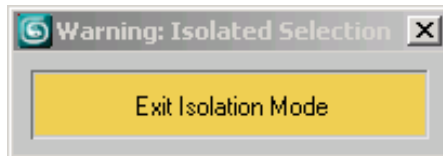
You now have a reasonably realistic texture for all of the containers in the utilities area of the compound.
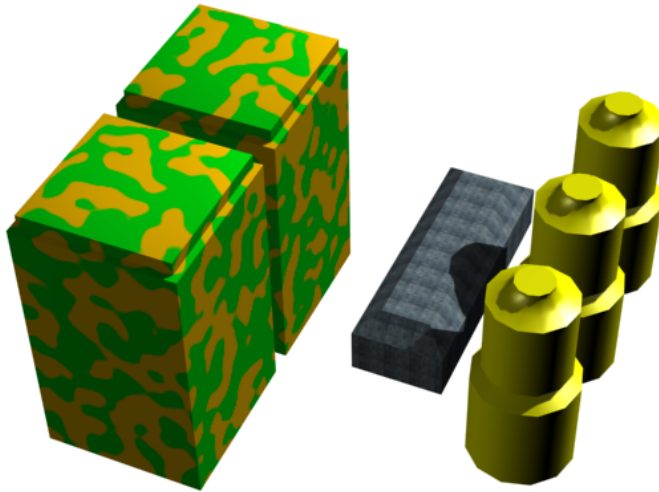
Utility containers with their textures

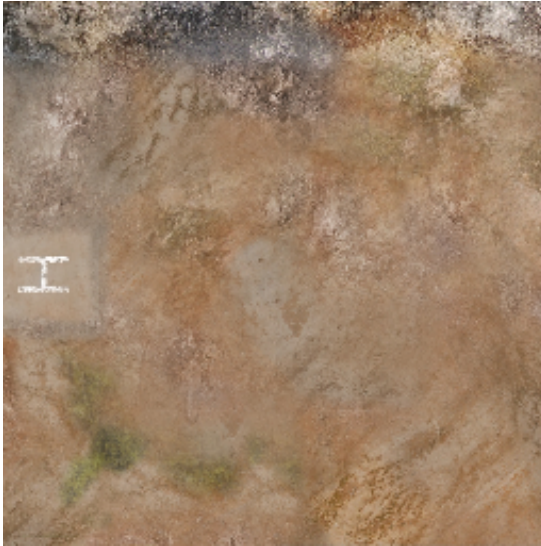**View the entire scene again:**

■ In the Warning: Isolated Selection dialog, click Exit Isolation Mode.

The viewport shows the entire scene once again.

Apply a texture map to the terrain:

For the last step in this lesson, you will apply a texture to the terrain beneath and surrounding the compound.

Terrain texture for the army compound

1 In the Material Editor, click the next unused sample slot to make it active, and name the new material **Terrain**.

2 In the Blinn Basic Parameters rollout, click the Diffuse map button. In the Material/Map Browser, double-click Bitmap.

3 In the file dialog, choose *terrain.jpg,* and then click Open.

The Terrain texture now has an image of the ground.

4 Click Go To Parent, and then drag the sample slot to the *Ground* object in the viewport. This is the large, flat, tan object that underlies all the other geometry.

The *Ground* object turns gray.

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

The *Ground* object turns brown, but it doesn't show the texture map. This is a sign that the object doesn't have mapping coordinates.

Primitive objects such as boxes and spheres have default mapping coordinates, but editable geometry such as *Ground,* which is an Editable
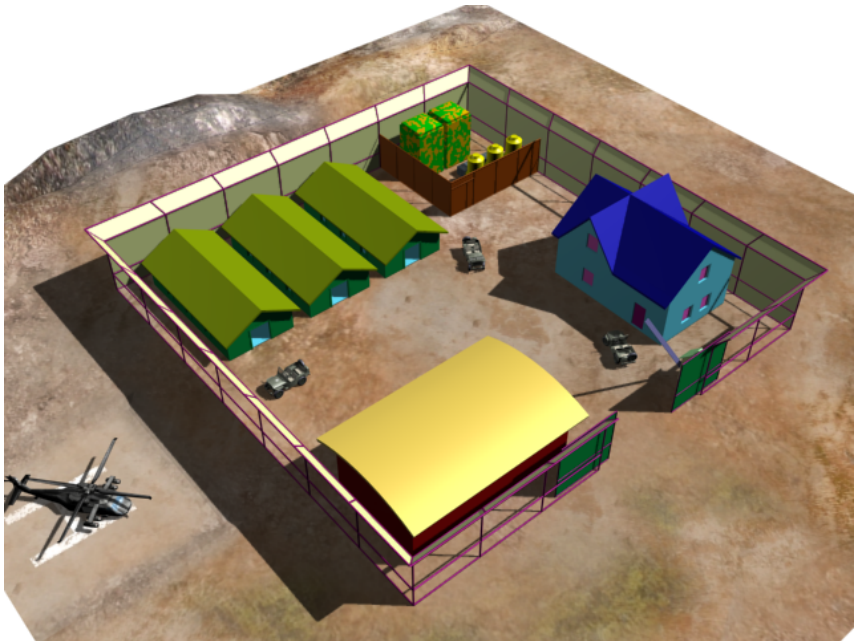
Poly, does not. You have to assign mapping coordinates by applying UVW Map.

6 Select the *Ground* object, and go to the Modify panel.

7 Use the Modifier List to apply a UVW Map modifier.

For the terrain, the default Planar projection works fine, and the map *terrain.jpg* is already the right size for the scene, so your work in this lesson is now complete.

Army compound with textured utility containers and terrain

Save your work:

■ Save the scene as **my_fieldhq_containers_and_terrain.max**.

Add Detail to Some Outbuildings

Next, you will add materials to the barracks. Materials for the barracks use texture maps, as the ammunition canister does, but they also use *bump mapping* to create a more three-dimensional appearance.

Set up the lesson:

■ Continue from the previous lesson, or open *army_compound01.max*.
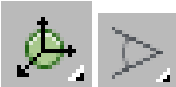
Isolate the barracks:

1 On the main toolbar, open the Named Selection Sets drop-down list, and choose the *barracks* selection set.
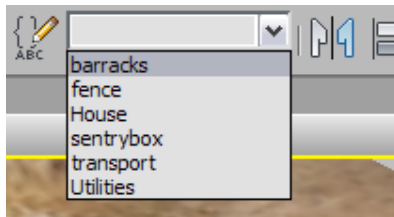
3ds Max selects the barracks buildings.

2 Right-click the viewport to display the quad menu, and choose Isolate Selection.

3ds Max displays the barracks in the center of the viewport, and hides the other scene geometry.

3 Use Orbit and Field-Of-View to adjust the view so you can clearly see the barrack walls.

Texture the barrack walls:

1 If it is not already visible, display the Material Editor.

TIP Besides the toolbar button, another way to display the Material Editor is simply to press M.

