Autodesk®
3ds Max® 2019
Fundamentals

Visit the following websites to learn more about this book:
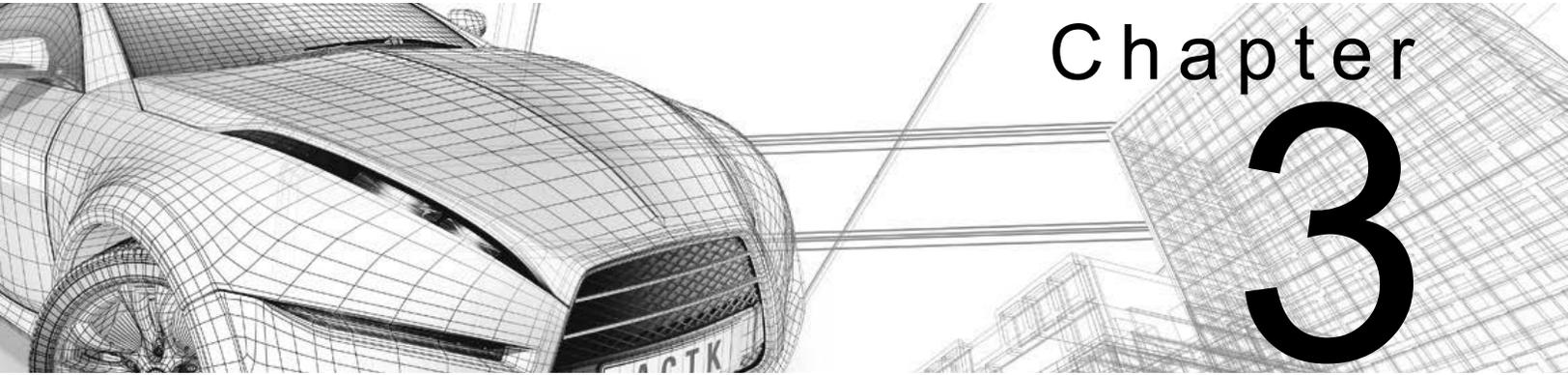
Chapter
3

Assembling Project Files

The files used in the Autodesk® 3ds Max® software can be modeled directly in the software, referenced by linking, or directly imported from another source. Linking files enables you to incorporate objects or other scene files into the current scene by externally referencing them. Once referenced, the connection between the two files can be maintained. If files are imported, they are merged with the project and no link is established. Understanding the benefits and drawbacks of using external data helps you decide how to best reference it in a project.

Learning Objectives in this Chapter

- Understand the difference between File Linking and File Importing, and edit the linked data files.
- Combine entities from .DWG, .DXF, .FBX, and .RVT files into an active Autodesk 3ds Max scene.
- Understand how to link AutoCAD® DWG, DXF, generic FBX files, and Autodesk® Revit® RVT/FBX files.
- Create and modify presets.
- Incorporate objects or other scene files into the current scene by externally referencing them.
- Manage data using the asset tracking systems.

3.1 Data Linking and Importing

Although the Autodesk 3ds Max software has a robust 2D and 3D modeling system, it might be efficient to link or import some or all of the design data from other Autodesk software, such as AutoCAD®, Autodesk® Revit® Architecture, AutoCAD® Architecture, or Autodesk® Inventor®.

Linking vs. Importing

You can link or import files using the **File Link** and **Import** tools. You can link files such as .DWG, .DXF, .FBX, and .RVT, and import files such as Autodesk® Inventor® (.IPT, .IAM), Autodesk® Alias® .Wire, LandXML and DEM data files, and Adobe Illustrator (.AI).

- Linked geometry differs from imported geometry in that it remains connected to the source file. If the source file is edited, the Autodesk 3ds Max Scene can be updated to show those changes. Imported geometry maintains no connection to the source file.

- If a source .DWG, .DXF, .FBX, or .RVT file is likely to change (or you would prefer to make changes in the .DWG, .DXF, .FBX, or .RVT directly), then using **File Linking** might be the best way to incorporate this data into the Autodesk 3ds Max software.

- **Importing** can be used as a faster alternative to linking to bring large amounts of data into the software. Complex geometry might be faster to reimport than to update through a file link.

- File links and imports are launched from the **File>Import** in the Menu bar, as shown in Figure 3–1.
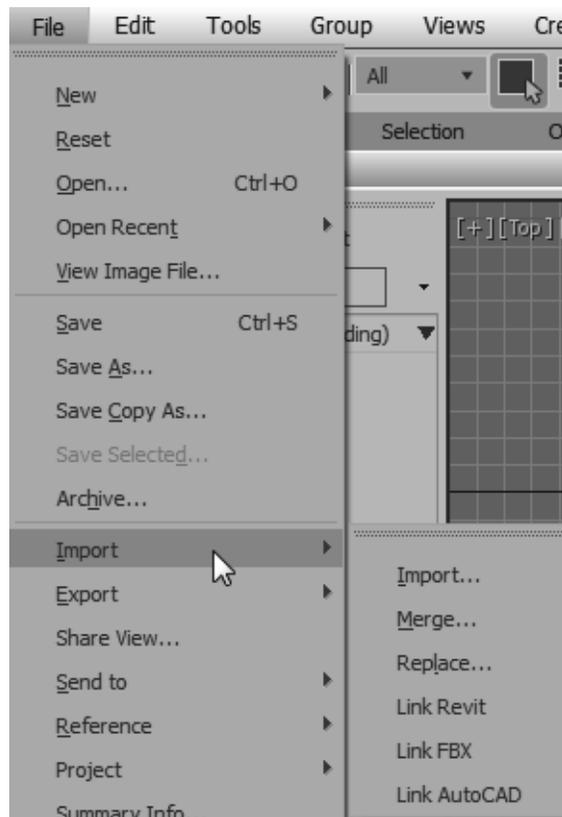
Figure 3–1

Editing Linked Data

- Linked geometry can be edited but not directly deleted from a scene file. Alternatively, the layer on which the objects are placed might be ignored during a reload, or set to **Hide** in the Layer Explorer.

- Edits applied to linked geometry (such as through modifiers) are reapplied after a link is updated. Some complex modifications might not apply as expected, so you should always review your geometry carefully after a link is updated.

- Links to drawing files are not bi-directional, so that changes you make to the data in the Autodesk 3ds Max software do not update the original .DWG, .FBX, .DXF, or .RVT file.

- In linked files that are bound, the geometry stays in the scene file as-is, but the connection to the source file is dropped.

Importing

You can export an .FBX file from the Autodesk Revit software and import it in Autodesk 3ds Max software. The FBX importer is an independent plug-in that is frequently updated. In the FBX Import dialog box, use **Web Update** to check for web updates, download the latest updates, and install them. Close 3ds Max when you do the install.

Merging Autodesk 3ds Max Scene Files

Objects already saved in Autodesk 3ds Max scenes (.MAX files) are imported into the current scene using the **Merge** option (**File>Import>Merge**). Merging files is a one-directional transfer that does not maintain any connection between the two files. Using the **Merge** option, you can either load a few objects from a scene or you can load a complete scene into the current one.

Civil View

Civil View enables you to import 3D geometry from Civil/Survey products, such as AutoCAD Civil 3D, Land Desktop, and other formats such as BentleyMX files.

Initializing Civil View

You only have to initialize Civil View once.

To use Civil View the first time, you are required to initialize it by selecting **Civil View>Initialize Civil View**. In the Initialize Autodesk Civil View dialog box that opens (as shown in Figure 3–2), you can set the *System Units* and the *Country Resource Kit* based on the civil project that you will be opening. After initializing the Civil View, you are required to exit and restart the Autodesk 3ds Max software.
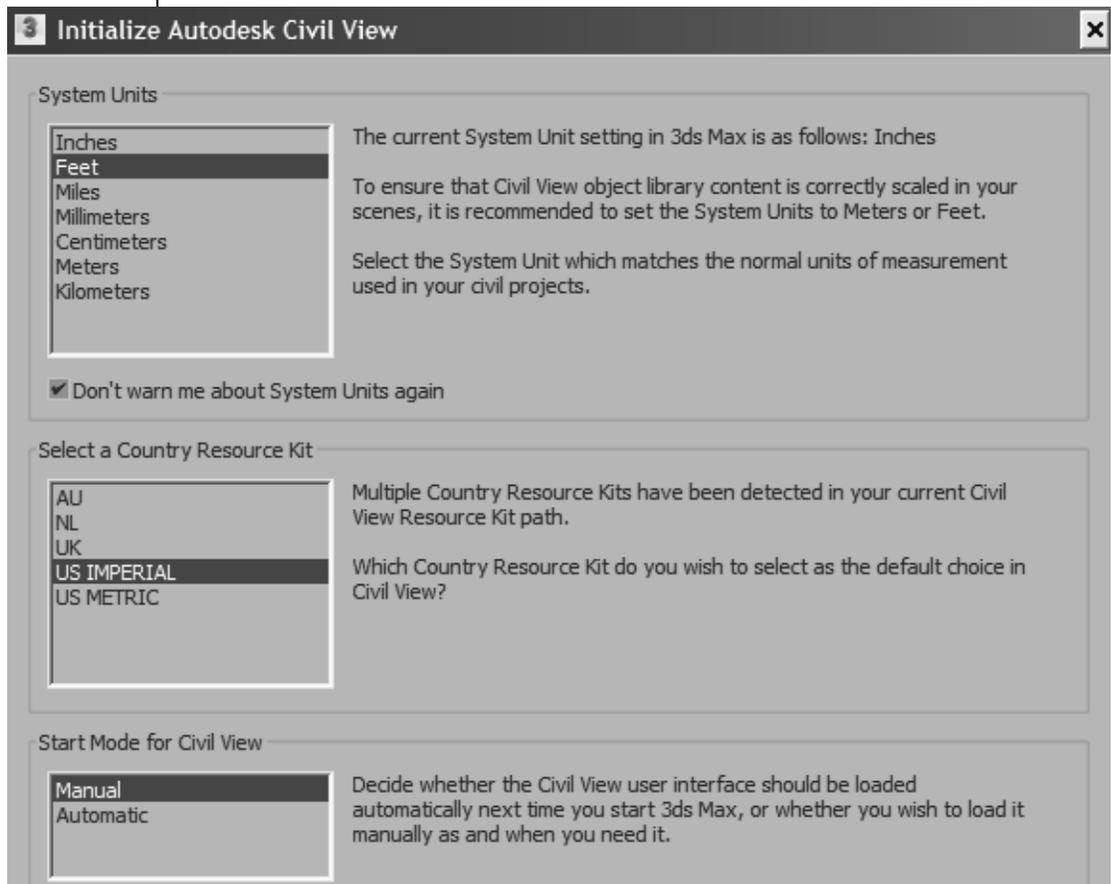
Figure 3–2

Although Civil View is initialized, if the *Start Mode for Civil View* is set to **Manual**, next time you launch the Autodesk 3ds Max software, you will still be required to start Civil View. You can change this setting in the Civil View Preferences dialog box, which can be accessed by selecting **Civil View>Civil View>Preferences**, in the *General* tab of the dialog box, selecting **Automatically start Civil View?**, as shown in Figure 3–3.
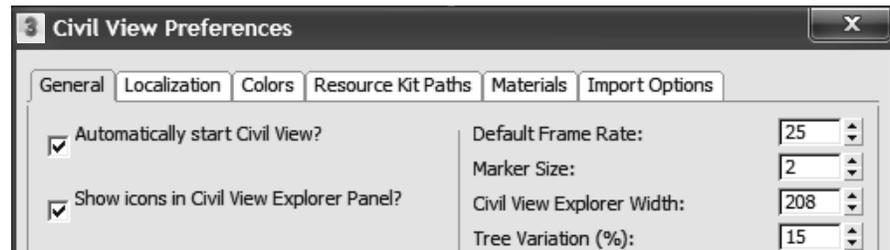

Figure 3–3

Using Civil View

*   You can open the interface from the Menu bar by selecting **Civil View>Start Civil View**.

