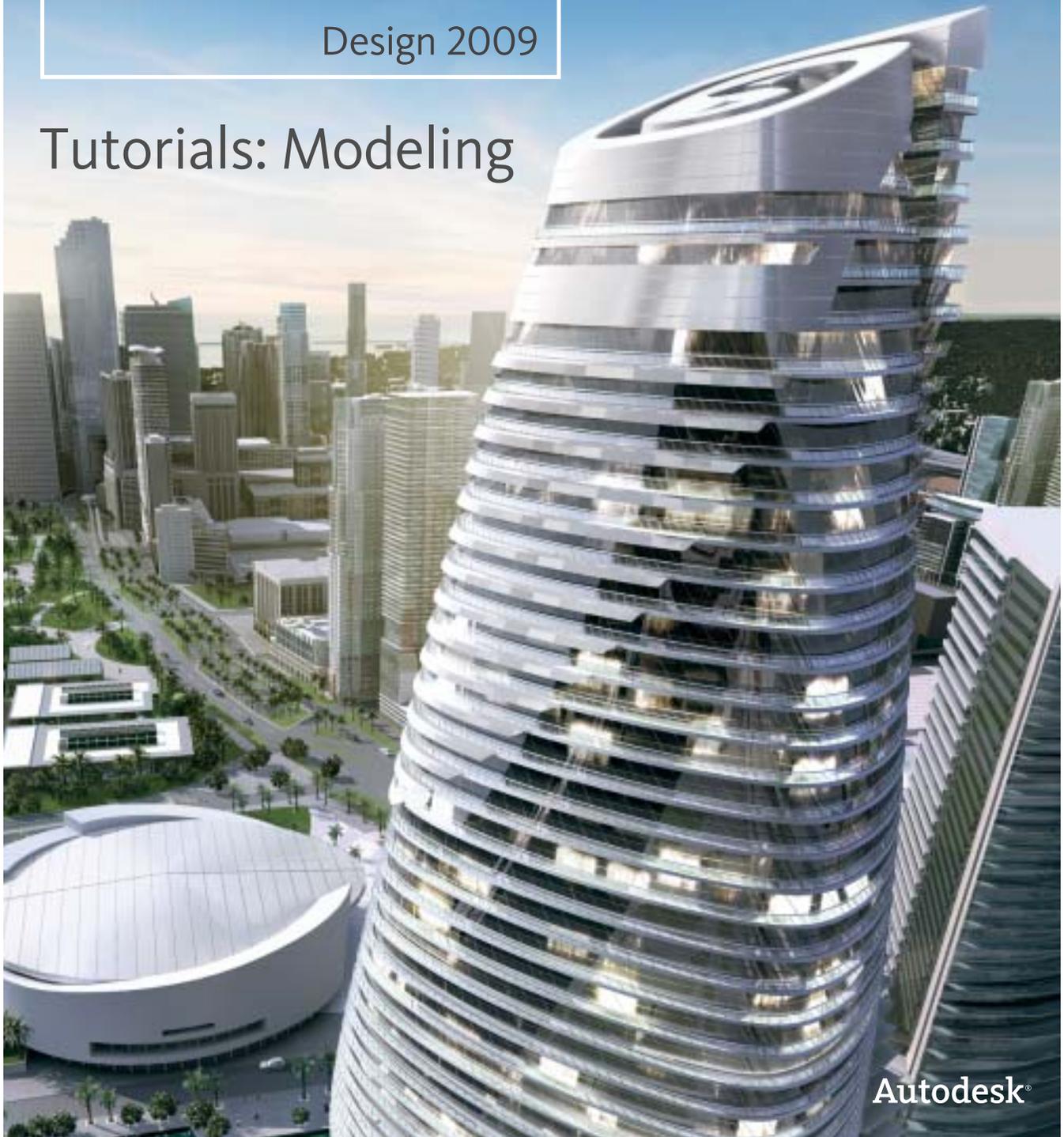


Autodesk® 3ds Max®

Design 2009

Tutorials: Modeling



Autodesk®

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Modeling Tutorials

3

The tutorials in this section show you how to use 3ds Max Design to create striking images of architectural concepts, all within a remarkably short period of time.

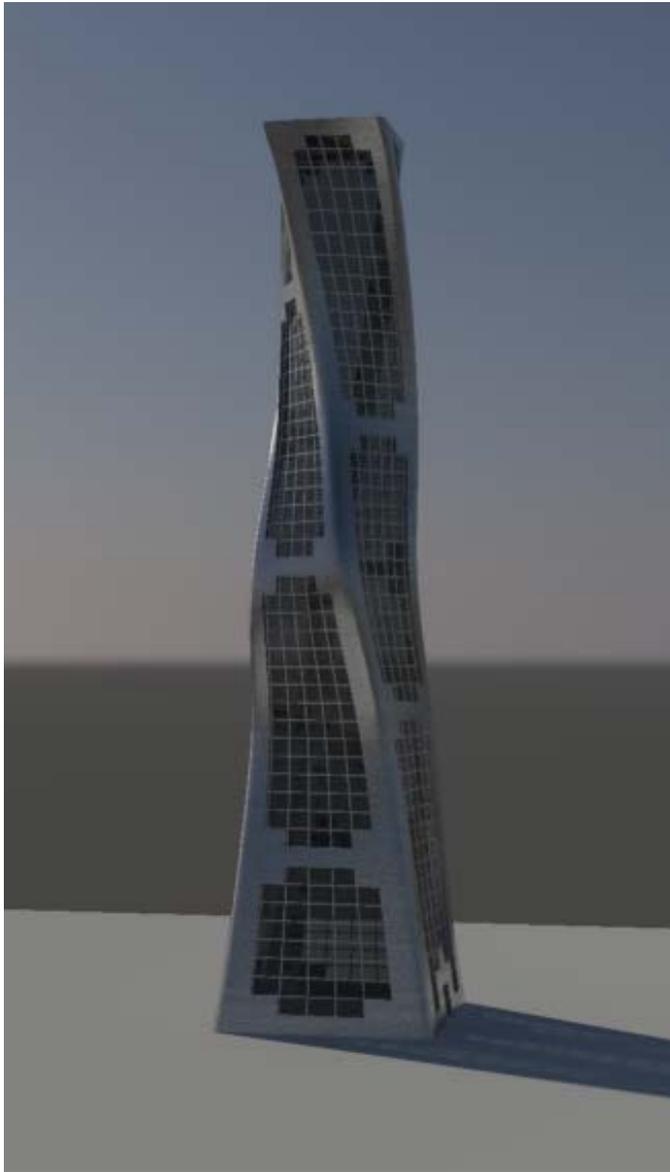
The first tutorial shows you how to give shape to an organically themed architectural model using several 3ds Max Design modifiers. In the second tutorial, you will quickly build a more linear structure using a number of Boolean operators. Both tutorials expose you to a number of useful polygon editing techniques.