2 Turn on Select Object, then click an empty area of the viewport to deselect the *barracks* set.

3 In the Material Editor, choose Options > Propagate Materials To Instances from the menu bar, in order to turn it on. (When this option is turned on, a check mark appears before its name.)

Like the oil tanks and generators, the barracks objects, roof, walls, and floors, are instances of each other. By turning on this option, you can apply a material to all the objects of one type by dragging and dropping to only one object.

4 In the Material Editor, click the next unused sample slot to make it active, and name the new material **BarracksWalls**.

5 In the Blinn Basic Parameters rollout, click the Diffuse map button. In the Material/Map Browser, double-click Bitmap.

6 In the file dialog, choose *planks.jpg,* and then click Open.

The BarracksWalls texture now has an image of the planking.

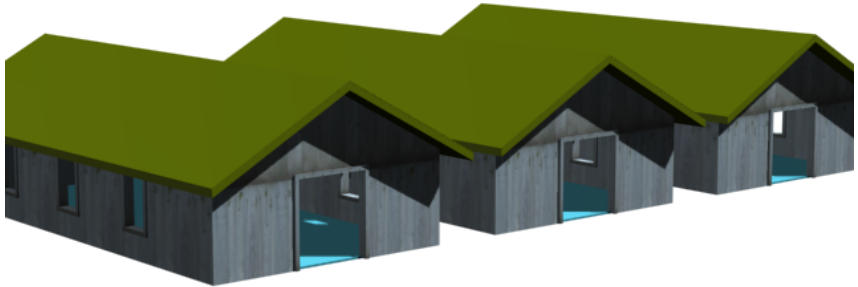
Planks texture for barracks walls

7 Drag the sample slot to the leftmost barrack walls.

All three barracks turn gray, to show the material has been applied.

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

The planks texture shows dirt at the bottom of the wall, but with default mapping coordinates, the dirt appears just above each doorway, instead.


Planks texture appears on the walls, but is not aligned correctly.

Use UVW Map to adjust the planks:

1 Select *Barracks01-Walls,* and then go to the Modify panel.

2 Use the Modifier List to apply a UVW Map modifier.

3 In the Parameters rollout > Mapping group, change the projection type to Box. Also set Length = Width = Height = **4.0m**.

Now the planking texture is correctly aligned with the walls.
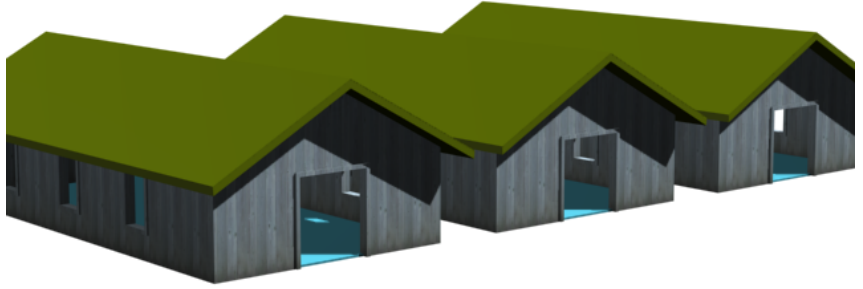
After applying UVW Map, the planks on the walls are aligned correctly.

Add a bump map to the planks material to improve realism:

If you take a closer look at the barracks, you can see that the texture looks good, but it also has a flat appearance, smoother than aged wood typically appears.
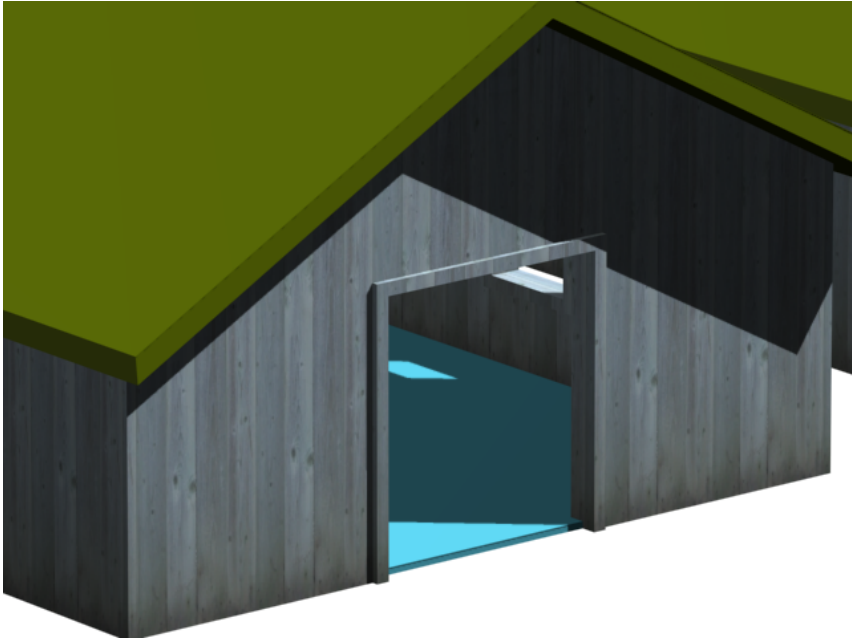
Barrack walls with a texture alone, and no bump mapping

You can improve the appearance of the plank walls by using *bump mapping*. Bump mapping makes an object appear to have a bumpy or irregular surface.

   1   In the Material Editor, make sure the sample slot for the BarracksWalls material is active.

   If it isn't, click it to make it active.

   2   If the rollouts area of the Material Editor displays map controls, click Go To Parent to go to the main material level.

   3   In the rollouts area of the Material Editor, open the Maps rollout.

   You might have to scroll down a bit to see the title bar of this rollout.

   4   In the Maps rollout, click the map button that on the left has the label "Bump" (at this point, the button itself is labeled "None").
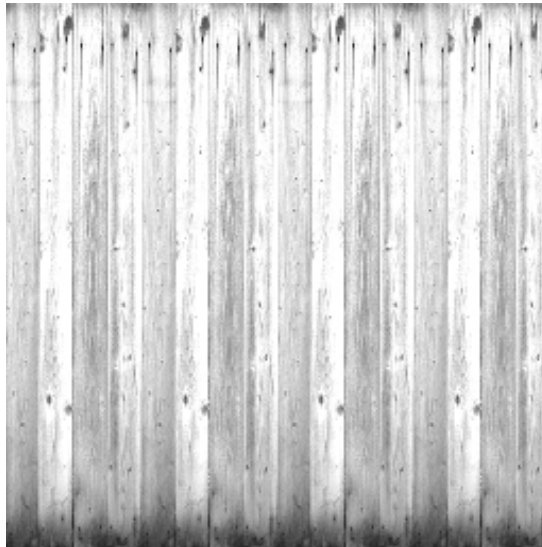
Bump map controls

Left: On/off toggle

Middle: Amount spinner

Right: Map button, which opens the Material/Map Browser

3ds Max displays the Material/Map Browser.