*   Once Civil View is started, you can import the required geometry by selecting **Civil View>Geometry Import** as shown in Figure 3–4.
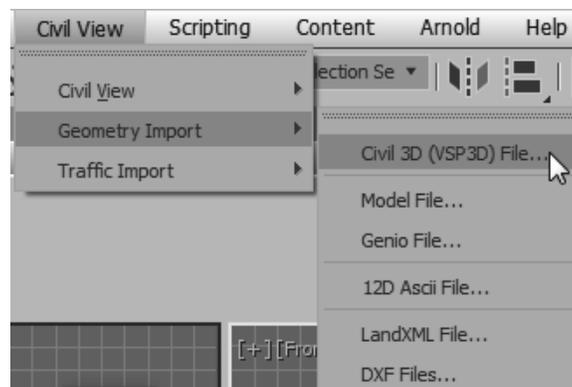

Figure 3–4

Civil View Explorer

You can use the Civil View Explorer (shown in Figure 3–5) to access the visualization aspects of the objects in the scene. It also contains all the editing commands for the selected objects. The objects that are imported retain a link to the original source file. The civil View visualization model retains a link to the original source file and updates the model whenever a design changes.
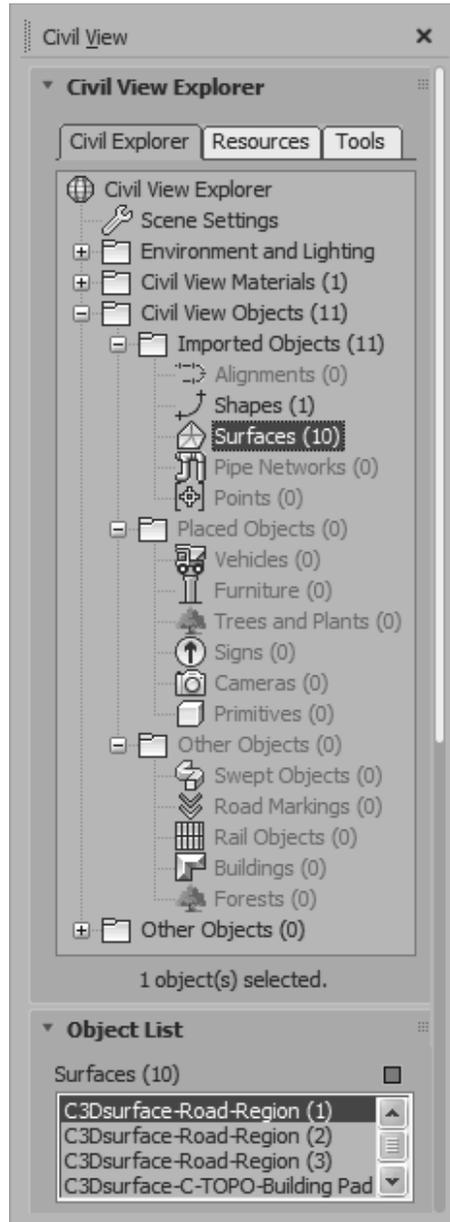
Figure 3–5

Practice 3a

Ground Surfaces using Civil View

Practice Objective

- Open a Civil 3D data file in a scene file.

In this practice, you will open a .VSP3D file for importing ground surfaces using Civil View. You will then modify the material assignment for various ground surfaces using the Civil View Explorer.

You must set the paths to locate the External files and Xrefs used in the practice. If you have not done this already, return to Chapter 1 and complete Task 1 to Task 3 in *Practice 1a: Organizing Folders and Working with the Interface*. You only have to set the user paths once.

Task 1 - Initialize Civil View.

It is recommended that you import 3D ground surfaces from Civil/Survey products, such as AutoCAD Civil 3D or Land Desktop using the vsp3d data format.

You have to initialize Civil View once.

1. In the menu bar, select **Civil View>Initialize Civil View**. If you have already initialized Civil View, go to Step 5.

2. In the Initialize Autodesk Civil View dialog box, set the *System Units* to **Feet** because the civil project that you will be opening uses Feet as its unit of measurement. Verify that **Don't warn me about System Units again** is selected.

3. In the *Select a Country Resource Kit* area, select **US IMPERIAL** and verify that *Start Mode for Civil View* is set to **Manual**. Click **OK**. In the Information dialog box, click **OK**.

4. Exit and then restart the Autodesk 3ds Max software.

5. Select **Civil View>Start Civil View** to start Civil View.

Task 2 - Opening a Civil 3D File.

1. Open **Civil Base XRef.max** from the *...\scenes* folder. If a Mismatch dialog box opens, click **OK** to accept the default values. If prompted again, click **OK**. This is an empty scene in which the System Unit Scale has been set to **1 Unit=1.0 Feet**.

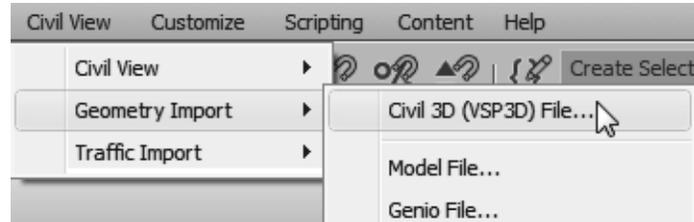2. In the menu bar, select C**ivil View>Geometry Import>Civil 3D (VSP 3D) File**, as shown in Figure 3–6.

Figure 3–6

3. In the Civil 3D Import Panel dialog box, click **Open**. In the Select a VSP3D File dialog box, browse to the *...\import* folder in the practice files folder and open **Civil surfaces.vsp3d**.

The objects listed include surfaces, site/ grading objects, corridors, (surfaces, baselines, featurelines etc.),and point groups, etc.

4. In the Civil 3D Import Panel dialog box, a list of objects that are in the AutoCAD Civil 3D file are listed. In the left pane, select **Surfaces [9]** to display all of the surfaces in the right pane. Select **Building Pad**, hold <Shift>, and select **Parking Lot Surface** to highlight the first seven surfaces. Select the checkbox for **Building Pad** to select all seven highlighted surfaces, as shown in Figure 3–7. You can select them individually as well.
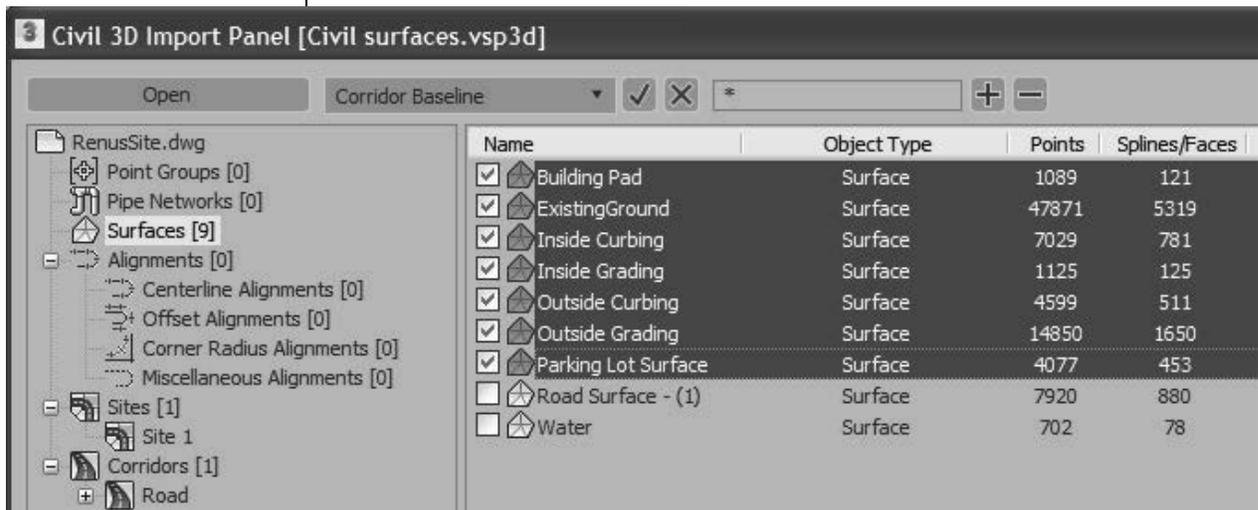

Figure 3–7

5. You will select the corridor surfaces and the baseline. In the left pane, select **Corridors [1]** and in the right pane, click in the checkboxes for **PrimaryAccess**, **Region(1)**, **Region(2)**, and **Region(3)**, as shown in Figure 3–8.
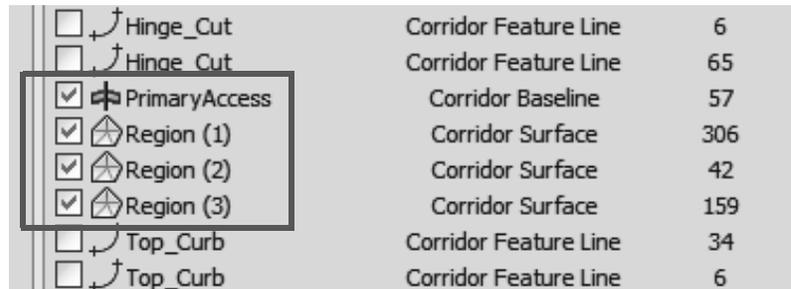

☐ Hinge_Cut	Corridor Feature Line	6
☐ Hinge_Cut	Corridor Feature Line	65
☑ PrimaryAccess	Corridor Baseline	57
☑ Region (1)	Corridor Surface	306
☑ Region (2)	Corridor Surface	42
☑ Region (3)	Corridor Surface	159
☐ Top_Curb	Corridor Feature Line	34
☐ Top_Curb	Corridor Feature Line	6

Figure 3–8

6. Click **OK**. In the Civil View Information, click **Yes** to accept the global shift values.

7. Click **Yes** to proceed without a feature interpretation style.

It takes a few minutes to load the file.

8. The ground surfaces, building pad, corridor, and parking lot display in all of the viewports. If they are not, click 🔲 (Zoom Extents All). In the Perspective viewport, note that only the corridor displays the right surface material but the rest of the surfaces display a checkerboard material.

*Right-click on the title bar and select **Dock> Left**.*

9. In the menu bar, select **Civil View>Civil View>Civil View Explorer** to open the Civil & View Explorer. Dock it along the left side of the screen.

Task 3 - Modify Material Assignment.

1. Verify that the *Civil Explorer* tab is selected. Expand **Civil View Objects>Imported Objects**, if not already expanded. Select **Surfaces** and note that the corridor is selected in the viewports. The *Object List* rollout opens with all of the surfaces listed, as shown in Figure 3–9.
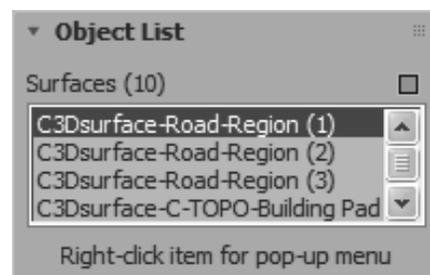

▾ **Object List**

Surfaces (10)   ☐

C3Dsurface-Road-Region (1)
C3Dsurface-Road-Region (2)
C3Dsurface-Road-Region (3)
C3Dsurface-C-TOPO-Building Pad

Right-click item for pop-up menu

Figure 3–9

A material is not required for the first three corridor regions.

The complete list might not be visible in the Explorer. Hover the cursor in empty space in the information area until it displays as a Pan (hand) cursor. Slide up or down, using the hand cursor or the scroll button to display all of the information.