Features Covered in This Section

- Creating primitive objects.
- Using modifiers to alter an object's shape.
- Clone objects to build complex geometry.
- Align objects.
- Create an array of objects.
- Use Boolean operators to change the shape of an object.
- Select and edit polygons and edges.
- Apply materials to polygons by their assigned material ID number.

Modeling Buildings Using Modifiers

In this tutorial, you will model a building with a distinctly organic design. Specially developed modifiers in 3ds Max Design make this task far easier than if it were attempted in a conventional CAD program.



In this tutorial, you will learn how to:

- Create simple geometry.
- Use the Twist, Taper, and FFD modifiers to alter geometry.

- Use polygon selection and editing techniques.
- Clone objects.
- Chamfer edges.
- Assign materials to objects.

Skill level: Beginner

Time to complete: 1 hour

Files for This Tutorial

All the files necessary for this tutorial are provided on the product DVD in the `\tutorials\modeling` directory. Before starting the tutorials, copy the `\tutorials\modeling` folder from the DVD to your local program installation.

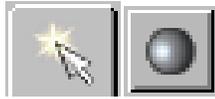
Creating the Tower

In this lesson, you will create the basic geometry of the model, then use 3ds Max Design modifiers to give the object a distinctive shape.

Create the tower object:

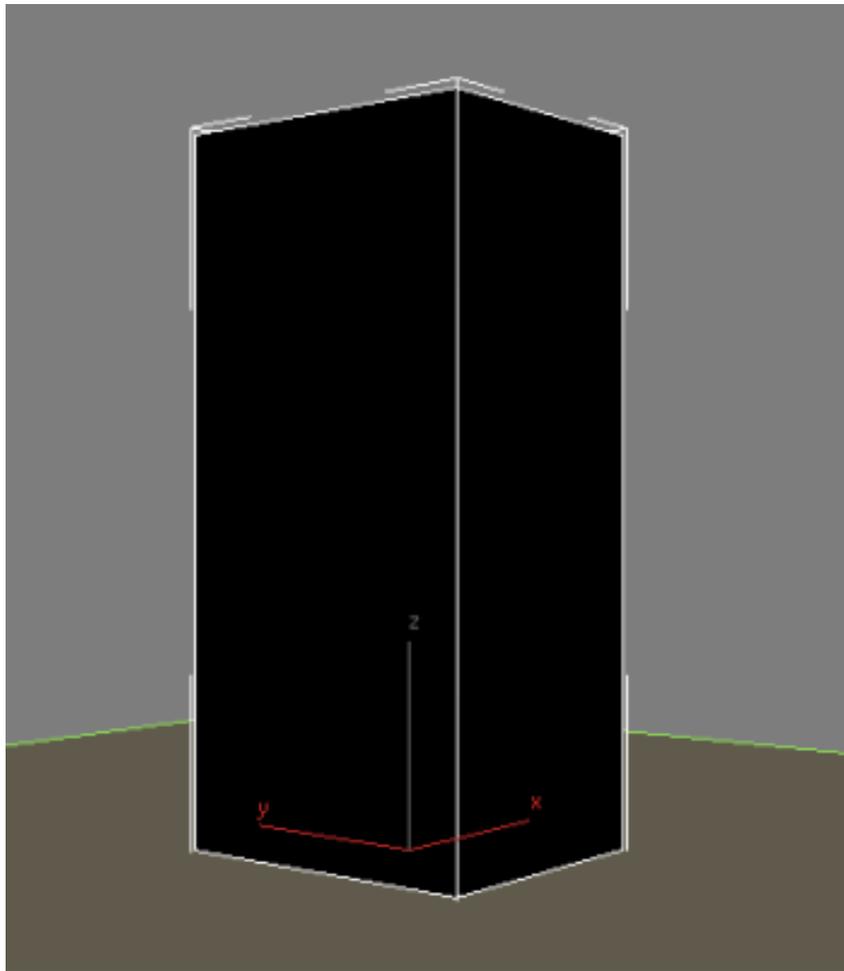
- 1 Choose File > Open to open *building 1 - start.max*.

A daylight system has already been set up, so you can start building your model right away.



- 2 On the Create panel, click the Geometry button, then in the Object Type rollout, click Box.
- 3 In the Perspective view, click and drag diagonally at the center of the ground object to set the width and depth of the box. Release the mouse button and drag upwards to set the height. Click a final time to complete the box.

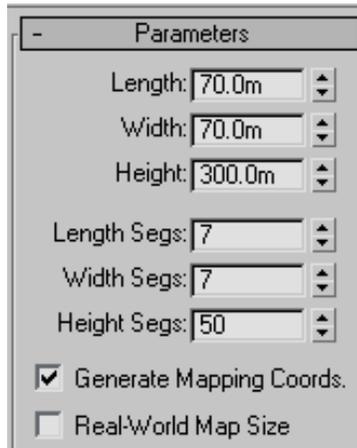
Do not worry about dragging the box to an exact width, depth, or height. You will set these parameters in the next step.



4 On the Modify panel > Parameters rollout, set the parameters of the box as follows:

- Length=70 m
- Width=70 m
- Height=300 m
- Length Segs=7

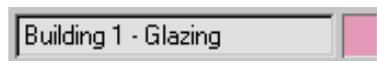
- Width Segs=7
- Height Segs=50



The segments are necessary to define the tower floor and window grid.

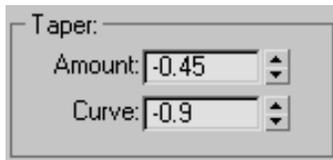
NOTE Normally, a building 300 meters in height would be divided into 100 height segments to create floors of three meters each, but in this tutorial the value is halved to make for easier polygon selection.

- 5 On the Name And Color rollout, change the name of the object to **Building 1 - Glazing**.