5 In the Browser's list of map types, double-click Bitmap. In the file dialog, choose *planks.bump.jpg,*, and then click Open.

This map is simply a black-and-white version of the *planks.bmp* map itself.

Black-and-white planks texture for bump mapping

Bump mapping uses intensities in the map to affect the surface of the material when you render it: white areas appear higher, and black areas appear lower. This is why the bitmap you use for bump mapping is often a black-and-white version of the map you use for texture.

6 Bump mapping isn't displayed in the viewports, so click Render Production to see the effect of the new map.
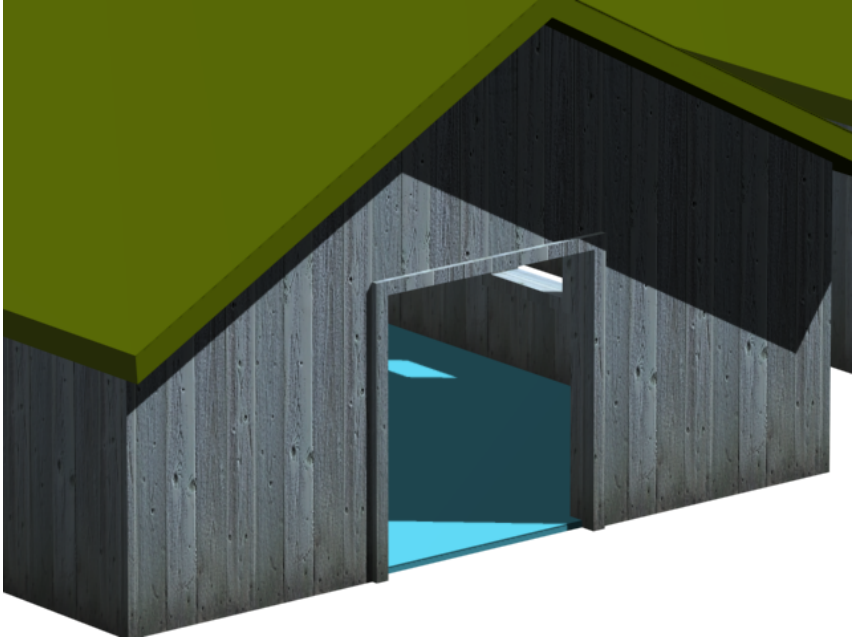
The barrack walls with bump mapping

To get an even more weathered look, you can increase the bump mapping Amount.

7 Click Go To Parent to go to the main material level, and then on the Maps rollout, increase the Bump Amount to **75**.

NOTE You might notice a couple of user-interface changes that happened when you assigned the map for bump mapping: a check box indicates that bump mapping is turned on, and the Bump button now shows the name of the map: *planks.bump.jpg*.
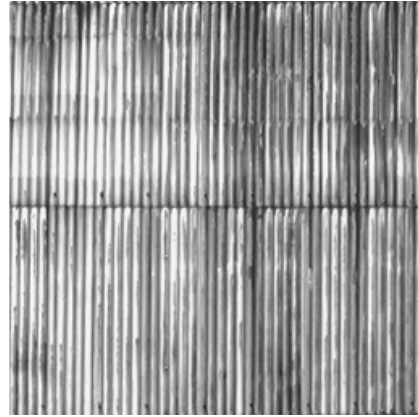
---

8 Click Render Production again.

Now the plans appear extremely weathered.
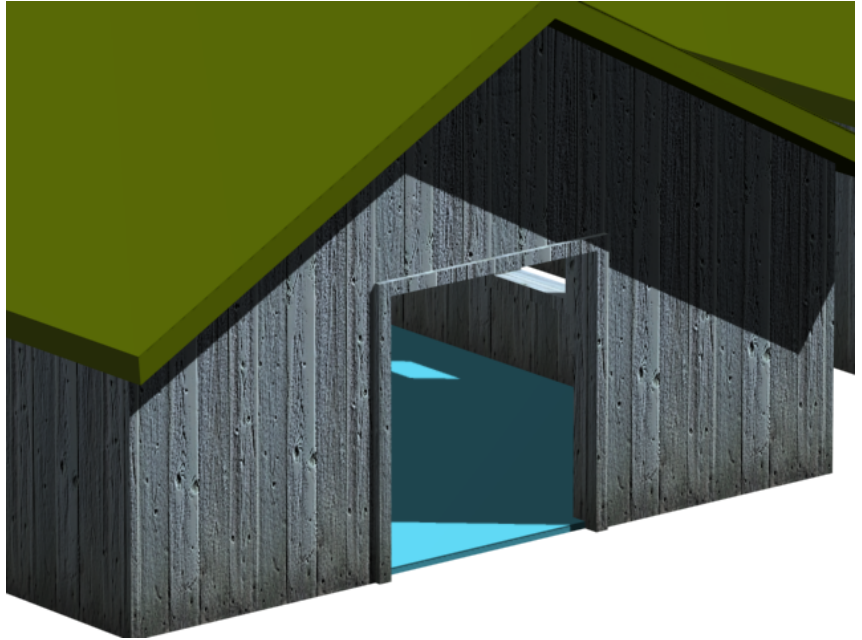
The barrack walls with increased bump mapping

Texture the barrack roofs:

You will use a similar method for the roofs and floors of the barracks.

Left: Texture map for the barrack roofs

Right: Bump map for the barrack roofs

1   Increase the Field-Of-View so you have a good view of the barrack roofs.

2   Select *Barracks01-Roof*.

3   Click the next unused sample slot to make it active, and name the material **BarracksRoof**.

4   In the Blinn Basic Parameters rollout, click the Diffuse map button. In the Browser, double-click Bitmap, and then choose *metal_plate.jpg* as the texture map.

5   Click Assign Material To Selection, and then click Show Standard Map In Viewport to turn it on.

   In the viewport, the map appears on the barrack roofs. However, it is oriented the wrong way: the corrugated plates should lie along the slope of each roof instead of lengthwise.

   TIP The map should be applied to all three roofs. If it isn't, Propagate Materials To Instances was not on. Choose Options > Propagate Materials To Instances to turn this option back on, and try applying the map again.

6 In the Material Editor > Coordinates rollout, change the W Angle to **90.0** degrees.

7 Go to the Modify panel, and use the Modifier List to apply a UVW Map modifier.

At first this appears to lose the W-Angle correction you just made, but changing the modifier alignment will fix that.

8 In the Parameters rollout > Alignment group, choose Y as the alignment axis.

Now the metal plates are oriented correctly again.

9 Also on the Alignment rollout, click Fit.

This sets the Width to its correct value of 7.04 meters.

10 In the Parameters rollout > Mapping group, change Length to also equal **7.04m**.

(Make sure you leave the UVW Map projection set to Planar, the default.)

The roof texture now has the correct size and orientation.