2. Scroll or pan down to display the rest of parameters, as shown in Figure 3–10.

3. In the *Object List* rollout, select **C3Dsurface-C-TOPO-Building Pad**.

4. In the *Surface Parameters* rollout, select the *Statistics* tab and note that in the *Face Selection Sets*, in *By Material ID*, **[31] Ground Type 4** has been assigned, as shown in Figure 3–11.
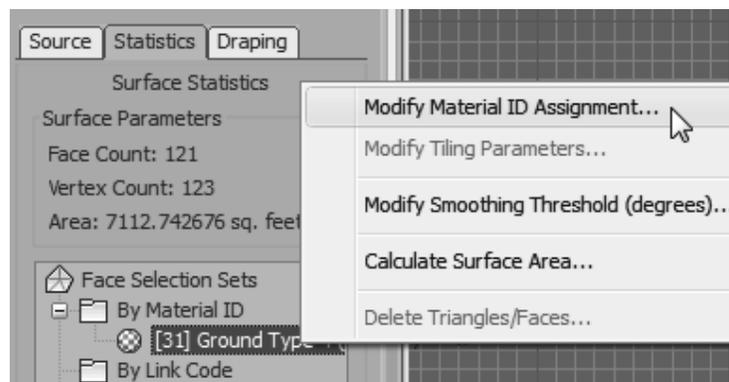

Figure 3–10
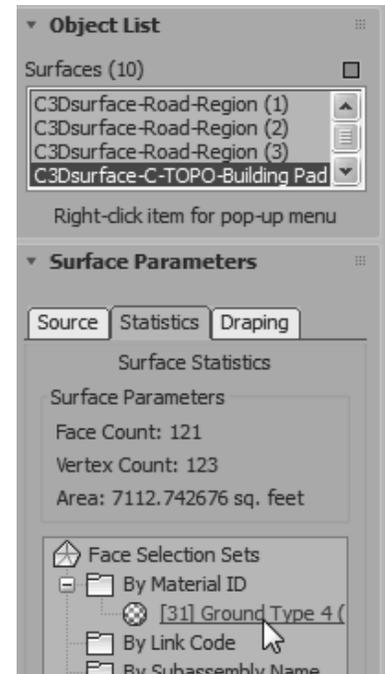
Figure 3–11

5. Right-click on **[31] Ground Type 4** and select **Modify Material ID Assignment**, as shown in Figure 3–12.

Figure 3–12

6. Click **Yes** in the Warning dialog box.

7. In the Modify material channel dialog box, select [**22**] **Concrete Type 1** as shown in Figure 3–13. Click **OK**.
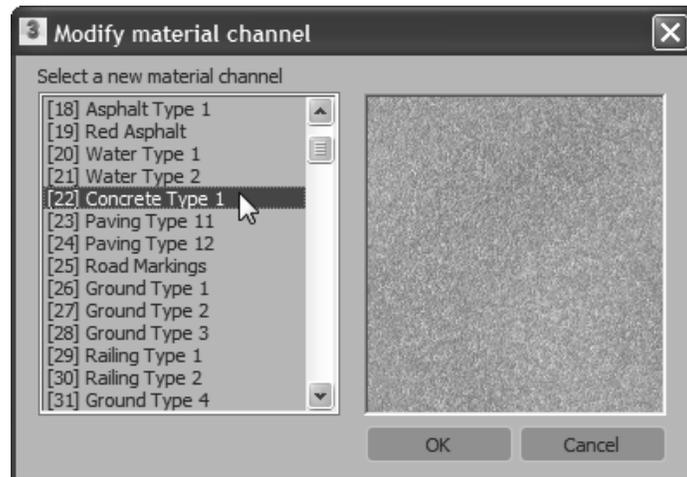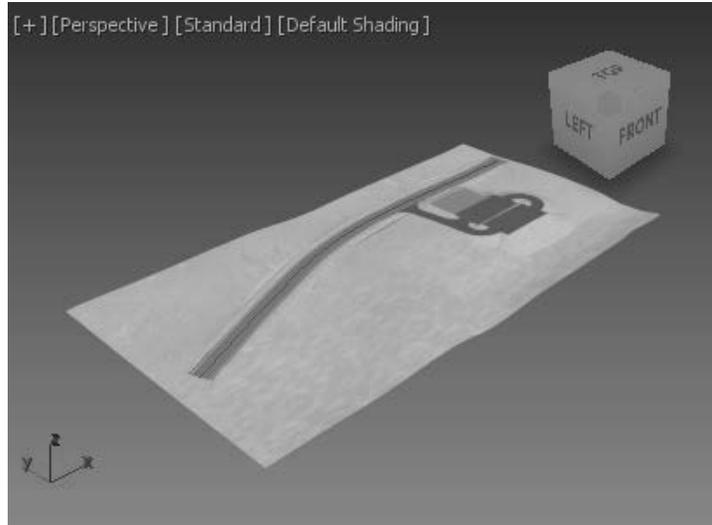

Figure 3–13

8. In the **Perspective** viewport, use **Zoom** and **Pan** to zoom into the building pad. Note how the new material is applied.

9. Select **Surfaces** again and in the *Object List* rollout, select **C3Dsurface-C-TOPO-Existing Ground**. In the *Surface Parameters* rollout, in the *Statistics* tab, right-click on [**31**] **Ground Type 4**, and select **Modify Material ID Assignment**. In the Warning dialog box, click **Yes**.

10. In the Modify material channel dialog box, select [**35**] **Ground Type 6** and click **OK**. In the **Perspective** viewport, note that the new ground type material is applied to the ground surface.

A material is not required for the first three corridor regions.

11. Similarly, for the other surfaces, apply the material types as follows:
    - C3Dsurface-C-TOPO-Inside Curbing:
      [**38**] **Concrete Type 3**
    - C3Dsurface-C-TOPO-Inside Grading:
      [**35**] **Ground Type 6**
    - C3Dsurface-C-TOPO-Outside Curbing:
      [**38**] **Concrete Type 3**
    - C3Dsurface-C-TOPO-Outside Grading:
      [**35**] **Ground Type 6**
    - C3Dsurface-C-TOPO-Parking Lot Surface:
      [**39**] **Asphalt Type 4**

You might need to undock the explorer first to close it.

12. Close the Civil View Explorer.

13. Click ![icon] (Zoom Extents All). In the **Perspective** view, the scene displays as shown in Figure 3–14.

Figure 3–14

14. Save your work as **MyCivil Base XRef.max**.

3.2 Linking Files

File Linking is used to incorporate data from other Autodesk software such as Autodesk Revit and AutoCAD into the Autodesk 3ds Max scene. If the incorporated data is changed in the originating software, the file link enables you to update those changes in the 3ds Max scene. File linking is useful when you are working on a visualization project and know that all design decisions have not yet been made. You can link files using the Manage Links dialog box that can be opened as follows:

- **File>Import>Link Revit**: Links the .RVT files from the Autodesk Revit Architecture software.

- **File>Import>Link FBX**: Links the .FBX files that can be created in the Autodesk Revit, Autodesk MotionBuilder, Autodesk Maya, and Autodesk Mudbox software.

- **File>Import>Link AutoCAD**: Links the .DWG and .DXF files from the AutoCAD software.

- You can also open the Manage Links dialog box outside of the Link commands (**File>Reference> Manage Links**) and modify the Link settings.

Linking DWG Files

In CAD data files it is common to have large numbers of objects. When linking or importing AutoCAD .DWG or .DXF files, it is efficient to combine multiple, related objects together into a single Autodesk 3ds Max object to control their display and visibility.

- When multiple entities are combined into compound Autodesk 3ds Max shapes (2D objects) and meshes (3D objects), you can still access and adjust the original geometry using the Sub-object level modifiers, such as **Edit Spline**, **Edit Mesh**, and **Edit Poly**.

- Once multiple entities are combined, you can detach objects or portions of an objects to form new ones for individual editing control.

Linking FBX and RVT Files

The Autodesk Revit and Autodesk 3ds Max software share the Autodesk Material Library materials.

- The .RVT and .FBX file format supports the import of photometric lights, both interior artificial lights and exterior daylight systems.

- Detailed .RVT and .FBX file formats can become very large in size and importing them as single files cannot be accomplished. In such cases, use a section box in the **3D View** in the Autodesk Revit software to limit the amount of the scene you are exporting.

Manage Links Options

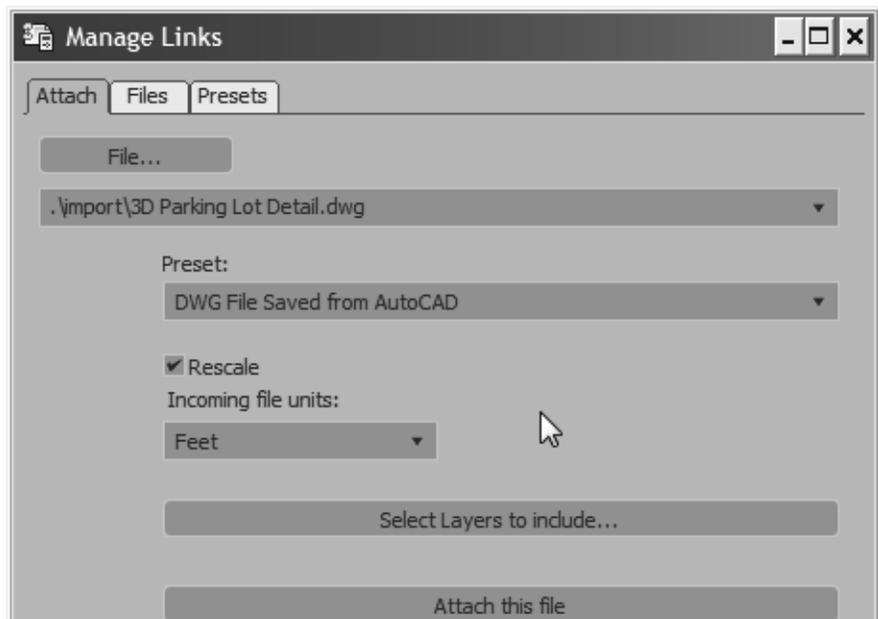The Manage Links dialog box (shown in Figure 3–15) contains the following tabs:

Figure 3–15

Attach Tab

The options available in the *Attach* tab are described as follows:

- **File...** enables you to open a file (.DWG, .DXF, .FBX, or .RVT) for linking. The selected filename and its path display in the File drop-down list. If the file that you selected is a .RVT file with more than one camera view, you are prompted to select a camera view.

- The Preset drop-down list enables you to select the preset settings. The Presets listed here can be created or modified using the *Presets* tab. You can set the units by selecting them in the Incoming file units drop-down list.

- **Select Layers to include** is only available with .DWG and .DXF file formats and enables you to select the layers that you want included with the drawing file.

- **Attach this file** links the selected file with the specified preset settings to the current Autodesk 3ds Max scene.

Files Tab

The *Files* tab displays a list of files that are linked to the current scene with a specific status icon.

- If the linked file has been modified, displays with the linked filename.

- indicates that the linked file is unchanged and does not have any errors.

- When a file is highlighted, the following options are available:

Reload...	When the original file has been changed, it displays the changes in the current scene.
Detach...	Use when you want to remove the link with the original file. This option removes all geometry associated with the linked file.
Bind...	Removes the link with the original file, but the geometry stays in the current scene, although the link between the original file is broken. Changes made to the original linked file cannot be reloaded.

Presets Tab

Many options are available before files are linked to your current scene. These options are configured and saved as **Presets** and can be used when linking files at a later stage. Many of these options require trial and error to find the most appropriate settings. You can link a file and then reload (or detach and relink) with different settings until you achieve the required results.

If you are linking a file for the first time, it is recommended that you create a new preset.

The *Presets* tab lists all existing presets and contains options for creating new presets, modifying existing presets, copying existing ones, renaming and deleting them. You need to select a preset for the **Modify**, **Copy**, **Rename**, and **Delete** options to be available, as shown in Figure 3–16. If no preset is selected, **Copy** is replaced by **New** and is the only available option.
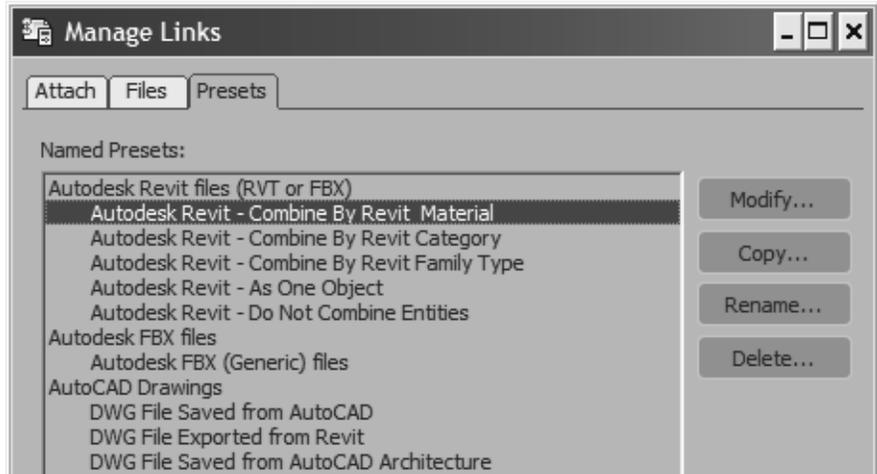
Figure 3–16

Depending on the type of preset selected (.RVT, .FBX, or .DWG), clicking **Modify...** opens a specific File Link Settings dialog box, which enables you to define the way you want the geometry to be linked, what portions of the file are to be modified on **Reload**, and how the geometry is combined.