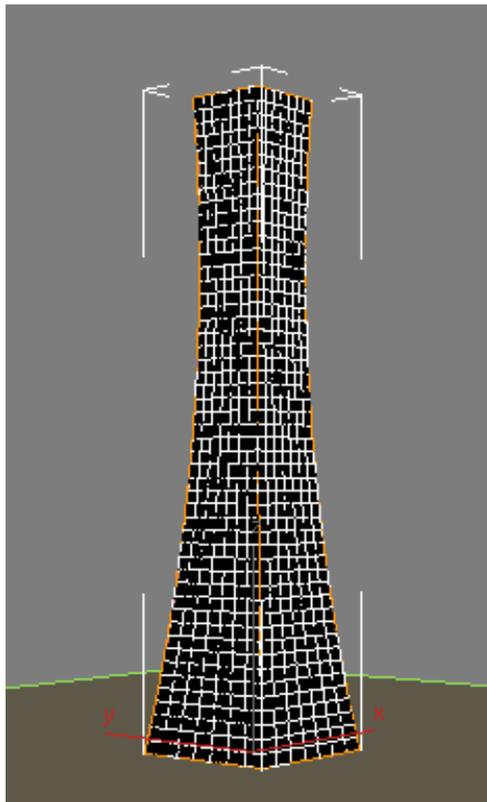


This name change is appropriate, since you will later be applying a glazing material to this object.

- 6 From the Modifier List > Object-Space Modifiers section, choose Taper.
- 7 On the Parameters rollout > Taper group, set Amount to **-0.45** and Curve to **-0.9**.

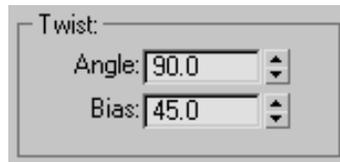


The negative taper amount tapers the building inwards at the top. The negative taper curve pulls the sides of the building in as shown in the next illustration.

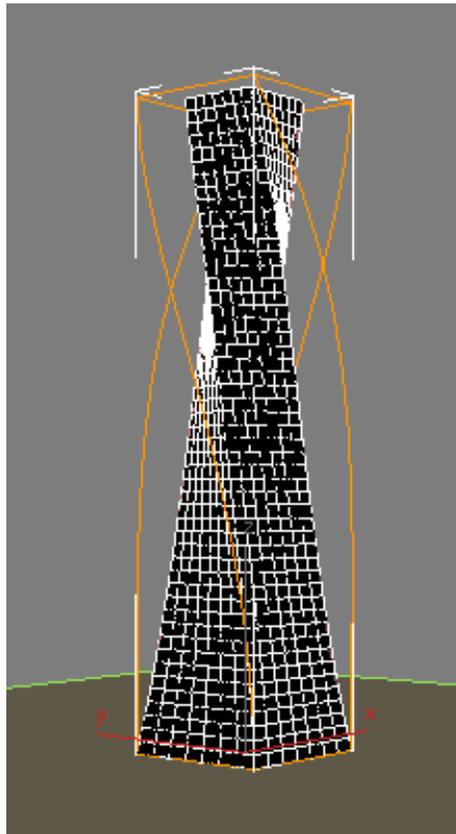


Next, you want to give the tower a twist.

- 8 From the Modifier List > Object-Space Modifiers section, choose Twist.
- 9 On the Parameters rollout > Twist group, set Angle to **90** and Bias to **45**.

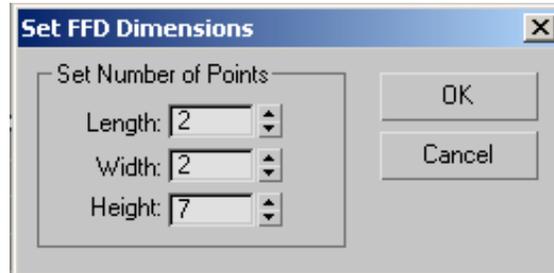


The 90-degree twist creates a quarter turn of the building. The bias of 45 causes the twist to start part-way up the side of the building, rather than immediately at its base.



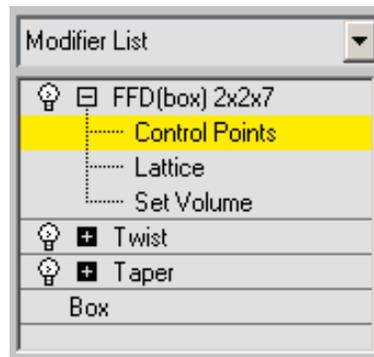
- 10 To give the building a serpent-like quality, from the Modifier List, choose FFD (Box). FFD modifiers surround the selected geometry with an adjustable lattice box.
- 11 On the FFD Parameters rollout > Dimensions group, click Set Number Of Points.

- 12 In the Set FFD Dimensions dialog, set the parameters as follows to set the number of control points for the lattice used to deform the structure:
 - Length=2
 - Width=2
 - Height=7



- 13 In the Modifier stack, expand the FFD (Box) modifier and choose Control Points.

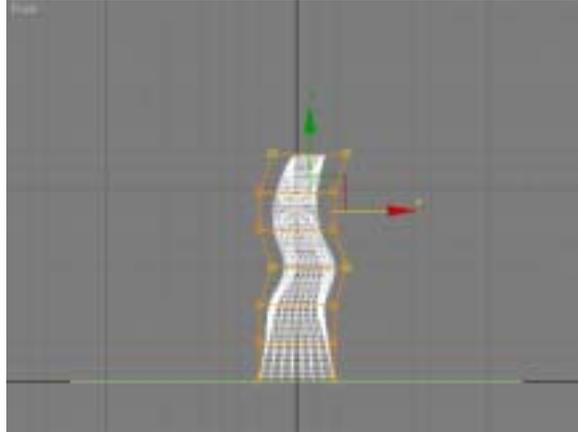
This lets you select and manipulate the lattice control points you defined in the previous step.



- 14 In the Front view, create the serpent effect by holding Ctrl and selecting the top and fourth row of control points.



- 15 Enable the Move tool and drag right slightly, as shown in the next illustration.



- 16 Exit the FFD Control Point sub-object level by clicking the main modifier entry: FFD (Box) 2x2x7 in the Modifier stack.