11 In the Material Editor, click Go To Parent, and then open the Maps rollout.

12 Assign *metal_plate.bump.jpg* as the Bump map.

13 In the Coordinates rollout, change the W Angle to **90.0** to match the texture.

14 Click Go To Parent again, and on the Maps rollout, increase the Bump Amount to **90**.

15 Click Render Production to see the effect.
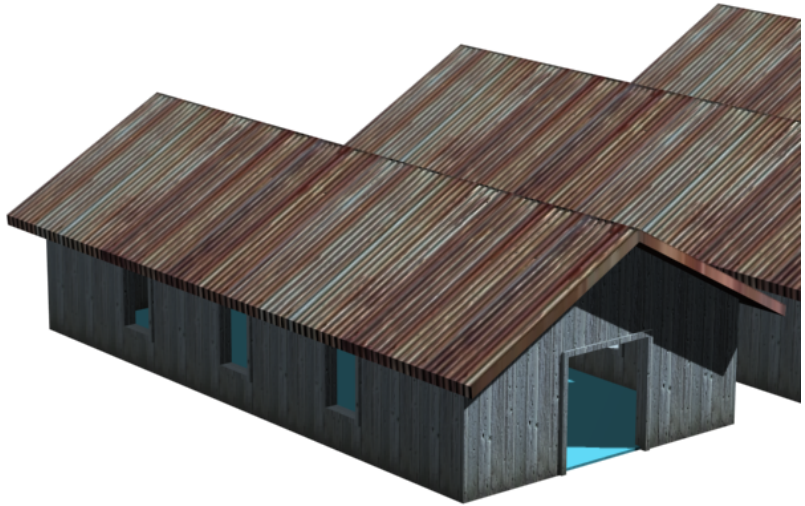
The barrack roofs with bump mapping

At the eaves of the roofs, the texture "slops over" a bit. In this scene, it isn't a problem because usually you will render the barracks from a distance. Of course, the bump mapping isn't too apparent at a distance, either. Whenever you texture a scene, bear in mind how much detail you want to use to make the scene believable.

Texture the barrack floors:

Texturing the barrack floors should now be a familiar process
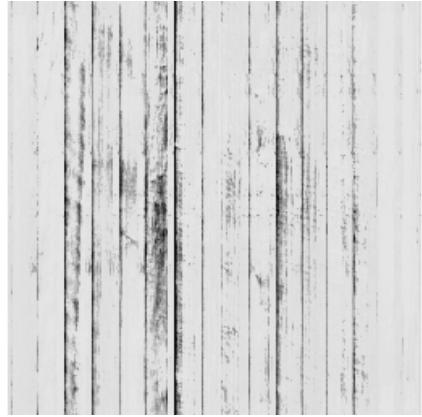
Left: Texture map for the barrack floors

Right: Bump map for the barrack floors

1 Select *Barracks01-Floor*.

2 Click the next unused sample slot to make it active, and name the material **BarrackFloors**.

3 Assign *wood_batten.jpg* as the texture (Diffuse) map.

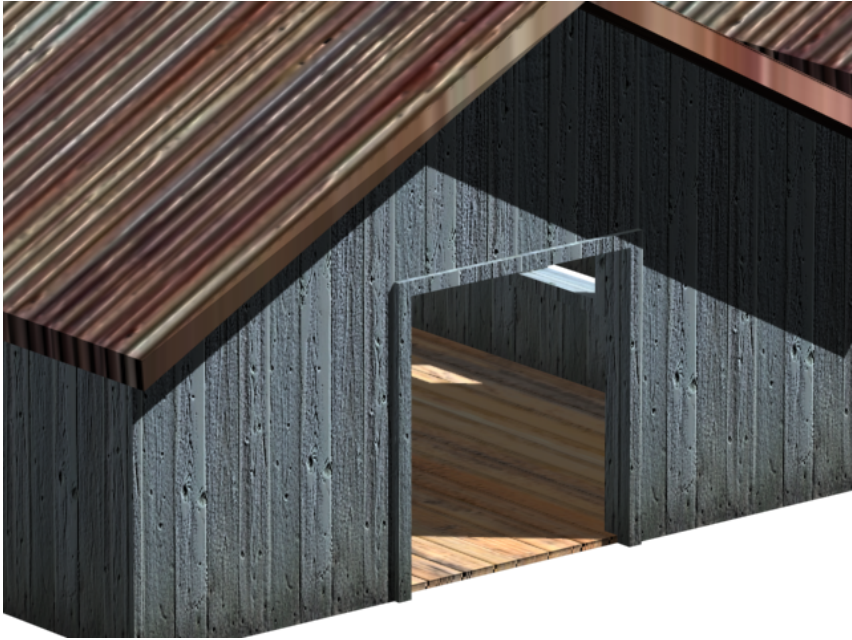**4** Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

5 Apply a UVW Map modifier. Leave the projection set to Planar. Set Length = Width = **4.0m**.

You don't need to adjust the orientation of the floorboards.

6 Assign *wood_batten_bump.jpg* as the Bump map, and increase its Amount to **90**.

Now the barracks are completely textured.

Close-up of one barrack with textures for roof, walls, and floor

Use the Barrack Materials for the Sentry Box

Now that you have textured the barracks, you can use the same materials for the sentry box. The trick is to use the same materials *and* the same UVW Map settings.

Change the view:

1   In the Warning: Isolated Selection dialog, click Exit Isolation Mode to return to a general view of the scene.

2   Click the Point Of View (POV) viewport label, and choose Cameras > Camera02.

    This gives you a view of the completed barracks, and the unfinished sentry box.

    TIP You might have to move the Material Editor to see the viewport label, or some of the geometry in the steps that follow.

The new view lets you see the roofs, walls, and floors of the completed barracks, and also the roof, walls, and floor of the sentry box, which doesn't yet have materials applied.
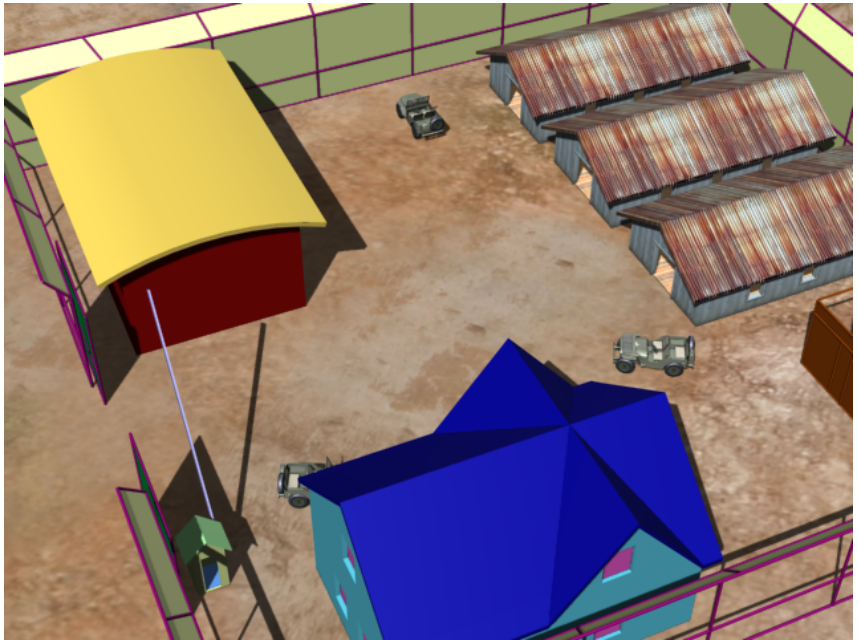
Camera02 view with finished barracks to the right, unfinished sentry box to the left.