File Link Settings: DWG Files

In the Manage Links dialog box, in the *Presets* tab, selecting an AutoCAD DWG file preset and clicking **Modify...** opens the File Link Settings: DWG Files dialog box, as shown in Figure 3–17.
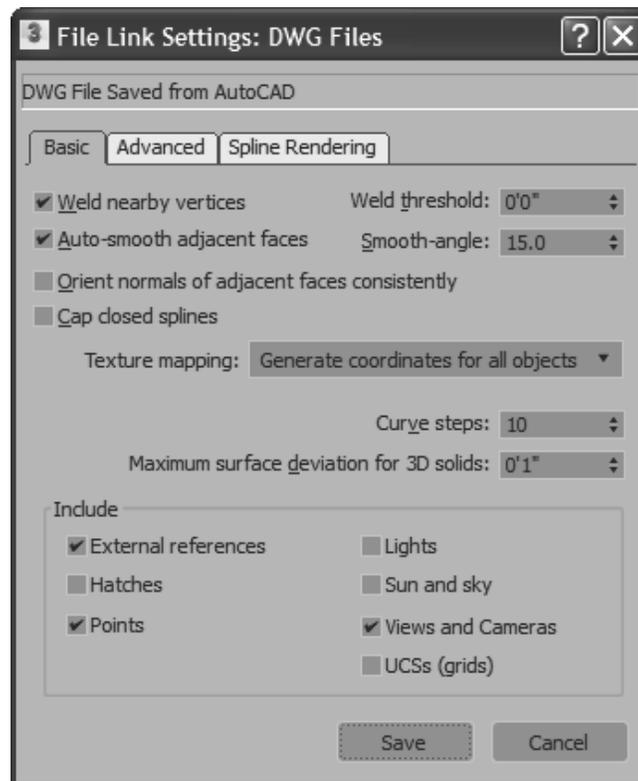
Figure 3–17

Basic Tab

The options available in the *Basic* tab are described as follows:

- **Weld nearby vertices** and **Weld threshold:** Welding joins together vertices of the same object that fall in the weld threshold. If the objects are joined by layer, this option removes duplicate vertices so that the adjacent 2D objects on the same layer are automatically combined into splines. Adjacent 3D objects that are welded become faces in a single mesh that share common vertices.

You can adjust smoothing later if you still encounter smoothing issues after import.

- **Auto-smooth adjacent face** and **Smooth-angle:** Auto-smooth enables adjacent faces in the same 3D mesh to display smooth if the angles of separation between their face normals (a directional vector perpendicular to the face) is equal to or less than the Smooth-angle. Otherwise, the adjacent faces have a faceted edge between them. This is the same smoothing process used in the Edit Mesh and Edit Poly modifiers.

- **Orient normals of adjacent faces consistently:** This option coordinates the face normals of linked objects. This option should be left off by default unless some faces of your 3D objects are missing after the link.

- **Cap closed splines:** It assigns an Extrude modifier to all closed 2D geometry (e.g., circles and closed polylines).

- **Texture mapping:** Texture mapping is used to locate texture maps on objects. Two options are available:

|	
Generate coordinates on-demand	• Links objects without adding any texture mapping. • Adds the mapping when it is first called for by the software. • Enables a faster link but might cause some discrepancies.
Generate coordinates for all objects	• Adds texture mapping to all objects at the time of the link, matching any that might have existed in the original drawing file.

- **Curve steps:** This setting defines the number of segments to subdivide each 2D curve segment into if they are later extruded in the Autodesk 3ds Max software. This setting applies to circles, arcs, polyline curves, spines, and similar curved objects.

- **Maximum surface deviation for 3D solids:** This setting defines the allowed deviation distance from a parametric AutoCAD 3D curve (such as a curved AutoCAD extrusion) and the resulting Autodesk 3ds Max mesh. The lower the value, the more a 3D curve is subdivided. In the Autodesk 3ds Max software, all 3D curves must be segmented.

  This value can be set as low, (0.01).

- **Include area options:** These options enable you to select the type of objects to be brought into the scene. Note that the **Lights** option only brings in Lights from AutoCAD drawings pre-2007. If you have Sun and Sky checked, a daylight system is created based on the information in the incoming DWG file from the Autodesk Revit 2009 software.

Advanced Tab

The *Advanced* tab (shown in Figure 3–18) controls the import of AutoCAD primitives and the effect of scene materials while importing.
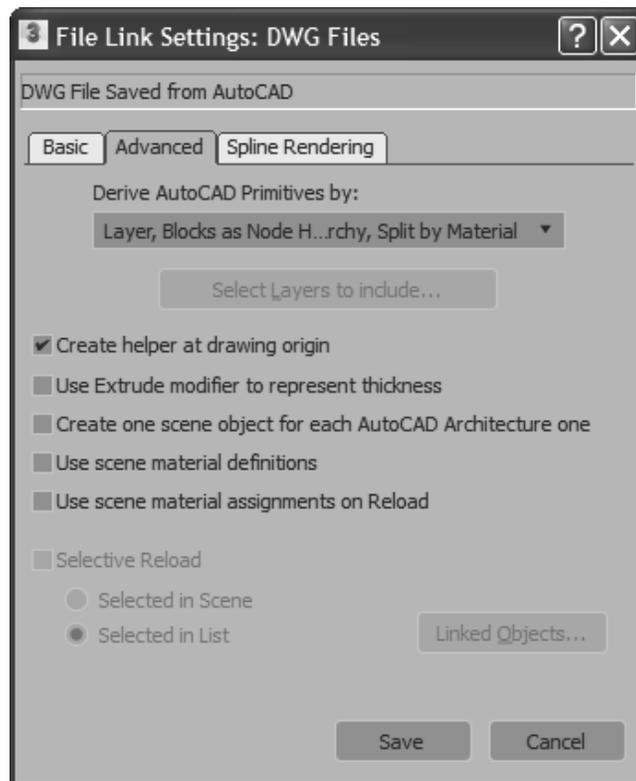
Figure 3–18

The options available in the *Advanced* tab are described as follows:

• **Derive AutoCAD Primitives by:** Controls how AutoCAD objects are combined when linked.

Layer	Creates one object for each AutoCAD layer. Each AutoCAD block links as a single object called a VIZBlock.
Layer, Blocks as Node Hierarchy	This option preserves material assignments in linked AutoCAD blocks. It structures each as a hierarchy of objects rather than single objects.
Layer, Blocks as Node Hierarchy, Split by Material	This option works similarly to the one above but takes into account drawings that have more than one material applied to objects on the same layer. Separate hierarchies are created for each material type on each layer.
Entity, Blocks as Node Hierarchy	This option includes all non-blocks as separate, individual objects. Blocks are preserved as hierarchies, however, organized by layer.
Color	Combines AutoCAD objects by color. All objects of one color are joined in as a single object, regardless of layer.

Entity	Does not combine AutoCAD objects at all. Instead, each AutoCAD object becomes an individual object.
One Object	This option combines all AutoCAD objects into a single object.

- **Create helper at drawing origin:** Adds an origin point helper at the origin of the current coordinate system. All of the linked geometry is part of a hierarchy parented by this helper, so all of the linked objects can be repositioned as one by transforming the helper.

- **Use Extrude modifier to represent thickness:** When disabled, linking 2D AutoCAD objects with a non-zero thickness value translates the objects into the Autodesk 3ds Max software as a 3D mesh. When enabled, objects translate as 2D objects with a parametric extrude modifier. The resulting geometry is the same but when this option is enabled, the extrusion properties (such as height) can be modified after the link or imported using the modifier stack.

- **Create one scene object for each AutoCAD Architecture one:** When unchecked, AutoCAD Architecture and AutoCAD MEP objects are subdivided into separate objects by material.

- **Use scene material definitions:** When unchecked, the Autodesk 3ds Max software includes the current state of any material applied to the linked objects in the AutoCAD software. If selected and the current scene has a material with the same exact name as the AutoCAD material, the scene material is used instead.

- **Use scene material assignments on Reload:** When unchecked, the Autodesk 3ds Max software re-loads the current state of any AutoCAD materials present in the drawing file when the link is updated. When enabled, the Autodesk 3ds Max software maintains the current state of any materials in the scene file after a link is updated. Select this option if you intend to adjust linked materials in the Autodesk 3ds Max software or leave it unchecked if you intend to adjust them the AutoCAD software.

- **Selective Reload:** Enables you to reload a subset of the original file. You can select objects to reload by selecting them in the scene or by selecting them from a list. If you select **Selected in List**, and click **Linked Objects** a list opens.

> **Hint: Hierarchies and File Linking**
>
> Autodesk 3ds Max Hierarchies are collections of objects linked together into parent/child relationships where transform applied to a parent are automatically passed on to its children. Connecting multiple objects in a hierarchical chain can enable sophisticated animations in the Autodesk 3ds Max software, such as the motion of jointed robotic arms.
>
> In the case of the **hierarchy** file link options, incoming AutoCAD blocks are brought into the Autodesk 3ds Max software as multiple objects so that they can maintain multiple material assignments from the AutoCAD software. The parent object itself does not have any geometry and does not render. Most modifiers (such as **Substitute**) must be applied to the objects in the hierarchy rather than the parent.

Spline Rendering Tab

The options available in the *Spline Rendering* tab (shown in Figure 3–19) enable linear objects (2D and 3D lines, polylines, etc.) to display as extruded 3D objects in the viewports or rendering. Normally, splines cannot be rendered because they do not have surface area to interact with scene lighting. These options enable splines to link into the Autodesk 3ds Max software as 3D linear objects with a cross-sectional radius or a rectangular length and width. This provides the surface area for rendering.
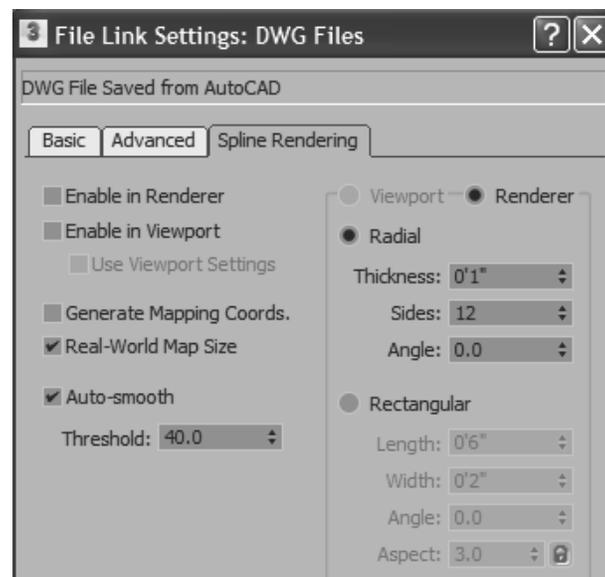
Figure 3–19

- If splines are to be rendered with materials then options such as smoothing, mapping coordinates, and/or real-world map size are often important.

- When enabled, all of the splines linked with this setting are renderable, and all have the same cross-section geometry.

- To make only certain 2D objects renderable (or want some to render differently than others) you could apply a Renderable Spline modifier directly to those objects after linking.

File Link Settings: Revit Files (RVT or FBX)

In the Manage Links dialog box, in the *Presets* tab, selecting an Autodesk Revit file and clicking **Modify...** opens the File Link Settings: Revit Files (RVT or FBX) dialog box, as shown in Figure 3–20. Additionally, you can also select the Autodesk FBX (Generic) file preset and click **Modify...**.This opens the File Link Settings: FBX Files dialog box, as shown in Figure 3–21. This dialog box is similar to the Autodesk Revit Files (.RVT and .FBX) but without a *Geometry* area for controlling the segments and smoothing the linked geometry.
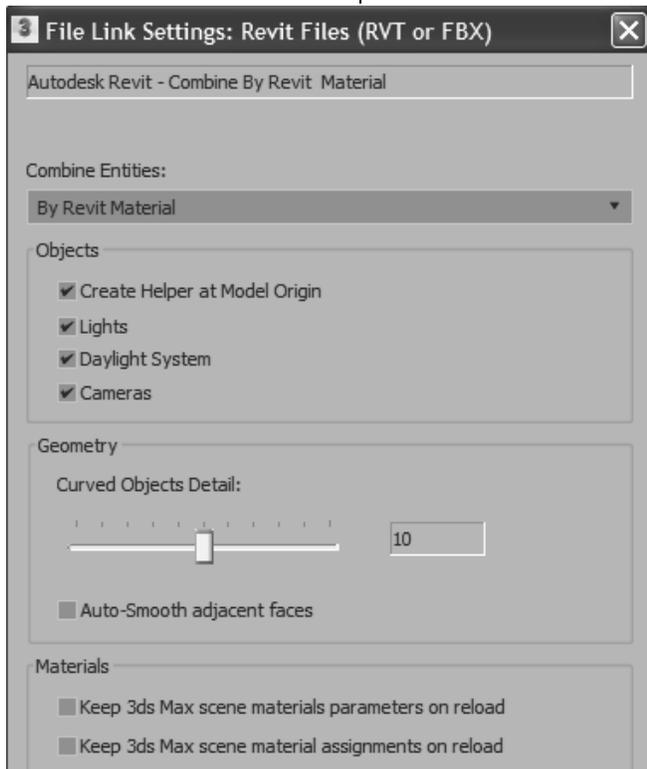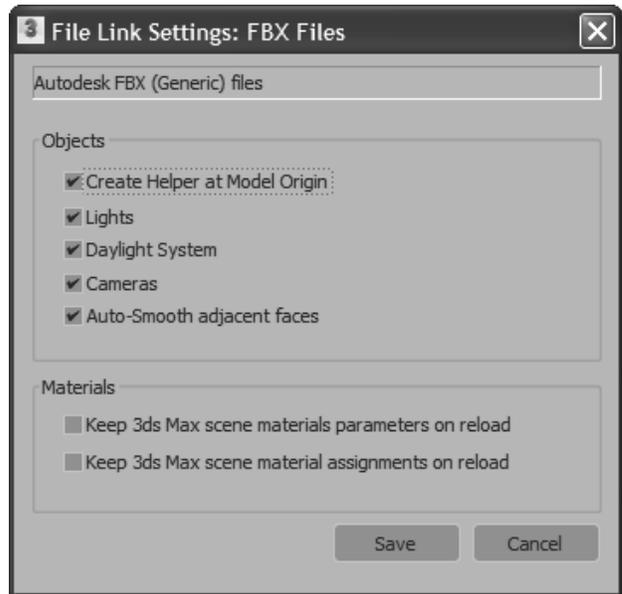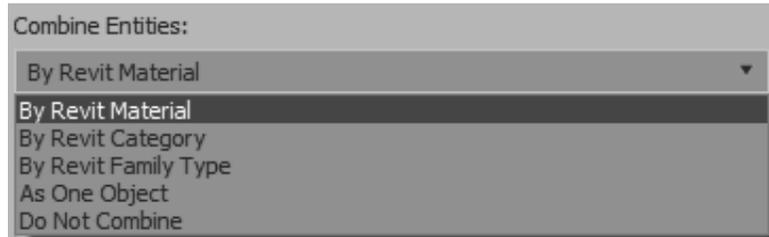