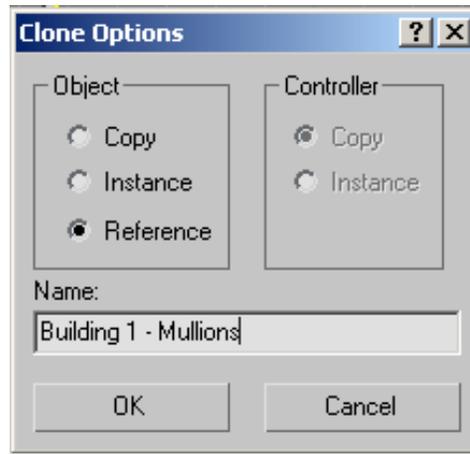
Now you are ready to create the mullions.

Adding the Mullions

You will start by cloning the object you created in the previous lesson. You will then take the clone, which retains twist, taper, and FFD modifiers, and use polygon editing techniques to create the structure's mullions.

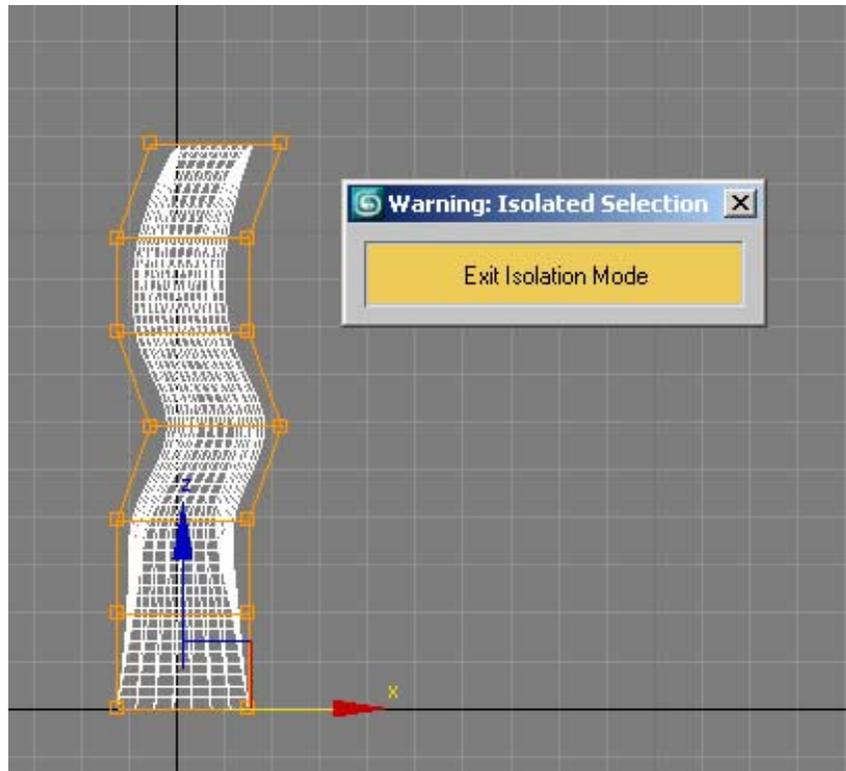
Create the mullions for the building:

- 1 Continue working on the your scene from the previous lesson, or choose File > Open to open *building 1 - glazing.max*.
- 2 Select the glazing object (the tower) and from the menu bar choose Edit > Clone. In the Clone Options dialog > Object group choose Reference and change the name of the object to **Building 1 - Mullions** and click OK.



As a reference, the newly created mullions object behaves in a specific way. Any subsequent edits to the mullions object will not affect the glazing object. However, if you modify the glazing object, the mullions object will be affected. This way, any changes to the modifiers that affect the tower structure, which were created in the glazing object, can be carried forward to the mullions. But any polygon edits intended to affect the mullions only, will not affect geometry in the glazing object.

- 3 If the mullions object was cloned as a *copy* instead of a reference, it would be completely independent of the original.
If the mullions object was cloned as an *instance*, it would be completely dependent on the original, and vice versa: any subsequent edits made to either object would affect the other.
- 4 With the *Building 1 - Mullions* object selected, right-click the viewport, and from the quad menu, choose Isolate Selection.



Isolation mode ensures you are working on the correct object.

You now want to take the polygons that form the window grid and modify them to take on the characteristics of mullions. You will do so using the Edit Poly modifier.

- 5 From the Modifier List, choose Edit Poly.



Notice how a grey bar is inserted between the newly added Edit Poly modifier and all other modifiers. The bar indicates that all modifiers

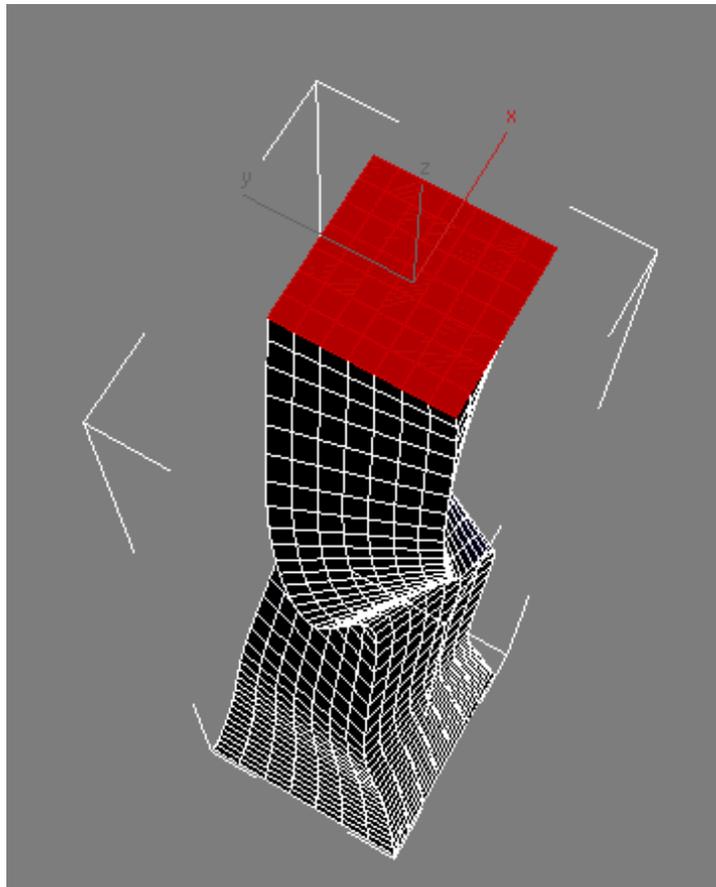
above the bar affect the reference object only and will not affect the original object. This way, you can keep on modifying the mullions object without affecting the glazing object.

Next, you will remove some unneeded polygons.