3 Click the Point Of View (POV) viewport label, and choose Perspective.

Changing to a perspective view doesn't change what appears in the viewport, but in the perspective view, you can navigate without changing the camera settings.

Copy the barracks floor material:

1 Click one of the *Barracks0X-Floor* objects to select it.

2 Ctrl+drag the UVW Mapping entry in the floor object's modifier stack, and drop this modifier instance over the floor of the sentry box. (Before it has a material, the floor appears blue.)

The sentry box floor now has the correct mapping, but it still needs its material.

3 Drag the BarrackFloors material from the Material Editor to the sentry box floor.

Now the floor has both the material and the correct mapping.

Copy the roof and wall materials:

■ For the roof and walls of the sentry box, follow the same steps you did for the sentry box floor: first select a barracks roof or wall, Ctrl+drag UVW Mapping from the modifier to the corresponding sentry box object, then drag the appropriate material from the Material Editor and drop it on the roof or walls.
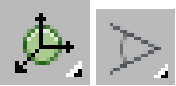

The sentry box with the same materials as the barracks

NOTE The order in which you apply the material and the mapping doesn't matter. The important thing is to assign the material *and* the UVW Mapping, so that the materials render correctly.

Create a new, 3D material for the sentry bar:

For the sentry bar, which blocks or permits vehicle access to the compound, you can use a simple material with a procedural map named Gradient Ramp.

1 On the main toolbar, open the Named Selection Sets drop-down list, and choose the *sentrybox* selection set.

   3ds Max selects the sentry box.

2 Right-click the viewport, and choose Isolate Selection from the quad menu.

3 Use Orbit and Field-Of-View to adjust the view so the sentry bar is clearly visible.

Isolated sentry box with a view of the bar

4 In the Material Editor, click the next unused sample slot to make it active, and name the new material **SentryBar**.

5 In the Material Editor > Blinn Basic Parameters rollout, click the Diffuse map button, then in the Material/Map Browser, double-click Gradient Ramp.

3ds Max assigns a Gradient Ramp as the map type. Gradient Ramp is a 3D procedural material like the Noise material you used for the generator casings.
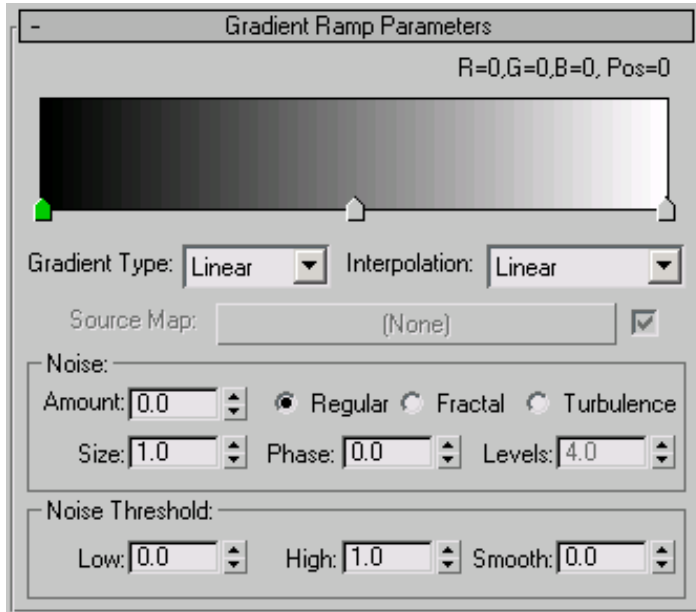
6 Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

7 In the Gradient Ramp Parameters rollout, change the Interpolation type to Solid.

The gradient display changes to two solid colors, one of them black.

8 Double-click the arrow-shaped slider at the middle of the gradient display. This slider controls the color to its right (you could use the first slider on the left to adjust the black color.)
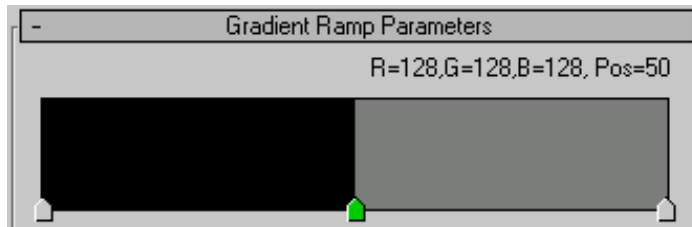
Gradient Ramp with solid colors

Double-click the middle slider (shown in green) to change the color to the right of the slider.

3ds Max displays a Color Selector.

9   In the Color Slider, change the second gradient color to orange: Red = **255**, Blue = **150**, Green = **0**.

10   Click OK to close the Color Selector.

11   In the Coordinates rollout, change the U Tiling value to **10.0**.

The material changes from two color areas to multiple stripes.

12   Also in the Coordinates rollout, change the W Angle value to **–2.5**.

Now the stripes have an angle to them.

Isolated sentry box with the completed sentry bar

View the entire scene again:

1   In the Warning: Isolated Selection dialog, click Exit Isolation Mode.

2   Click the viewport label and choose Cameras > Camera02.

3   Click the viewport label again and choose Perspective.

Save Your Work

■   Save the scene as **my_fieldhq_barracks.max**.

Using Opacity Mapping for the Fences

The fences are a bit of a special case, because the chain-link parts of them should be partially transparent. You accomplish this the way you did bump mapping: by the use of bitmaps.

Set up the lesson:

■ Continue from the previous lesson, or open *army_compound02.max.*

Select the fences:

➤ On the main toolbar, open the Named Selection Sets drop-down list, and choose the *fence* selection set.

This step is mainly to show you what and where the fences are. There is the main fence around the compound and the smaller fence that encloses the utility containers.

NOTE Incidentally, the main fence includes two gates, left and right. Each gate can move along its own local X axis to open or close the compound.

Use a basic material for the fence supports:

Each fence component, including the gates, actually includes two objects: a "structure" component for the fence's supportive piping, and a "wire" component for the actual chain link.

1 In the Material Editor, click the next unused sample slot to make it active, and name the material, **FenceSupport**.

2 In the Blinn Basic Parameters rollout, click the Diffuse color swatch to display the Color Selector, and then assign the material a light gray color: Red = Blue = Green = **188**.

3 Click OK to close the Color Selector.

4 Press H to display the Select From Scene dialog. Highlight the structure objects for all the fences: *Fence-Structure, Gate-left-structure, Gate-right-structure,* and *Fence-sml-Structure.* Click OK to select these four objects.