Figure 3–20

Figure 3–21

The options available in the File Link Settings: Revit Files (RVT or FBX) dialog box are described as follows:

It is recommended that you combine entities to reduce the number of objects.

- **Combine Entities** list: Enables you to select the Autodesk Revit entities that you want to combine, as shown in Figure 3–22. For example, if you select **By Revit Material**, all of the entities that have the same material are linked in the current Autodesk 3ds Max scene as a single object.

Combine Entities:

By Revit Material

By Revit Material
By Revit Category
By Revit Family Type
As One Object
Do Not Combine

Figure 3–22

- *Objects* area: The selected options in this area are linked from the .RVT file to your current scene. If the .RVT file or .FBX file contains photometric lights, interior artificial lights, cameras, and exterior daylight systems, you can select the associated options in the File Link Settings dialog box.

- *Geometry* **area:** Enables you to set the number of segments for your curved entities and apply auto-smoothing to them.

- *Materials* **area:** Enables you to control the material definitions and assignment settings.

Practice 3b

Linking an AutoCAD DWG

Practice Objectives

- Create a preset to link an AutoCAD .DWG file and reposition it.
- Revise the link settings and reload the linked file.

In this practice, you will link AutoCAD geometry to represent the parking lot details, such as pavement markings and other details. You will reposition this file using the Helper object, and will create 3D markings by projecting 2D lines to the elevation of a terrain model.

You must set the paths to locate the External files and Xrefs used in the practice. If you have not done this already, return to Chapter 1 and complete Task 1 to Task 3 in *Practice 1a: Organizing Folders and Working with the Interface*. You only have to set the user paths once.

Task 1 - Link an AutoCAD .DWG File.

If a dialog box opens prompting you about a File Load: Mismatch, click OK to accept the default values.

1. Open **Civil Base.max** from the *...\scenes* folder.

2. Select **File>Import>Link AutoCAD**. In the Open dialog box, browse and open the *...\import* folder in the practice files folder. Select **3D Parking Lot Detail-Civil.dwg** and click **Open**. The Manage Links dialog box displaying the partial path, as shown in Figure 3–23.

Figure 3–23

3. To display the full path, click on **File** to reopen the Open dialog box, select **C:\Autodesk 3ds Max Fundamentals Practice Files\Import** from the History drop-down list and select the **3D Parking Lot Detail.dwg** again. Click **Open** again. The complete path should display as shown in Figure 3–24.
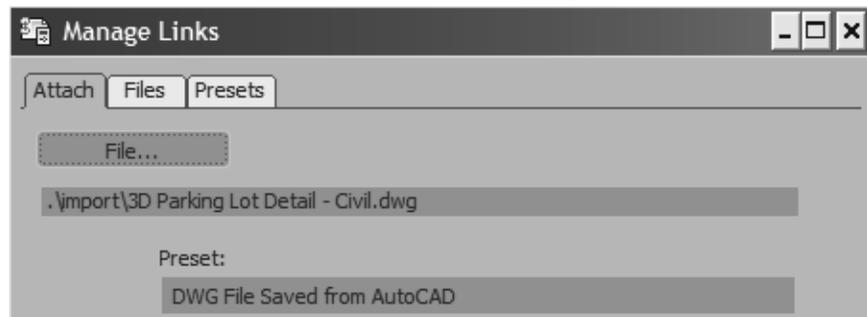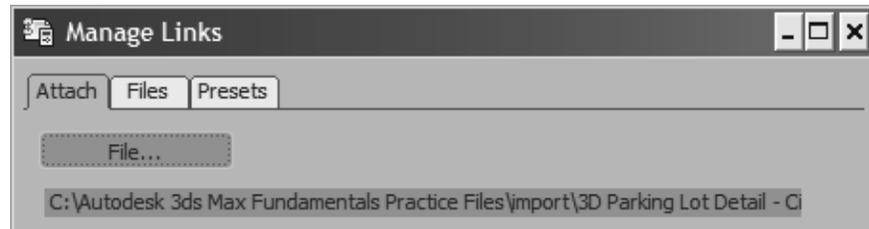

Figure 3–24

*If no preset is selected, only **New...** is available.*

4. Select the *Presets* tab and click **New...** to create a new link preset.

5. In the New Settings Preset dialog box, set *New Name* as **AutoCAD – Derive by Layer**. Note that the *Format* is selected as **AutoCAD Drawings**. Click **OK**.

6. In the Manage Links dialog box, select the new **AutoCAD – Derive by Layer** preset, as shown in Figure 3–25. Click **Modify...**.
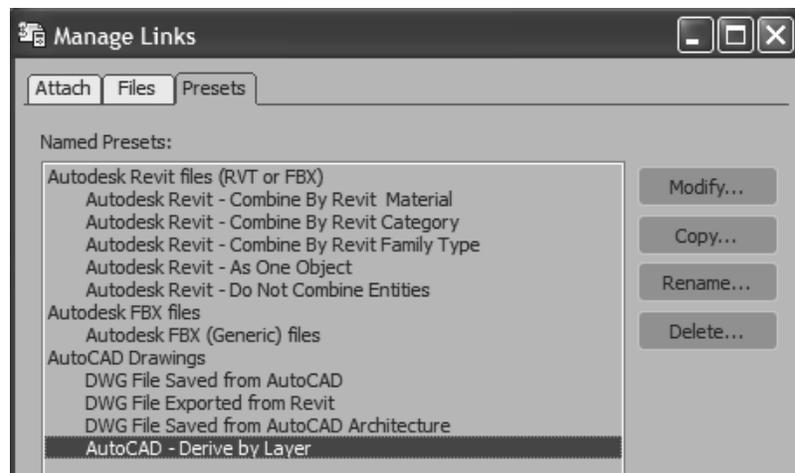

Figure 3–25

*The **Create Helper at drawing origin** option adds a helper object at the origin of the linked file.*

7. In the File Link Settings: DWG Files dialog box, in the *Basic* tab, set the link options, as shown in Figure 3–26. Select the *Advanced* tab and select **Create helper at drawing origin**, as shown in Figure 3–27. Leave all other options as defaults (clear).
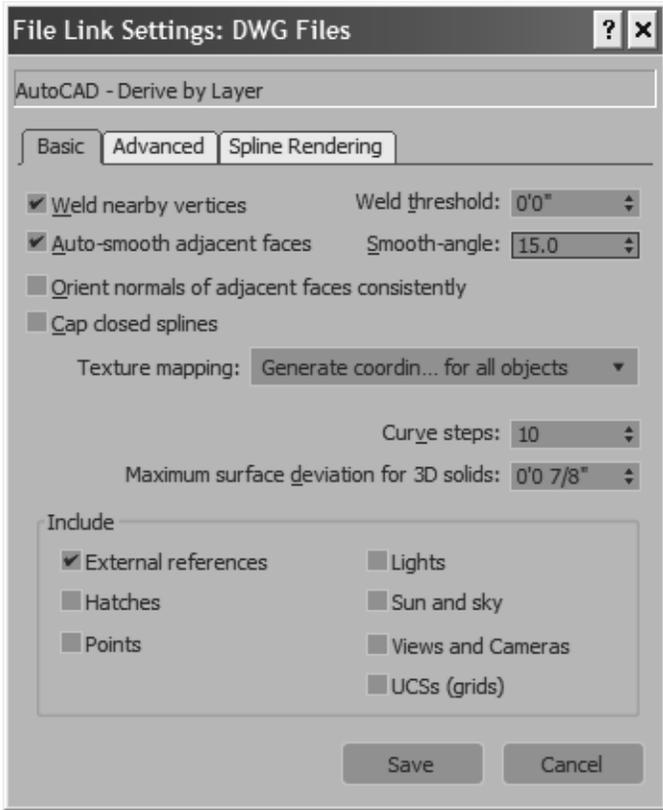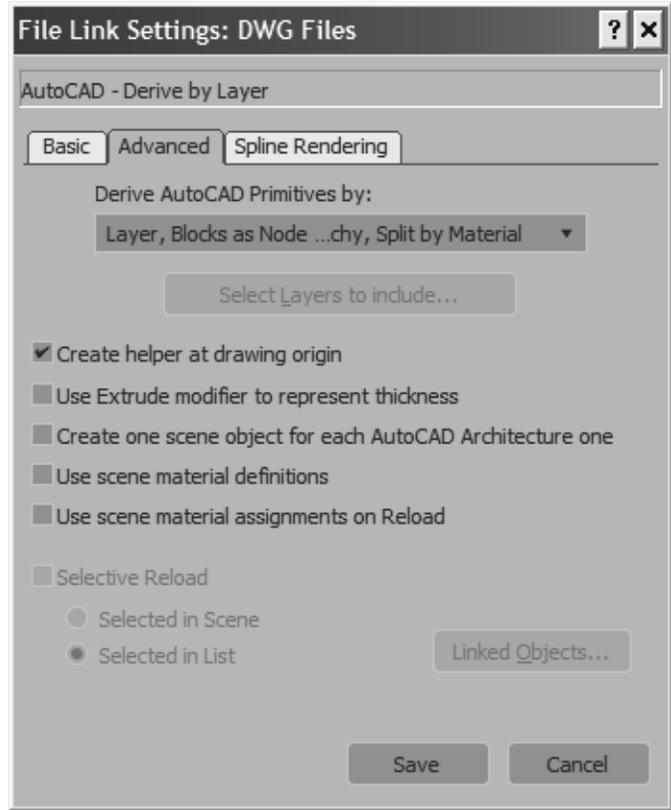

Figure 3–26

Figure 3–27

8. Select the *Spline Rendering* tab and verify that the link options are set to the defaults, as shown in Figure 3–28.
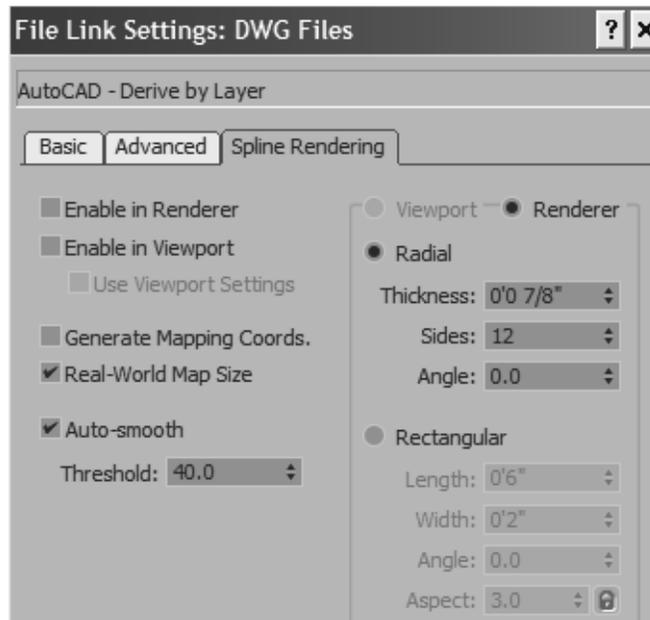