- 6  Activate the Perspective viewport. Zoom, orbit, and pan until the roof of the tower is clearly visible, and then on the Selection rollout, click the Polygon button.



- 7  Select the middle polygon on the roof. On the Selection rollout, click Grow repeatedly until you have selected the entire roof. Press Delete to remove all the selected polygons.

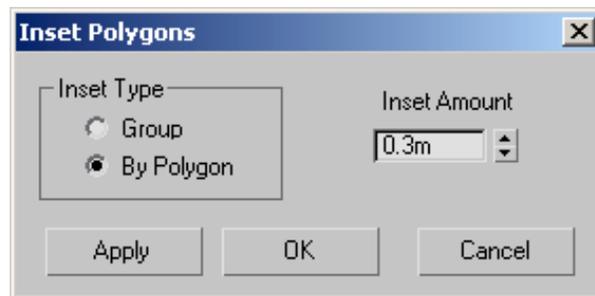


- 8** Repeat the previous two steps to remove the polygons that make up the bottom of the building.
You will now create insets out of the remaining polygons, which you will use as the window mullions.
- 9** Press Shift+Z repeatedly to undo the viewport changes, and can now see the entire building in the Perspective viewport, again.
- 10** Press Ctrl+A to select all the polygons in the building.
- 11** On the Edit Polygons rollout, click the settings button next to the Inset button (just to the right).

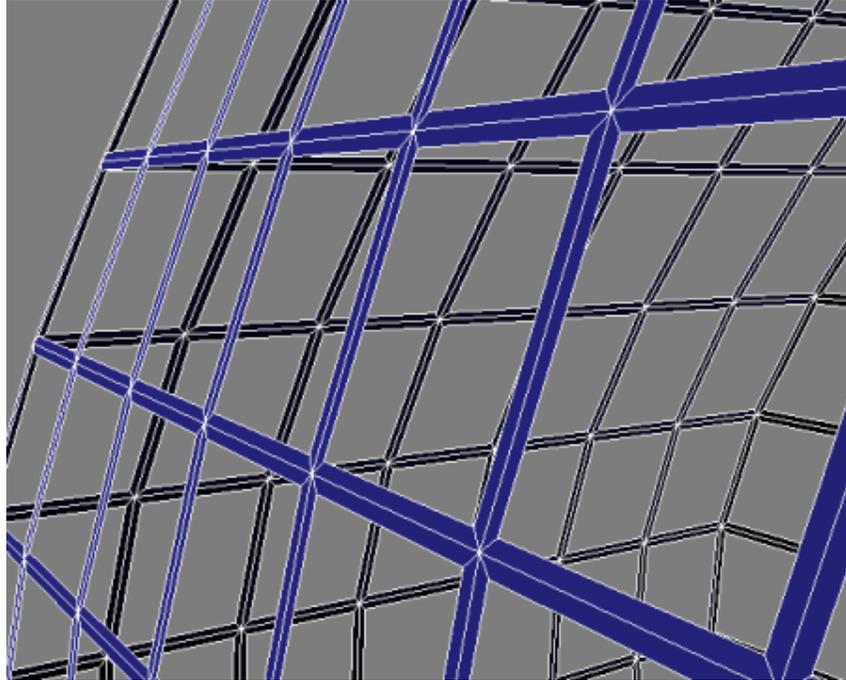


- 12 On the Inset Polygons dialog > Inset Type group, choose By Polygon and set Inset Amount to **0.3 m**. Click OK.

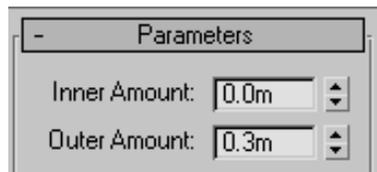
The By Polygon option applies the inset poly edit to each polygon in the selection.



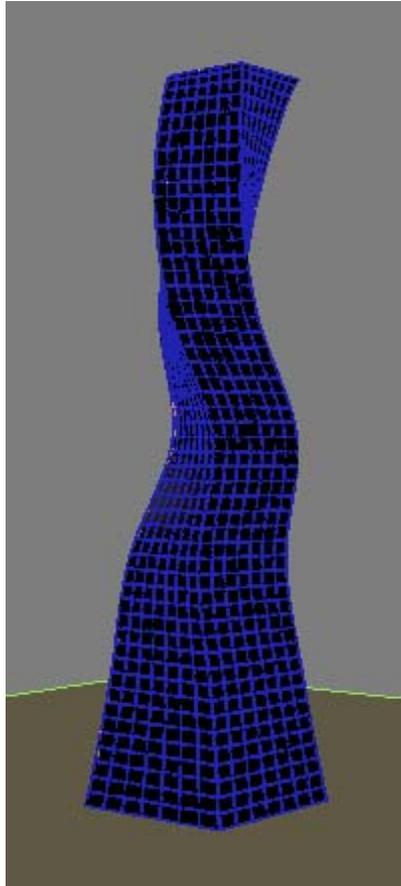
- 13 Press Delete to remove the selected polygons and keep their insets.
- 14 On the Selection rollout, click the Polygon button to exit polygon selection mode.
- 15 In any viewport, zoom in to the mullions you just created.
The mullions appear as thin, two-dimensional faces. You need to give them some thickness.



- 16** From the Modifier List > Object-Space Modifiers section, choose Shell. On the Parameters rollout, set Outer Amount to **0.3**.



- 17** In the Warning: Isolated Selection dialog, click Exit Isolation Mode to view the glazing and mullion objects together.



You are now ready to create the structure's metallic shell.

Creating the Metallic Shell

In this lesson, you will create another reference object and apply additional polygon editing techniques that will cloak the building in a metallic shell.

Create a metallic shell for the building:

- 1 Continue working on your scene from the previous lesson or choose File > Open to open *building 1 - mullions.max*.

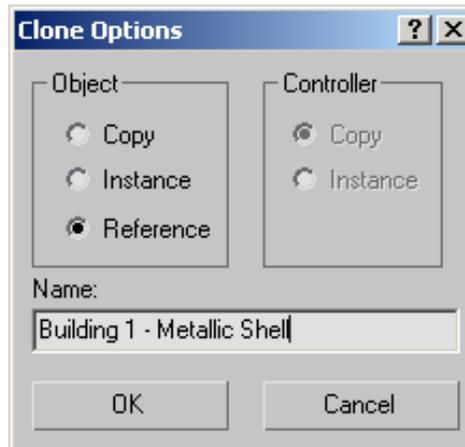
You will start by temporarily deactivating the modifiers on the glazing object, so you can work with the polygons of the shell object more easily.