5 Click Assign Material To Selection.

Use a texture map for the chain link:

The chain link itself uses a bitmap with a chain-link pattern.

Chain-link texture for the fence

1   In the Material Editor, click the next unused sample slot to make it active, and name the new material **FenceChainLink**.

2   In the Shader Basic Parameters rollout, turn on 2-Sided.

3   In the Blinn Basic Parameters rollout, click the Diffuse map button. In the Browser, double-click Bitmap, and then in the file dialog, assign the bitmap *sitework.chainlink.jpg* as the diffuse map.

4   Press H to display the Select From Scene dialog. Highlight the wire objects for all the fences: *Fence-Wire, Gate-left-wire, Gate-right-wire,* and *Fence-sml-Wire.* Click OK to select these four objects.

5   Click Assign Material To Selection and then turn on Show Standard Map In Viewport.

The fence texture appears in viewports as a gray pattern on a black background. It isn't yet to scale, so you need to adjust it with UVW Map.

NOTE Because the mapping isn't yet right, some fence surfaces might appear gray even if you turned on 2-Sided. The UVW Map adjustments will fix this.

6 With all four objects still selected, go to the Modify panel and apply a UVW Map modifier.

7 Change the mapping projection type to Box, and then set Length = Width = Height = **0.5m**.

Now the mapping and the scale of the chain link are correct; but of course, the fences still appear to be solid objects.

Use the chain-link texture to create transparency and opacity:

Just as in bump mapping, where black areas of a map appear recessed and white areas appear prominent (with gray values having an intermediate effect), in opacity mapping, black areas appear transparent and white areas appear opaque (while gray values create some degree of translucency).

Because the chain-link map is already black-and-white, it should work effectively both as a texture and as an opacity map.

1 In the Material Editor, click Go To Parent if you are not already at the top material level, and then open the Maps rollout.

2 In the Maps rollout, drag the Diffuse Color map button to the Opacity map button, and then release the mouse.

3 3ds Max displays a Copy (Instance) Map dialog. Make sure you choose Instance, and then click OK.

(Also, leave the Opacity Value set to 100 percent.)

4 Click to turn on Show Standard Map In Viewport at the main material level.

Now, in the viewport, the chain-link portions of the fence appear partially transparent.
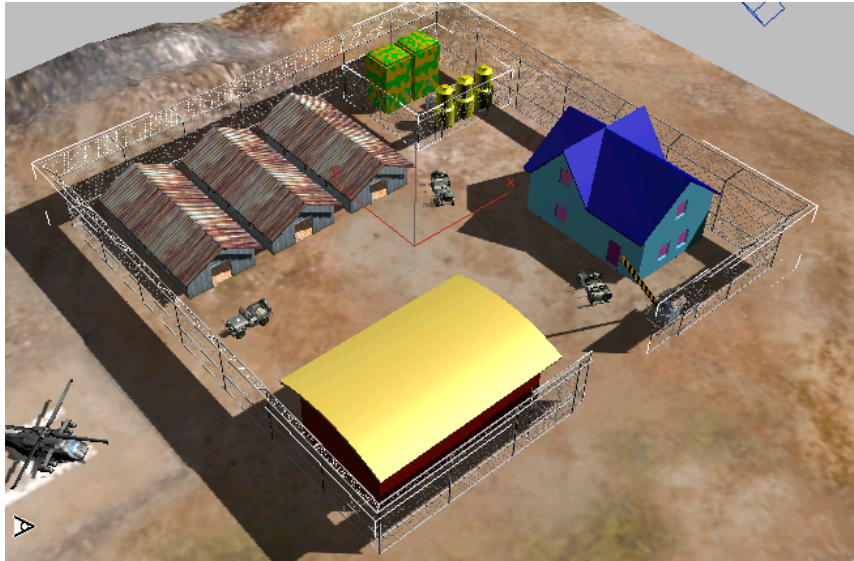
Viewport display of fence with opacity mapping

The one thing missing from this view is transparency in the fence shadows. Depending on your graphics card, viewports might not display opacity mapping just as they don't display bump mapping. If this is the case, you must render to see the effect of opacity mapping on shadows.

5 Click Render Production.

In the rendering, the shadows convincingly match the transparency of the fence.
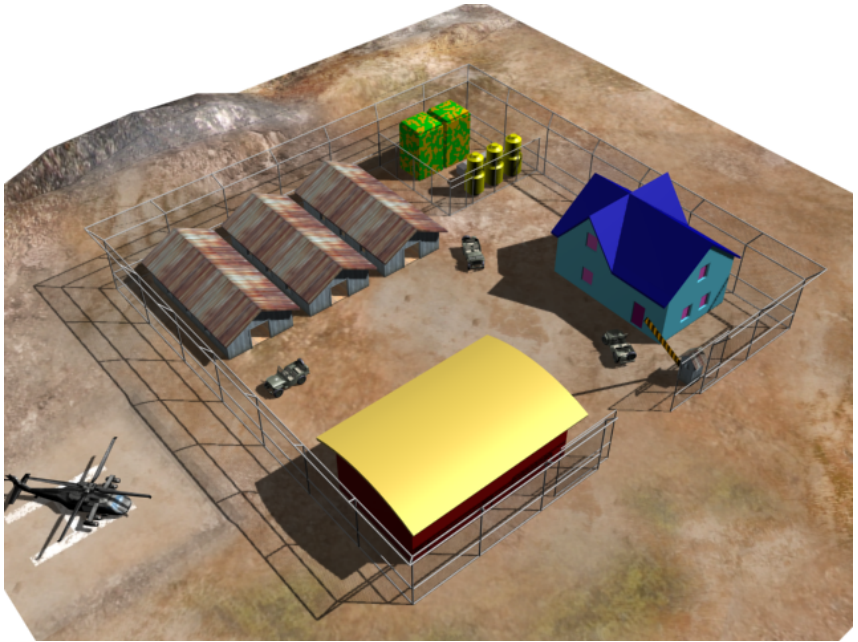
Rendering of opacity-mapped fence

Save your work:

■ Save the scene as **my_fieldhq_fencing.max**.

Texturing the House: More Mapping Techniques

The house is of stone, not of wood, but for the most part, the mapping techniques you use should be familiar from previous lessons. This lesson introduces a couple new techniques that can be useful.

Set up the lesson:

■ Continue from the previous lesson, or open *army_compound03.max*.

Texture the walls of the house:

The walls of the house present familiar techniques.

1 On the main toolbar, open the Named Selection Sets drop-down list, and choose the *house* selection set.

3ds Max selects the farm house.