Figure 3–28

9. Click **Save**.

10. In the Manage Links dialog box, select the *Attach* tab. Set *Preset* to **AutoCAD – Derive by Layer**, as shown in Figure 3–29. Click **Select Layers to include...**.
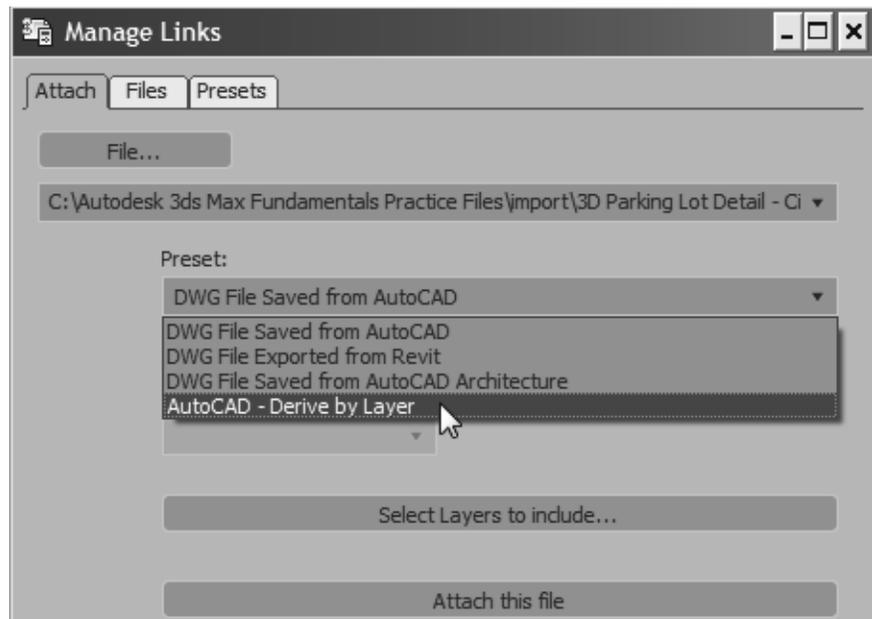

Figure 3–29

11. In the Select Layers dialog box, select **Select from list**. Clear **0** and **DEFPOINTS** and leave all other layers as selected, as shown in Figure 3–30. Click **OK**.
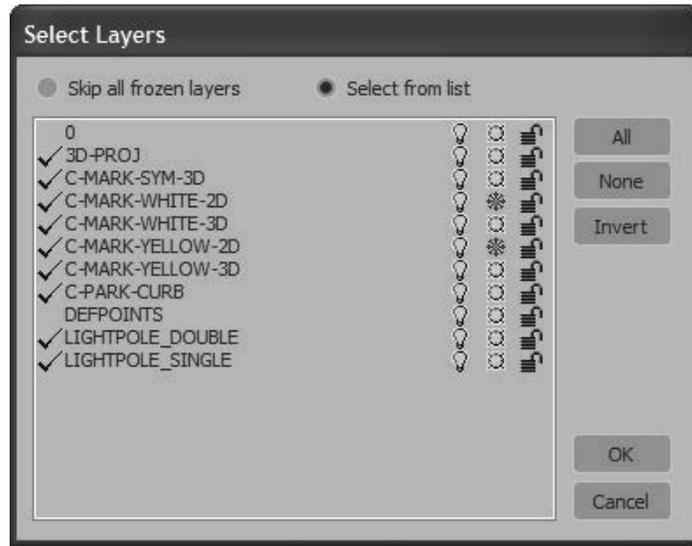

Figure 3–30

12. In the Manage Links dialog box, click **Attach this file**. Close the Manage Links dialog box. Note that the parking lot details have been added to the scene, but are located far away from the origin, as shown in the **Top** viewport in Figure 3–31.
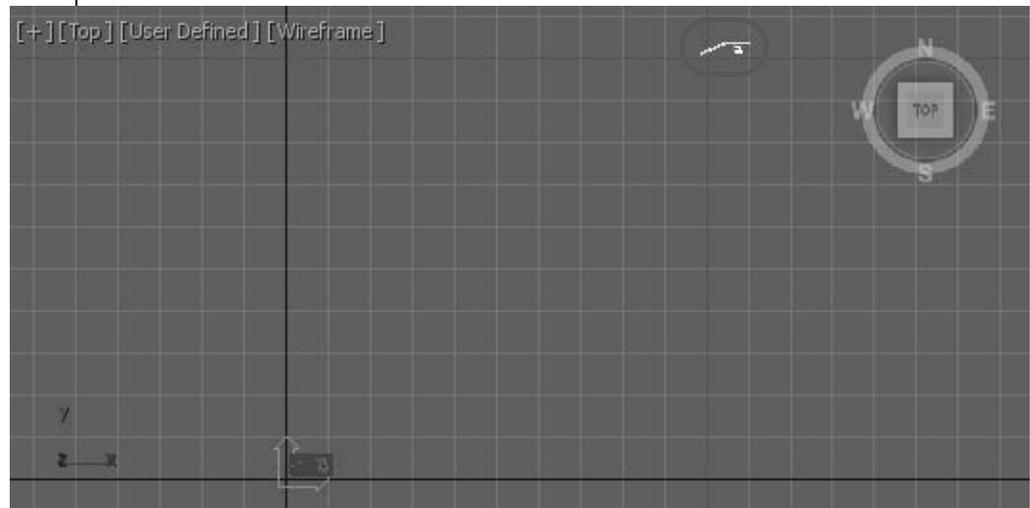

Figure 3–31

Task 2 - Relocate the Linked Geometry.

1. You need to move the parking lot details by the global shift values in Civil View. In the menu bar, select **Civil View>Civil View>Civil View Explorer**.

2. In the Civil View Explorer, select **Scene Settings**, as shown in Figure 3–32. In the *Scene Settings* rollout, note the *Global Import Shift* values for *X Shift* and *Y Shift (-9901)*, as shown in Figure 3–33. Close the Civil View Explorer.
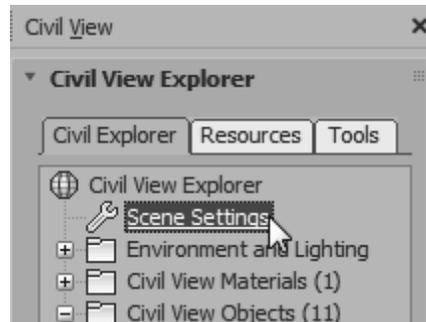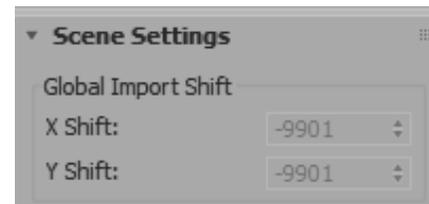
Figure 3–32   **Figure 3–33**

3. In the Main Toolbar, click ✥ (Select and Move).

4. In the Scene Explorer, click (■ (Display None) and
   ◣ (Display Helpers)), and then select the helper object **3D Parking Lot Detail - Civil.dwg**, as shown in Figure 3–34. Note that the **User Coordinate System** icon located at the origin is selected, as shown in Figure 3–35.
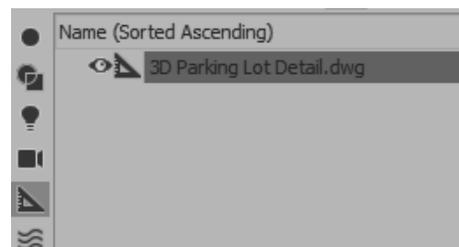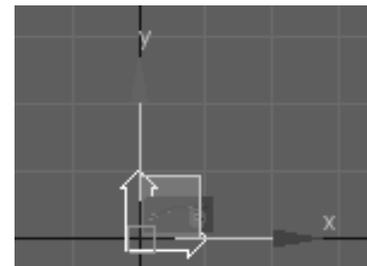
Figure 3–34   **Figure 3–35**

Ensure that the feet symbol is added with the values.

5. In the Status Bar, ensure that [icon] (Absolute Mode Transform) displays. Set the following, as shown in Figure 3–36:

   - *X* edit box: **-9901'0"**
   - *Y* edit box: **-9901'0"**

[icon] X: -9901'0" Y: -9901'0" Z: 0'0"
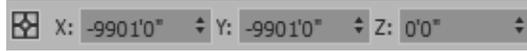
Figure 3–36

6. Press <Enter>.

7. Click [icon] (Zoom Extents All). Note how the parking lot details are placed exactly on the parking lot surface.

In the Main toolbar, use [icon] (Select Object) to exit any command.

8. In the **Perspective** viewport, use [icon] (Orbit) to tilt the view to display the area below the surfaces, similar to that shown in Figure 3–37. Use **Zoom** to zoom into the area. Note that in addition to the 3D pavement markings, 2D line markings are imported through the link.

Figure 3–37

Task 3 - Revise the Link Settings.

In the Files tab, if the linked file has been modified, 🖿 displays.

You can use:
***Reload...** to update the file in the scene.*
***Detach...** to remove a linked drawing from the scene.*
***Bind...** to insert the drawing as is and removes the connection.*
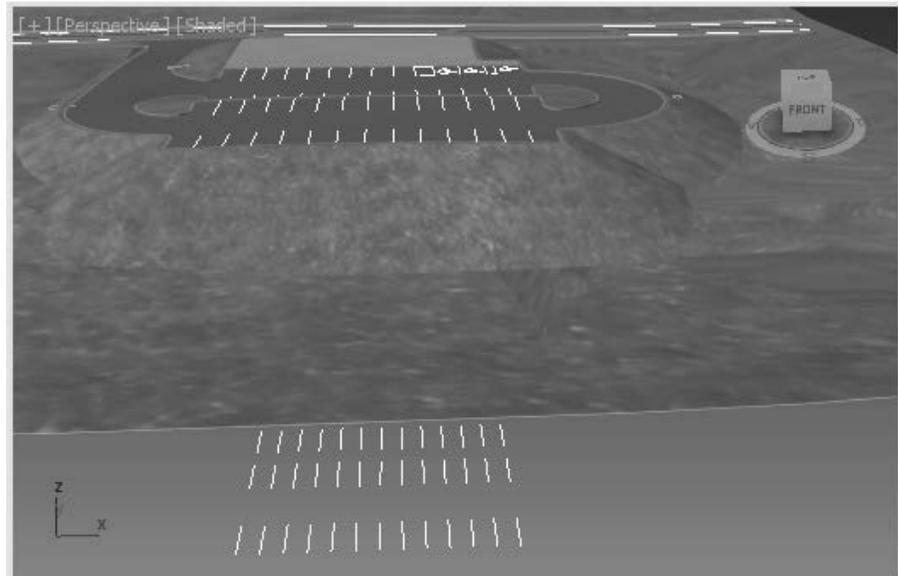
1. Click **File>Reference>Manage Links** to open the Manage Links dialog box.

2. In the Manage Links dialog box, select the *Files* tab and note that the linked file displays 🖿, indicating that the file has not changed. Although the linked file has not changed, you can use **Reload...** to revise the link settings. Verify that **Show Reload options** is selected and click **Reload...**.

3. The File Link Settings: DWG Files dialog box opens. In the *Advanced* tab, click **Select Layers to include...**. Clear the 2D layers (**C-MARK-WHITE-2D and C-MARK-YELLOW-2D)**, and the two **LIGHTPOLE** layers, as shown in Figure 3–38.

Figure 3–38

The 2D linework should no longer display, keeping the scene smaller.

4. Click **OK** twice to close both dialog boxes. Click ❌ to close the Manage Links dialog box. In the **Perspective** viewport, note that the 2D line markings do not display any longer.

5. Save your work as **MyCivil Base.max**.

Practice 3c

Linking and Reloading Autodesk Revit File

Practice Objectives

- Link and reposition an Autodesk Revit file to the current scene.
- Reload a modified .RVT file.

In this practice, you will link a .RVT file into a 3ds Max scene. You will reposition the Revit file using the Helper object. You will then reload a modified version of the .RVT linked file to incorporate the changes made to the original Autodesk Revit file using **Reload**.

You must set the paths to locate the External files and Xrefs used in the practice. If you have not done this already, return to Chapter 1 and complete Task 1 to Task 3 in *Practice 1a: Organizing Folders and Working with the Interface*. You only have to set the user paths once.

Task 1 - Link an Autodesk Revit (.RVT) file.

*If a dialog box opens prompting you about a File Load: Mismatch, click **OK** to accept the default values.*

1. Open **Civil Base Link.max** from the *...\scenes* folder. The file contains the ground surfaces, building pad, and parking lot details.