- 2 Press H and use the dialog to select the *Building 1 - Glazing* object. On the Modify Panel, in the Modifier stack, click the light-bulb icons to the left of each modifier to turn off the effect of these modifiers.



- 3 From the menu bar, choose Edit > Clone. In the Clone Options dialog > Object group, choose Reference and change the name of the object to **Building 1 - Metallic Shell**.



- 4 With the shell object selected, right-click the active viewport and from the quad menu, choose Isolate Selection.
- 5 From the Modifier List, choose Edit Poly.

- 6    Right-click the Perspective viewport if it is not already active. Zoom, orbit, and pan until the bottom of the building is clearly visible.

- 7  On the Selection rollout, click the Polygon button to turn it on.

- 8  Select the middle polygon on the bottom of the building. On the Selection rollout, click Grow repeatedly until you have the entire bottom selected. Press Delete to remove the polygons.

You now need to remove additional polygons to create the window pattern on the building exterior.

- 9 Press Shift+Z repeatedly to undo viewport changes until you can see the entire building again.
- 10 In the Perspective view, click Front on the ViewCube.

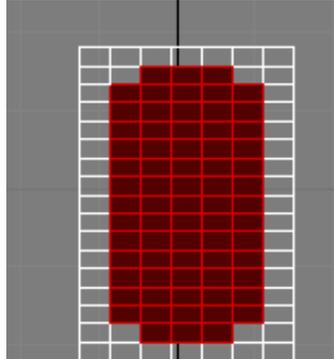
NOTE If the ViewCube is not visible in your viewports, from the main menu choose Views > Viewport Configuration > ViewCube tab > Display Options group > Show The ViewCube.

- 11 Press Alt+W to maximize the viewport.

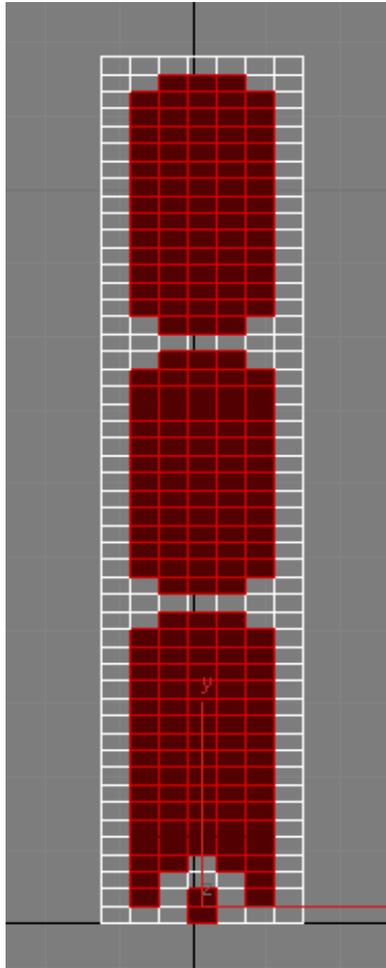
- 12  Turn on Select Objects. Ctrl+click+drag to select a 5x15 grid of polygons in the upper portion of the model, leaving one row of polygons unselected at each edge of the building.

This selects polygons on both the front and back faces of the model.

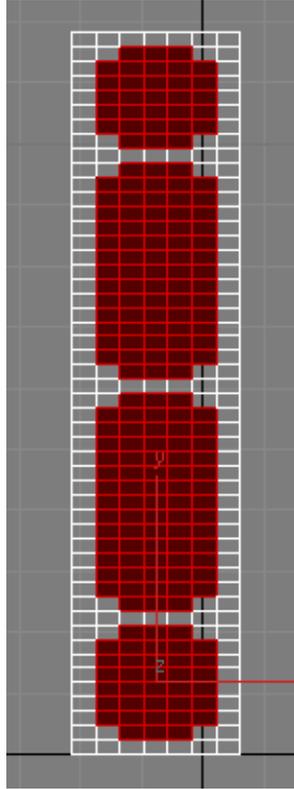
- 13 Alt+drag to select each corner polygon, as shown in the illustration. This removes the selected polygons on the front and back faces of the model.



- 14 Ctrl+click+drag to select the remaining polygons, as shown in the next illustration. Use the Alt+drag technique to remove polygons from the corners as needed.



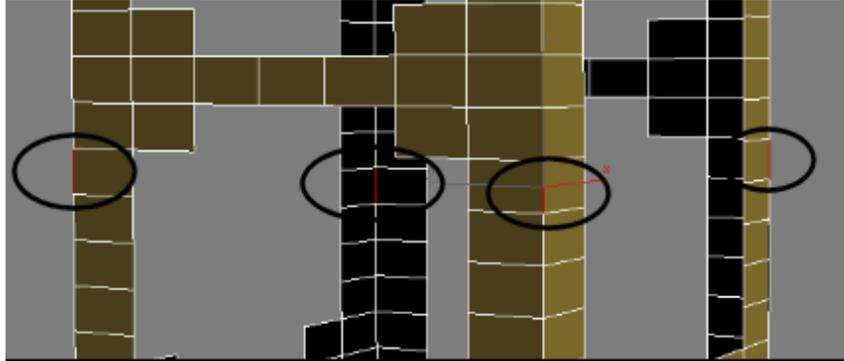
- 15** Press Delete to delete all of the selected polygons on the front and back of the building.
Next, you will select the polygons on the side of the building, changing the pattern slightly.
- 16** Click the Left face of the ViewCube and begin removing polygons following a pattern of 5x7, 5x15, 5x15, and 5x8 as shown in the next illustration.



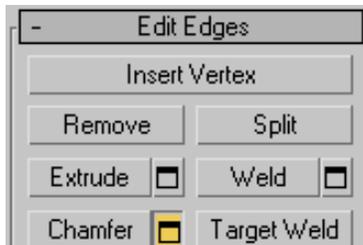
- 17 Press Delete to delete the polygons, then activate the Perspective viewport. Next, you will edit the building edges to give them a rounded look.
- 18 From the Selection rollout, choose the Edge sub-object level.