2 Right-click and choose Isolate Selection from the quad menu.

3 Click an empty area of the viewport to clear the selection, and then click the *House* object to select the walls.

4 In the Material Editor, click the next unused sample slot, and name the new material **Masonry**.

5 In the Blinn Basic parameters rollout, click the Diffuse map button. Assign *masonry.fieldstone.jpg* as the texture map.
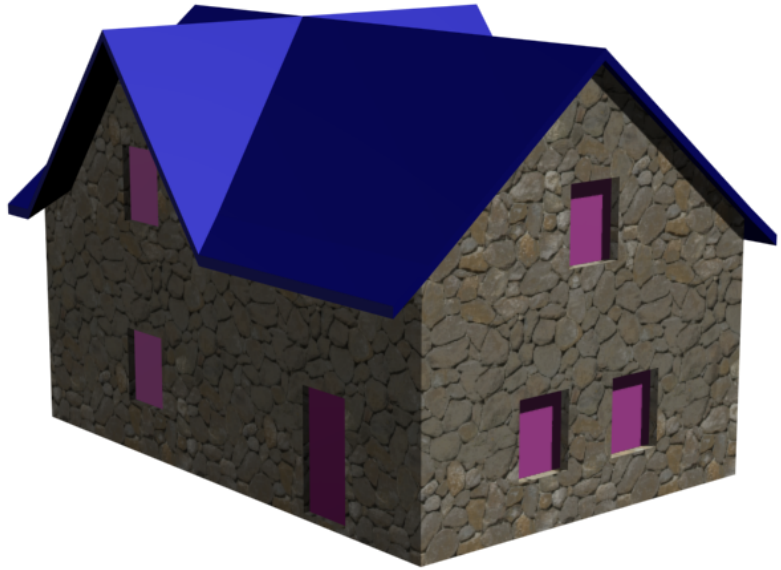

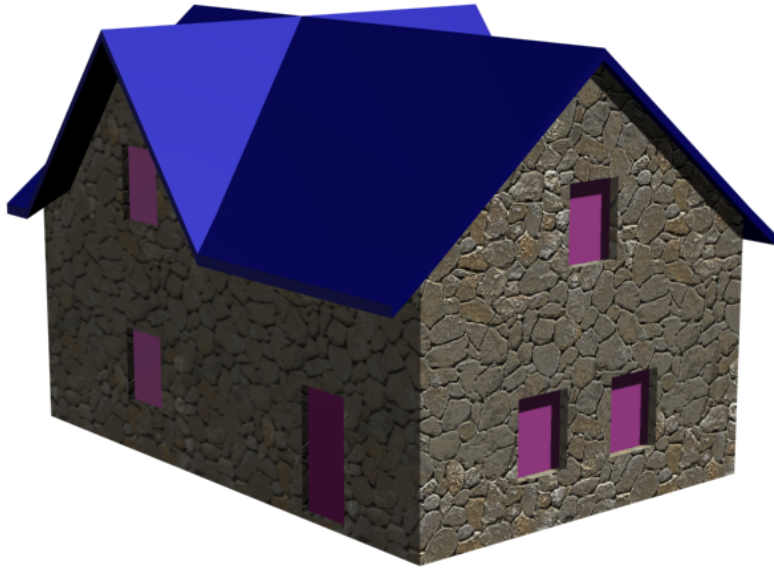**Texture for the house walls**

6 Click Go To Parent.

7   Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

8   Apply a UVW Map modifier to the house walls. Change the map projection to Box, and set Length = Width = Height = **5.0m**.

House walls with a masonry texture

9 The *masonry.fieldstone.jpg* bitmap is not strictly black-and-white, but it has enough of a black-and-white range to work well as its own bump map. In the Material Editor, open the Maps rollout. Drag the Diffuse Map button and drop it on the Bump Map button. Make sure you choose Instance, then increase the Bump Amount to **90**.

**House walls with both texture and bump mapping**

Use a Mapscaler to texture the roof:

The roof, on the other hand, presents a problem. With its two gables, there is no straightforward way to map the pattern using UVW Map.

Shingle texture for roof of house

With default mapping (you don't need to go through these steps, yourself), the texture doesn't look right. Even if you were to adjust the scale or change the projection type, the shingles wouldn't conform to the direction of the gables.
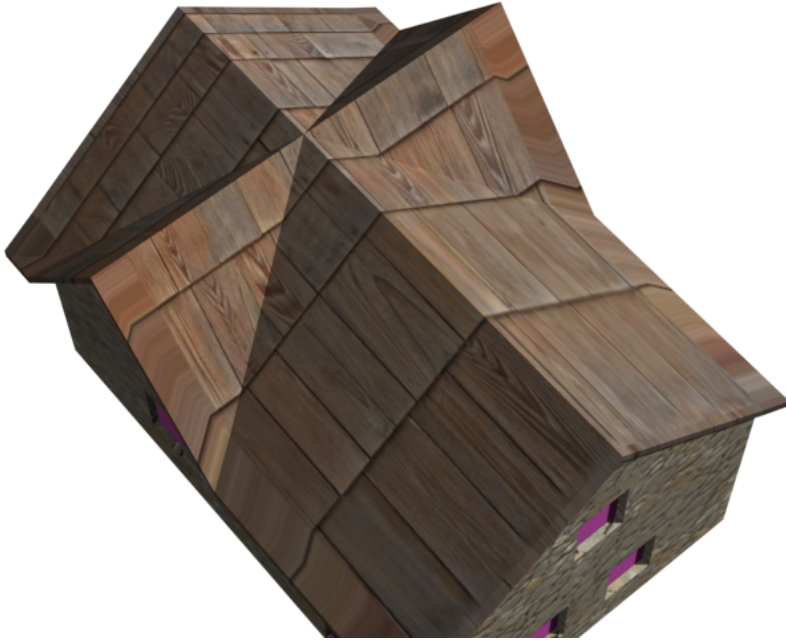
Default texture mapping for the roof

The solution is to use a different modifier, Mapscaler, to handle the texture mapping.

1 Select the *House-Roof* object.

2 In the Material Editor, click the next unused sample slot to make it active, and name the new material **HouseRoof**.

3 In the Blinn Basic Parameters rollout, click the Diffuse map button. Assign *shakes.weathered.jpg* as the texture map.
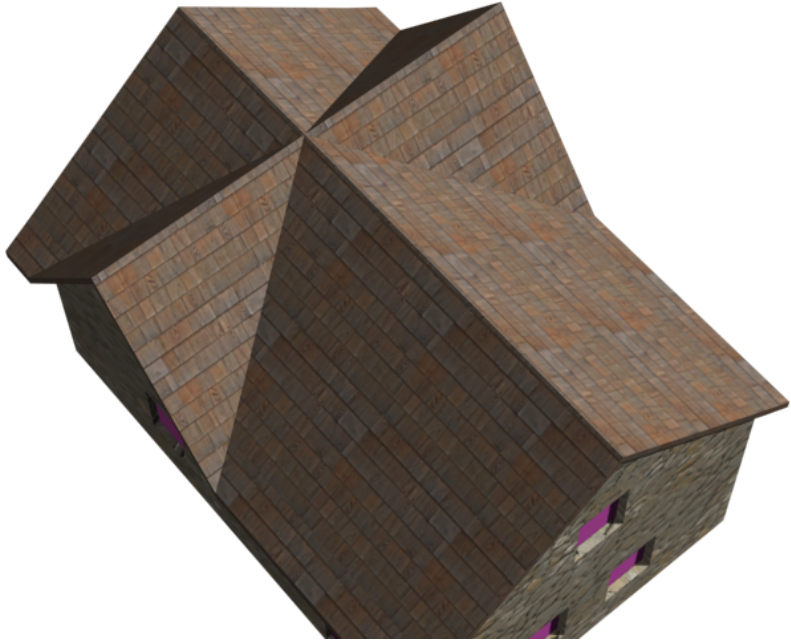
4 Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

5 Go to the Modify panel. From the Modifier List, choose MapScaler.

The MapScaler modifier maintains the map scale relative to the object (in this case, the roof), and by default it wraps the texture so the shingles follow the angles of the roof.