2. Select **File>Import>Link Revit**.

3. In the Open dialog box, in the *...\import* folder, select **Revit Building-1.rvt** and click **Open**.

It might take a few minutes to load the file.

4. The Status Bar is replaced by the Loading file bar, indicating the progress of the file as it loads. Once loaded, the Select Revit View dialog box opens, as shown in Figure 3–39.
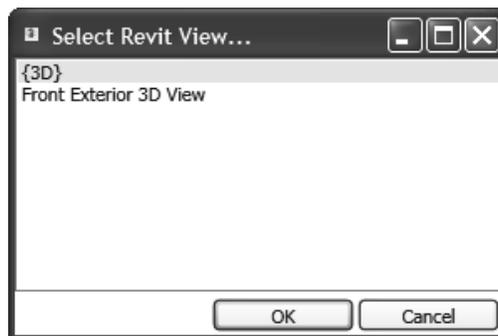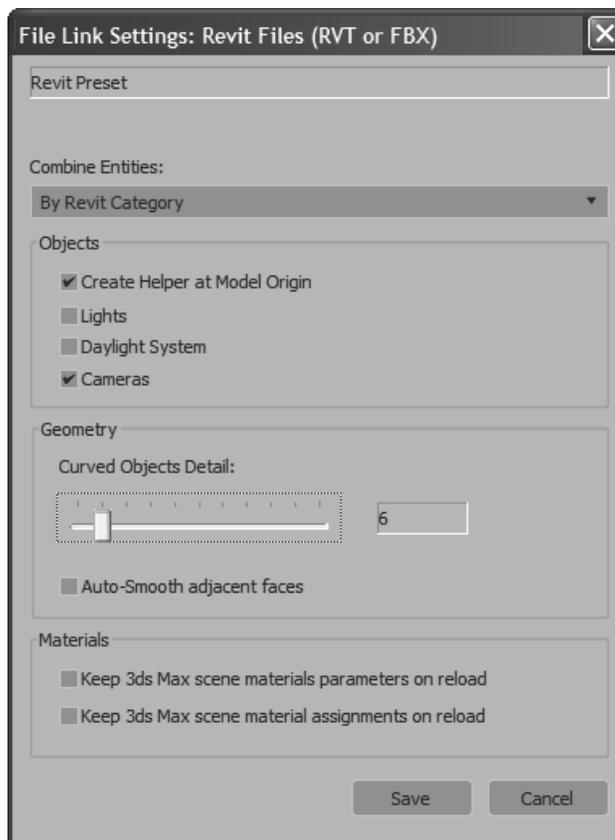

Figure 3–39

5. Select **Front Exterior 3D View** and click **OK**.

6. In the Manage Links dialog box, select the *Presets* tab. Click **New...** to create a new preset. In the New Settings Preset dialog box, set the following:
   - *New Name*: **Revit Preset**
   - *Format*: Select **Autodesk Revit (*.rvt,*.fbx)**

7. Click **OK**.

8. In the Manage Links dialog box, select **Revit Preset** and click **Modify**.

*The **Create Helper at Model Origin** option adds a helper object at the origin of the linked file. Selecting and applying transforms (move, rotate, or scale) to the helper object applies the transform to the linked geometry together.*

9. In the File Link Settings dialog box, do the following, as shown in Figure 3–40:
   - In the Combine Entities drop-down list, select **By Revit Category**.
   - In the *Objects* area, clear the **Lights** and **Daylight System** options.
   - In the *Objects* area, select **Create Helper at Model Origin** and **Cameras**.
   - In the *Geometry* area, set *Curved Objects Detail* to **6**.
   - In the *Materials* area, verify that **Keep 3ds Max scene materials parameters on reload** and **Keep 3ds Max scene material assignments on reload** are cleared.
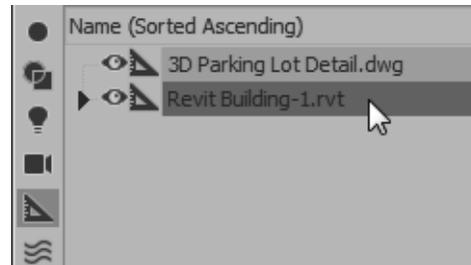

Figure 3–40

10. Click **Save**.

11. Select the *Attach* tab. Expand the Preset drop-down list and select **Revit Preset**.

It might take a few minutes to load the file.

12. Click **Attach this file**. Note that the Autodesk Revit building and camera are loaded at the 0,0,0 location in the viewports.

13. Click ☒ to close the Manage Links dialog box.

*If the Scene Explorer is not displayed, select **Tools>Scene Explorer** and then dock it.*

14. In the Scene Explorer, click ■ (Display None) and ◤ (Display Helpers), if required, and then select the helper object **Revit Building-1.rvt**, as shown in Figure 3–41.

Figure 3–41

15. Right-click on the **Top** viewport to make it active and to maintain the selection. In the Main Toolbar, click ✛ (Select and Move). The Transform gizmo displays at the helper location, which is the origin of the linked Autodesk Revit file.

The position of the building pad from the origin has been calculated.

16. In the Status Bar, verify that ⊞ (Absolute Mode Transform) displays. Set the following, as shown in Figure 3–42:
   - *X* edit box: **800'0"**
   - *Y* edit box: **382'0"**
   - *Z* edit box: **154'6"**

Figure 3–42

17. Press <Enter>.

18. Click (Zoom Extents All). Note how the building is placed on the building pad.

19. In the **Front** viewport, use (Zoom Region) and create a rectangular window around the building to zoom into the building. Verify that the **Standard** shading label displays. Select the [**Wireframe**] *Per View* label and select **Default Shading**. Then, select **Default Shading** again and select **Edged Faces** to define the windows and doors. The building should display similar to that shown in Figure 3–43.

Figure 3–43

20. In the **Left** viewport, select the [**Wireframe**] *Per View* label and select **Default Shading** and then **Edged Faces**.

21. Select the [**Left**] *Point of View* label, and select **Cameras>Views: Front Exterior 3D View**, as shown in Figure 3–44.

Figure 3–44

22. Use (Orbit Camera) and (Field-of-View) to display the complete building in the **Left** viewport, similar to that as shown in Figure 3–45.

23. In the **Perspective** viewport, use (Zoom), (Orbit) and **Pan** to zoom into the building and parking lot area so that the display is similar to that shown in Figure 3–45.
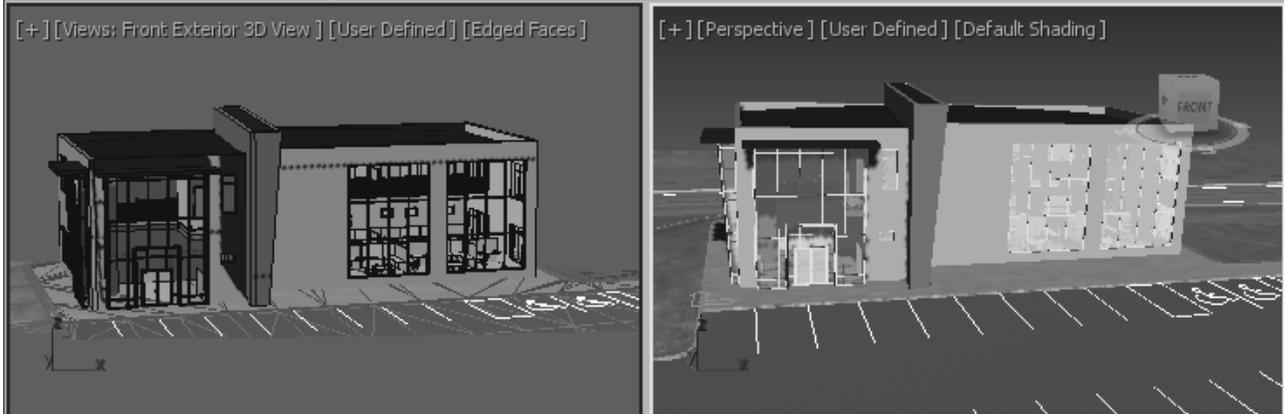

Figure 3–45

Task 2 - Reload the variation of the .RVT file.

A variation to the .RVT linked file (windows have been added) has been included in the *...\import* folder.

1. In Windows Explorer, open the ...\import folder in the practice files folder.

2. Right-click on **Revit Building-1.rvt** and select **Rename**. Rename the file as **Revit Building-1_ORIGINAL.rvt**.

3. Right-click on **Revit Building-2.rvt**, and select **Copy**. Paste a copy of this file into the same directory. Right-click on the copied file, select **Rename**, and rename the file as **Revit Building-1.rvt**. This must be the same name as the original file that was linked to indicate that the original linked file has changed.

4. Return to the Autodesk 3ds Max software. Select **File>Reference>Manage Links** to open the Manage Links dialog box.

5. In the Manage Links dialog box, select the *Files* tab. Note that displays in front of the .RVT filename (as shown in Figure 3–46), indicating that changes have been made to the original linked file.
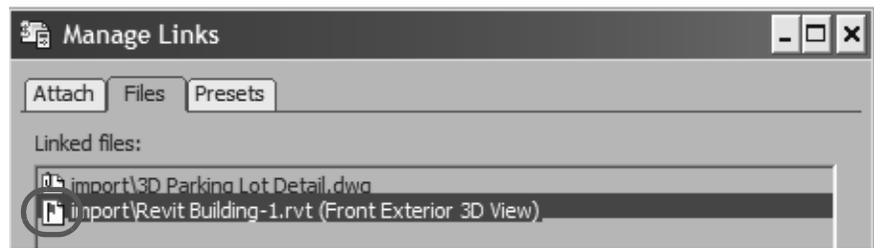
Figure 3–46

6. Select **Revit Building -1.rvt** (if not already selected) and click **Reload...**. The Loading file bar displays the progress.

7. In the File Link Settings dialog box that opens, in the *Materials* area, select **Keep 3ds Max scene material assignments on reload**. Click **OK**. The scene is refreshed with the new changes.

8. In the Manage Links dialog box, in the *Files* tab, the icon has changed to ⬚, as shown in Figure 3–47. This indicates that there are no differences between the original file and the linked file.
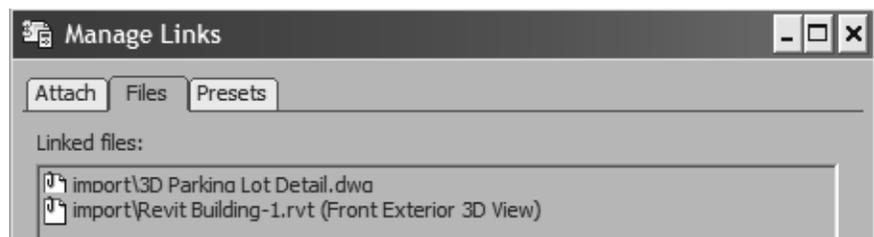

Figure 3–47

9. Close the Manage Links dialog box.

10. In the viewports, the modified building displays. More windows are added to the building, as shown in Figure 3–48.

Figure 3–48

11. Save the file as **MyCivil Base Link.max**.

3.3 References

External References (XRef)

Autodesk 3ds Max Scene files can reference data from other .MAX scene files by expanding **File> Reference>XRef Objects or XRef Scene**. The XREF data remains linked to the source (.MAX) scene file so that changes in the source file can be reflected in any scene that contains the XREF.

- External References are useful to break up large projects into more manageable pieces, permit more than one person to work on the same project at the same time in separate files, and to enable the same core scene geometry to be used in multiple files.

- **XRef Scenes** bring in the entire scene. All of the XREF objects are non-selectable and cannot be modified.

- **XRef Objects** enable you to select individual objects (or all) from an XREF scene. These objects remain selectable and modifiable in the XREF scene file.

- You can snap to XREF and use XREF objects with AutoGrid. You can also use XREF objects as alignment targets and you can select an XREF object's coordinate system for object transformation. XREF support parameter wiring and you can XREF the controllers.

- Objects in scenes (.MAX) are imported into other . MAX scenes using the **Merge** option.

Data Management and Asset Tracking

The Autodesk 3ds Max software enables you to manage your data through Data Management (DM) solutions, referred to as Asset Tracking Systems (ATSs).

- DM solutions such as the Autodesk® Vault software enables you to store scene files and any supporting data (such as material maps) in a single database repository.

- These systems can be accessed simultaneously by multiple users with different rights assigned based on their project responsibilities. Data can be checked out for editing by one individual at a time while still being referenced by other users. Users can see who is editing which portion of the project at any time.

- By centralizing the files in a DM system it is much easier to adjust paths for external files such as image maps.