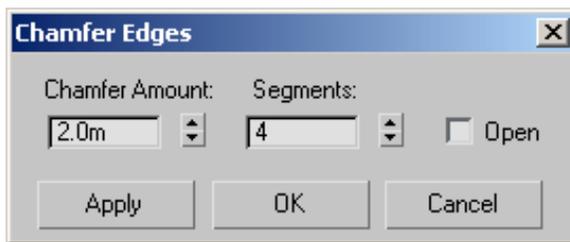
Hold down Ctrl and select four vertical polygon edges, one on each corner of the building.



- 19 On the Selection rollout, click the Loop button. This selects all four edges of the building in their entirety.
- 20 On the Edit Edges rollout, click the settings button next to the Chamfer button (just to the right).



- 21 On the Chamfer Edges dialog, set Chamfer Amount to **2.0m**. This sets the width of the bevel created by the chamfer operation. Set Segments to **4**, to divide the beveled region into four segments. The more segments you set, the more rounded the edge. Click OK.



- 22 Exit Edge selection mode by clicking the Edge sub-object level button again.

- 23 From the Modifier List, add a Shell modifier and on the Parameters rollout, set Outer Amount to **2.0m**.

This gives the metallic shell a thickness of two meters.

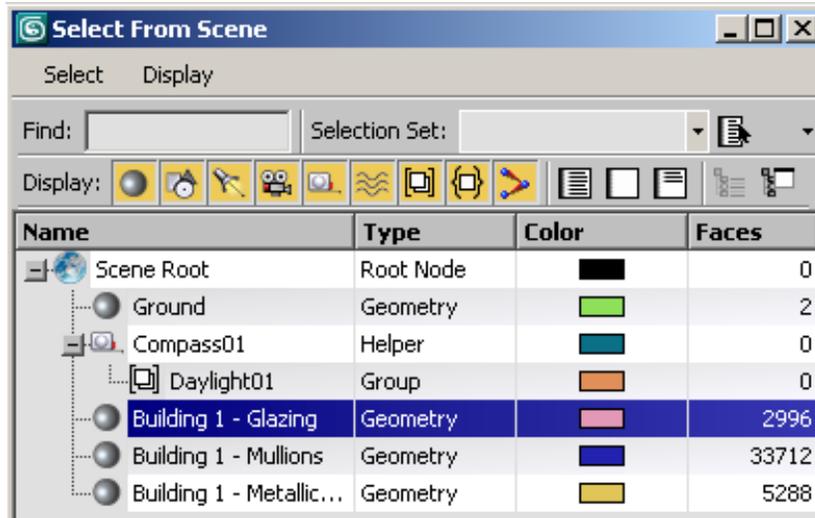
Now, let's look at the building with the modifiers applied.

- 24 Exit Isolation Mode.
- 25 Click Alt+W to view all four viewports again.
- 26 On the Modifier Stack, turn on the three modifiers you turned off earlier: FFD, Twist, and Taper.

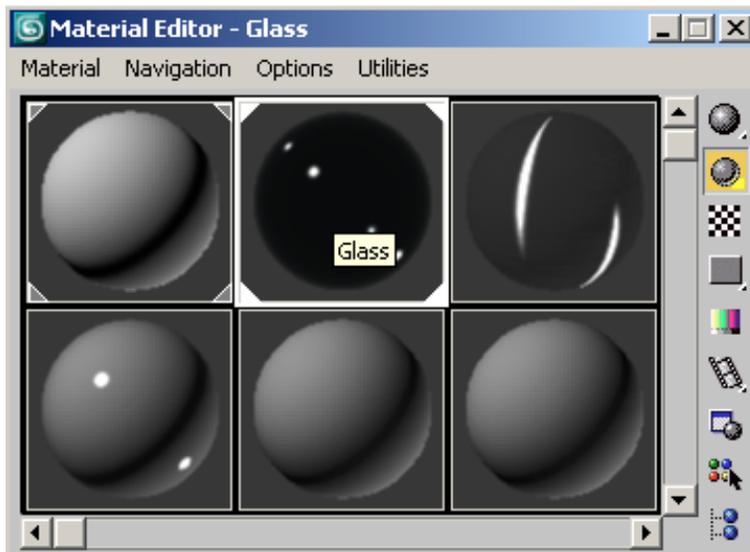


The modeling phase of the building is now complete. Next, you will add materials to the building exterior.

- 27 Press M to open the Material Editor.
- 28 Press H and on the Select From Scene dialog, highlight the *Building 1 - Glazing* object, and then click OK.



In the Material Editor, select the Glass material.



- 29  Click Assign Material To Selection to apply the Glass to the glazing object.

- 30 On the Select From Scene dialog, select the *Building 1 - Mullions* object, and then in the Material Editor, apply the material called Mullions.
- 31 On the Select From Scene dialog box, select the *Building 1 - Metallic Shell* object and apply the material called Metal.



- 32 Make sure the Perspective viewport is active, then click Render to check your work.

Your scene should look something like this:



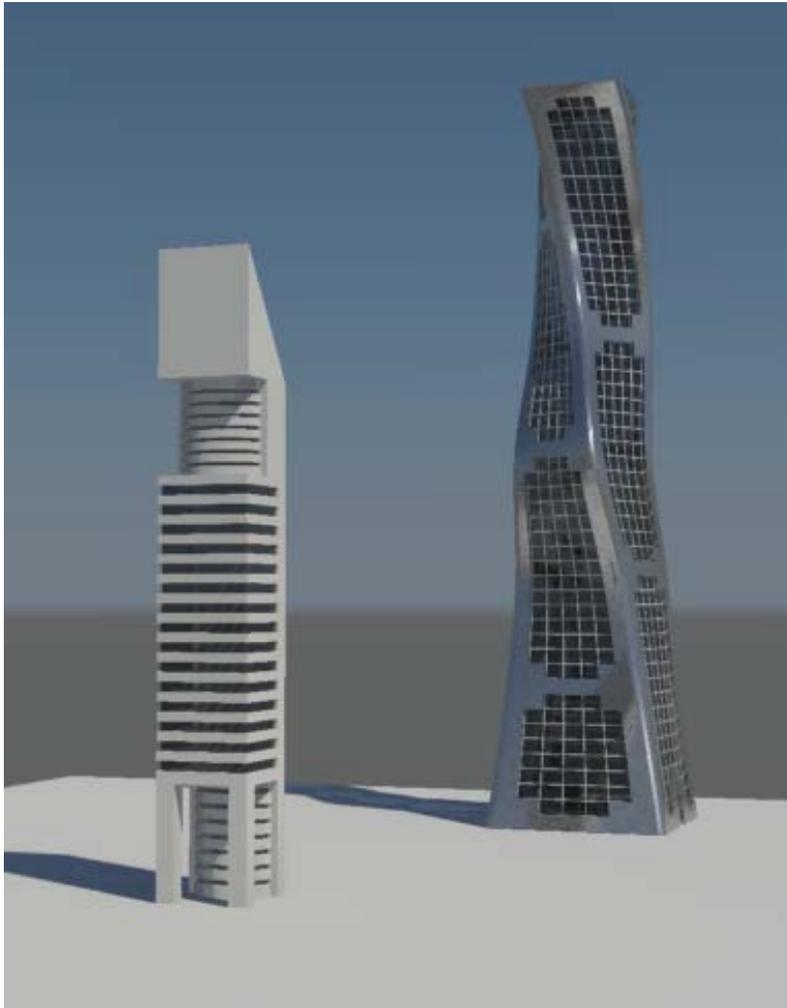
- 33** Save your file and name it **mybuilding 1 - final.max**.
You can use this scene file as your starting point in the tutorial called Modeling Buildings Using Boolean Operations.