Shingle texture mapped using MapScaler

Texture the windows:

The windows use another small feature to ensure correct mapping.

1   In the Warning: Isolated Selection dialog, click Exit Isolation Mode.

2 ![icon] Click one of the purple windows to select it. The windows are a single grouped object named *Windows*.

3 Right-click the viewport, and choose Isolate Selection from the quad menu.

4 In the Material Editor, click the next unused sample slot to make it active, and name the new material **HouseWindows**.

5 In the Shader Basic Parameters rollout, click to turn on Face Map.

When Face Map is on, a texture map is applied to each face of an object individually.

6 In the Blinn Basic Parameters rollout, click the Diffuse map button. Assign *window.jpg* as the texture map.

Bitmap for the window texture

7 ![icons] Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

8 In the Warning: Isolated Selection dialog, click Exit Isolation Mode.

Texture the front door:

Like the walls, the front door of the house is a straightforward texture mapping.

1 Click to select the *Door* object.

2 In the Material Editor, click the next unused sample slot, and name the new material **WoodBoards** (you will use it elsewhere in the scene).

3 In the Blinn Basic parameters rollout, click the Diffuse map button. Assign *wood.boards.jpg* as the texture map.

Left: Texture for the wood boards that make the house door
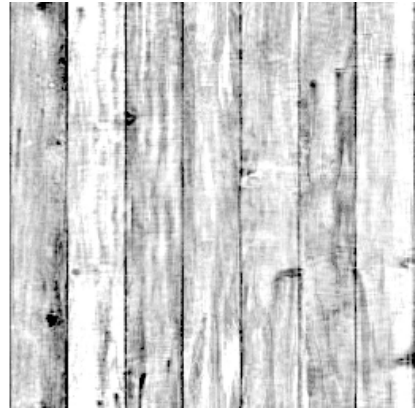
Right: Bump map for the wood boards

4 Click Go To Parent.

5 Click Assign Material To Selection, and then turn on Show Standard Map In Viewport.

6 Apply a UVW Map modifier to the door. Change the map projection to Box, and set Length = Width = Height = **4.0m**.

7 In the Material Editor, open the Maps rollout. Click the Bump Map button and assign *wood.boards.bump* as the bump map. Click Go To Parent, then increase the Bump Amount to **70**.

This completes your texturing of the house.

The house with all its textures

Save your work:

■ Save the scene as **my_fieldhq_farmhouse.max**.

Mapping the Barn

The army compound scene is nearly complete. The walls and doors of the barn use the same material you just created for the door, while the floor of the barn is the same as the barracks floors. The only difference is the roof of

the barn: this also uses the WoodBoards material, but with a slightly different mapping.

Set up the lesson:

■ Continue from the previous lesson, or open *army_compound04.max*.

Use the front-door texture for the walls and doors of the barn:

1 Click the Perspective viewport label, and choose Cameras > Camera03. Camera03 shows a view of the barn.

2 Click the viewport label again, and choose Perspective, so any navigation you do won't change the camera position or settings.

3 From the Material Editor, drag the WoodBoards material onto the barn walls and barn doors: the objects *Barn, Barn-Door-right,* and *Barn-Door-left*.

4 Press H to display the Select From Scene dialog. Select the *Door* object, then Ctrl+drag its UVW Mapping from the modifier stack to the barn walls and doors.

Use the barracks floor material for the floor of the barn:

1 From the Material Editor, drag the BarrackFloors material onto the barn floor.

2 Press H to display the Select From Scene dialog. Select one of the barracks floor objects, then Ctrl+drag its UVW Mapping from the modifier stack to the barn floor.

Texture the roof of the barn:

1 From the Material Editor, drag the WoodBoards material onto the barn roof.
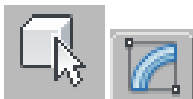
2 Select the barn roof and apply a UVW Map modifier to the it. Leave the map projection set to Planar. In the Alignment group, change the alignment axis to Y. In the Mapping group, change Length = Width = **4.0m**.

Now the army compound scene is completely textured.

Render the completed scene:

1 Right-click the viewport label and choose Cameras > Camera01.

2 Click Render Production to view the final results.

The fully textured field headquarters

Save your work:

■ Save the scene as **my_fieldhq_finished.max**.
You can see a version of the finished scene in
army_compound_completed.max.

Summary

This tutorial has introduced a variety of methods for applying materials to objects. Among the methods shown were:

■ Applying a basic material to change an object's color or shininess (the oil tanks and the fence piping)

■ Applying a 3D procedural map to create a patterned material (the generators and the sentry bar)

■ Applying a Diffuse or "texture" map to give an object a photorealistic pattern (the ammunition canister, the terrain, and almost all of the building surfaces)

■ Using the UVW Map modifier to control the projection, orientation, and scale of texture mapping
We also showed how to copy UVW Map from one object to another when the objects share the same material

■ Using bump mapping to give a 3D appearance to a textured material (most of the materials on the buildings)

■ Using opacity mapping to make a material partially transparent (the chain-link fence)

■ Using the object-space Mapscaler modifier to project a map onto a complicated shape (the roof of the house)

What About the Vehicle Textures?

The jeeps and helicopter were already textured when you began working on the army compound scene. If you look at their texture maps, they appear to be a patchwork of different elements.

Left: Texture map for the helicopter
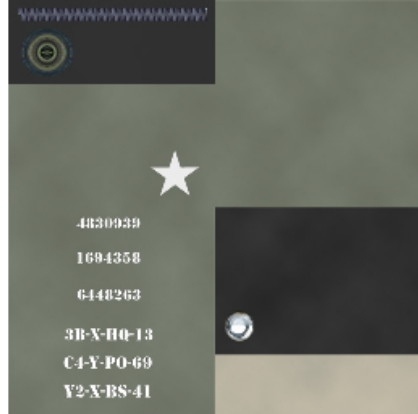
Right: Texture map for the jeeps

A single bitmap can provide the texture for a complicated object, provided you control its texture coordinates with a modifier called Unwrap UVW. This is the subject of the next tutorial, Managing Texture Coordinates on page 1112.