- Data files can be versioned through DM solutions, so that the older versions can be readily accessed, if required.

- For more information see *Asset Tracking* in the Autodesk 3ds Max Help files. Asset Tracking is available through the **File>Reference> Asset Tracking Toggle**.

Practice 3d	# XRef and Merge Objects

Practice Objective

• Link an AutoCAD .DWG file and incorporate objects from another scene file into the current scene.

In this practice, create a new scene file that will contain linked AutoCAD objects and XRef objects from the Civil Base scene. You will then merge objects into the current scene file.

You must set the paths to locate the External files and Xrefs used in the practice. If you have not done this already, return to Chapter 1 and complete Task 1 to Task 3 in *Practice 1a: Organizing Folders and Working with the Interface*. You only have to set the user paths once.

Task 1 - Assemble the Data.

If an unsaved scene is open, you need to save or discard the changes to the scene.

1. Click **File>Reset** and click **Yes** to reset the scene.

2. For this scene, set the *System Unit Scale* to **Inches**. Select **Customize>Units Setup**. In the dialog box, verify that the following is set:
   • *Display Unit Scale:* **US Standard**, **Feet w/ Fractional Inches**
   • *Default Units*: **Inches**
   • *Lighting Units*: **American**

3. Click **System Unit Setup**. In the System Unit Setup dialog box, set *System Unit Scale* to **Inches**. Click **OK** in both the dialog boxes.

4. Expand **File>Reference** and select **Manage Links**.

5. In the Manage Links dialog box, in the *Attach* tab, click **File...**. In the ...*import* folder, select **Exterior AutoCAD Architectural Model.dwg**. Click **Open**.

*The **AutoCAD – Derive by Layer** preset was created in the **Practice: Linking an AutoCAD DWG**. Complete the above mentioned practice to create the preset if not already done so.*

6. In the *Preset* drop-down list, select **AutoCAD – Derive by Layer** and click **Attach this file**. Once the file has been loaded, close the Manage Links dialog box.
   • The AutoCAD objects were not joined together by layer. Each was subdivided by material type into different objects. Materials previously assigned in AutoCAD were preserved on these separate objects.

7. Click (Zoom Extents All) to display all of the objects in all of the viewports.

8. In the **Front** viewport, select all of the objects by creating a window around the objects. In the Main Toolbar, in the *Named Selection Sets* field, enter **exterior AutoCAD Architectural building**, as shown in Figure 3–49. Press <Enter>.
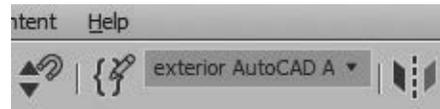

Figure 3–49

You select objects to XREF rather than the entire scene because XREF scene objects cannot be individually selected or modified.

9. Click **File>Reference>XRef Objects**. In the XRef Objects dialog box, click (Create XRef Record from File) as shown in Figure 3–50.

Figure 3–50

10. In the Open File dialog box, select **Parking Lot Detail.max** (from the ...*import* folder) and click **Open**.

11. If the Units Mismatch dialog box opens, click **OK**. This rescales the XRef objects to the system units.

12. The Duplicate Material Name dialog box opens prompting you that there is an incoming material with the same name as an existing scene material. Select **Apply to All Duplicates** to keep both materials, as shown in Figure 3–51. Click **Auto-Rename Merged Material**.
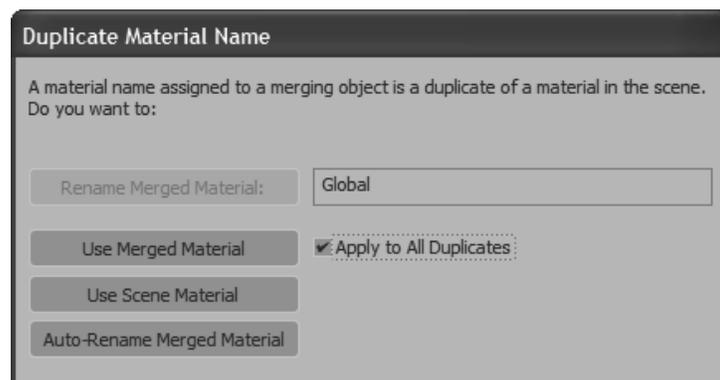

Figure 3–51

13. In the XRef Objects dialog box, note that the .MAX filename displays. Click ❌ to close the dialog box.

14. Click ⚘ (Zoom Extents All). Note that the Civil Base objects are located far from the origin. This is a coordinate system discrepancy and not a scale issue. The AutoCAD drawing is based in a different coordinate system and scale than the accompanying Civil drawing.

Task 2 - Coordinate the Data.

In this task you will relocate the Civil Base in the Architectural Data. To line up the data accurately you will need the exact coordinate translation and rotation. You can measure ahead of time in programs, such as AutoCAD by comparing the coordinates of points common to both files.

1. Verify that no object is selected. In the Scene Explorer, click ■ (Display None) and ● (Display Object XRefs). Select all of the XRef objects in the list (use <Shift> and then select the first and last).

2. With these XRef objects selected, select **Group>Group** from the menu bar.

3. In the Group dialog box, set the *Group name* to **Site XRef** and click **OK**.

4. In the Main Toolbar, click ✛ (Select and Move). In the Reference Coordinate System, select **World**, as shown in Figure 3–52. Click ▦₊ (Use Transform Coordinate Center).
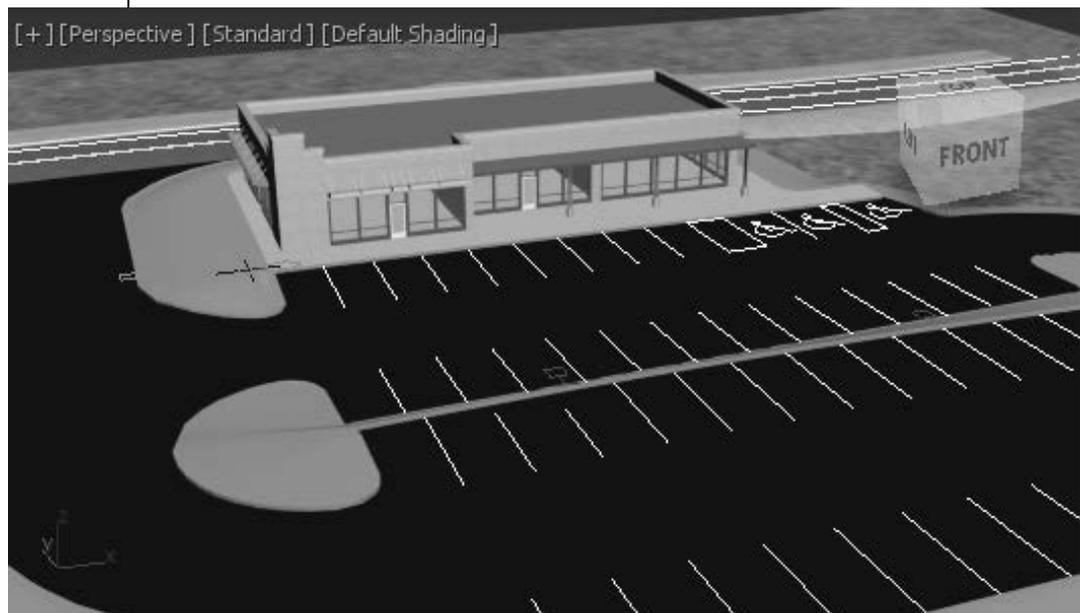

Figure 3–52

The translation coordinates have already been measured in AutoCAD.

5. In the Status Bar, verify that 🔲 (Absolute Mode) displays. In the *Transform Type-in* area, set the following, as shown in Figure 3–53:

• *X:* **-197'4"**

• *Y:* **-30'0"**

• *Z:* **-4'11"**

Figure 3–53

6. Press <Enter>.

7. In the Main Toolbar, click 🔲 (Select Object) to exit the **Move** transform operation.

8. Click 🔲 (Zoom Extents All).

9. In the **Perspective** viewport, use 🔲 (Orbit Point of Interest) and click to place a point on the building and then orbit around that point. Using **Pan** and **Zoom**, zoom into the parking lot and building area (as shown in Figure 3–54), and verify that the building is located on the building pad. Although the XREF had a different Unit Scale (feet), it scaled correctly to the active scene (in inches).

Figure 3–54

10. Save your work as **MyArchitectural Scene.max**.

Task 3 - Merging Objects.

1. Select **File>Import>Merge**. In the Merge File dialog box, select **Light Poles for Project1.max** from the *...\scenes* folder. Click **Open**.

2. In the Merge dialog box, click **All**, as shown in Figure 3–55. Click **OK**.
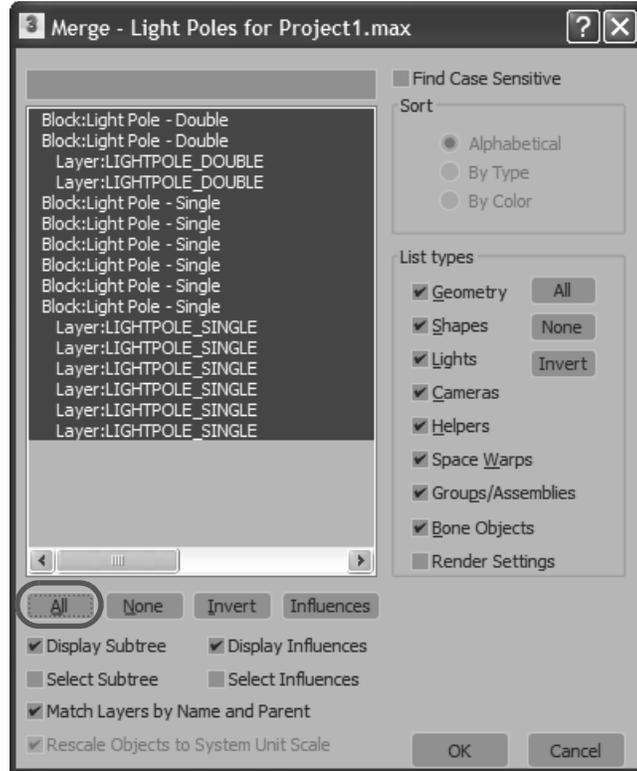

Figure 3–55

*Merge enables both objects to have the same name, **Skip** ignores the incoming object, and **Delete Old** removes the original object.*

3. The Duplicate Name dialog box opens, prompting you that an object with the same name already exists in the scene. Select **Apply to all Duplicates** and click **Auto-Rename**.

4. The light poles display in the scene, as shown in Figure 3–56.

Figure 3–56

5. Save your work.

Chapter Review Questions

1. The following file formats can be linked to the current Autodesk 3ds Max scene:

   a. .DWG, .OBJ, .APF, .FBX

   b. .DWG, .DXF, .FBX, .RVT

   c. .DWG, .DXF, .OBJ, .RVT

   d. .DWG, .OBJ, .FBX, .RVT

2. In the Manage Links dialog box, in the *Files* tab, which of the following options do you use to remove the link with the original linked file but maintain its geometry in the current scene?

   a. **Reload...**

   b. **Detach...**

   c. **Bind...**

3. Which command do you use to combine objects from a saved Autodesk 3ds Max scene (.MAX file) into your current .MAX scene?

   a. **Import**

   b. **Link**

   c. **Open**

   d. **Merge**

4. While linking Autodesk Revit files in the current Autodesk 3ds Max scene, which of the following options are provided in the Combine Entities List? (Select all that apply.)

   a. By Revit Material

   b. By Revit Layer

   c. As One Object

   d. By Revit Camera

5. When an entire .MAX scene is brought into the current scene using **XREF Scenes**, the XREF objects are selectable but cannot be modified.

   a. True

   b. False

Command Summary

Button	Command	Location
	Absolute Mode	• **Status Bar**
N/A	**Civil View**	• **Menu Bar:** Civil View
N/A	**Asset Tracking**	• **Menu Bar:** File>Reference
N/A	**Import**	• **Menu Bar:** File>Import
N/A	**Link AutoCAD**	• **Menu Bar:** File>Import
N/A	**Link FBX**	• **Menu Bar:** File>Import
N/A	**Link Revit**	• **Menu Bar:** File>Import
N/A	**Manage Links**	• **Menu Bar:** File>Reference
N/A	**Merge**	• **Menu Bar:** File>Import
	Select by Name	• **Main Toolbar**
	Select Object	• **Main Toolbar**
	Use Transform Coordinate Center	• **Main Toolbar**
N/A	**XRef Objects**	• **Menu Bar:** File>Reference
N/A	**XRef Scene**	• **Menu Bar:** File>Reference