Modeling Buildings Using Boolean Operations

Boolean operations are an effective way to create complex shapes out of simple geometric objects. In the case of 3ds Max Design, the Boolean operators are Subtraction, Union, Intersection, and Merge.

In this tutorial, you will learn how to use two Boolean operators, Subtraction and Union, to create an avant-garde model of a sky scraper.

The remaining steps in this tutorial show you how to use the Align tool to accurately move objects into position. You will also learn how to use material ID numbers to instantly assign materials to multiple portions of a model.



In this tutorial, you will learn how to:

- Create simple geometry.
- Align objects.
- Move objects using their XYZ coordinate values.
- Create an array of objects.
- Use Boolean operators to change the shape of an object.

- Select multiple polygons and edges.
- Edit polygons to create beveled and extruded shapes.
- Assign materials IDs to object polygons.
- Apply materials to object polygons by material ID number.

Skill level: Beginner

Time to complete: 1.5 hours

Files for This Tutorial

All the files necessary for this tutorial are provided on the product DVD in the `\tutorials\modeling` directory. Before starting the tutorials, copy the `\tutorials\modeling` folder from the DVD to your local program installation.

Creating the Floors

In this lesson, you will create the basic geometry of the model, then create an array of objects that you will use in a Boolean subtraction operation to create a set of floors in the building midsection.

Create the floors for the building:

- 1 Continue working on the your completed scene from the previous tutorial, or choose File > Open to open *building 2 - start.max*.
- 2 Press to Alt + W to maximize the Perspective viewport if it is not already maximized.

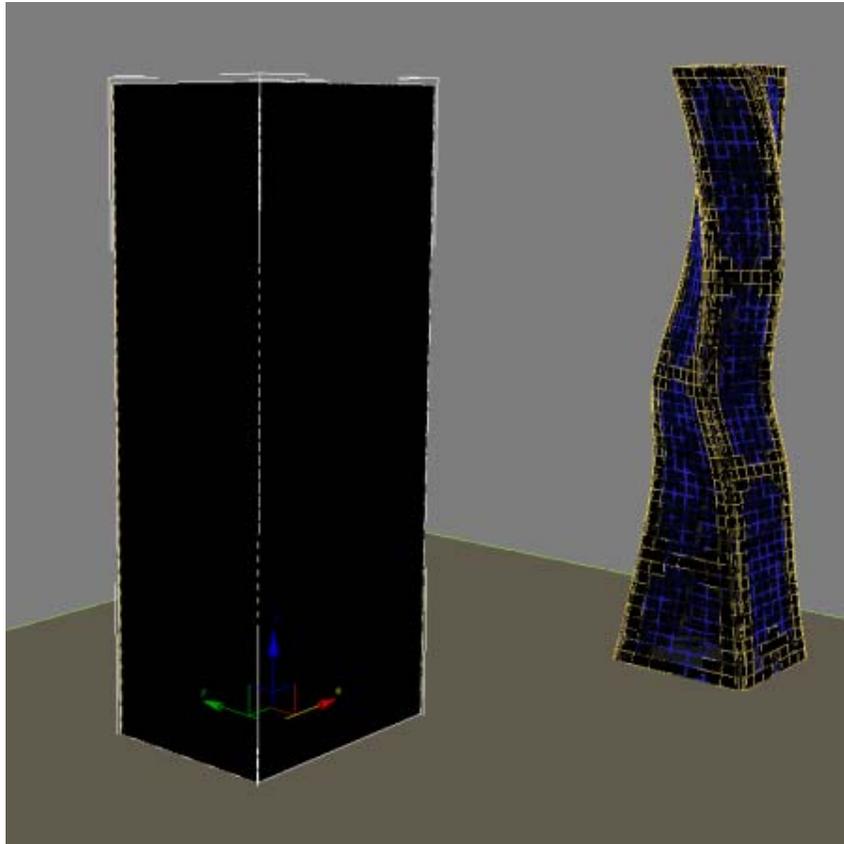


- 3 Use the Select And Move tool to select the three objects that comprise the architectural model and move them to the right on the *Ground* object.



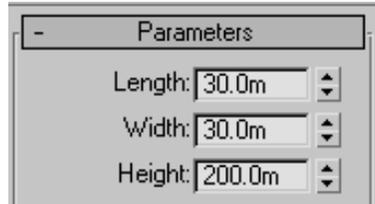
- 4 On the Create panel, click the Geometry button, then in the Object Type rollout, click Box.

- 5 At the center of the ground object, click and drag diagonally to set the width and depth of the box. Release the mouse button and drag upwards to set the height. Click a final time complete the box.
- Do not worry about dragging the box to an exact width, depth, or height. These parameters will be set in the next step.



- 6  On the Modify panel > Parameters rollout, set the parameters of the box as follows:
- Length=30 m
 - Width=30 m
 - Height=200 m

Make sure the Length Segs, Width Segs, and Height Segs fields are all set to 1.



Now that you have defined the footprint of your tower model, you are ready to define the floors in the mid-section of the structure.

- 7  Press to Alt + W to switch see all four viewports, and in the Top viewport, zoom in to the top of the *Box01* object (the tower object you just created).

- 8   Go to the Create panel, then drag out a second box so that it is larger on three sides than the *Box01* object, as shown in the next illustration.

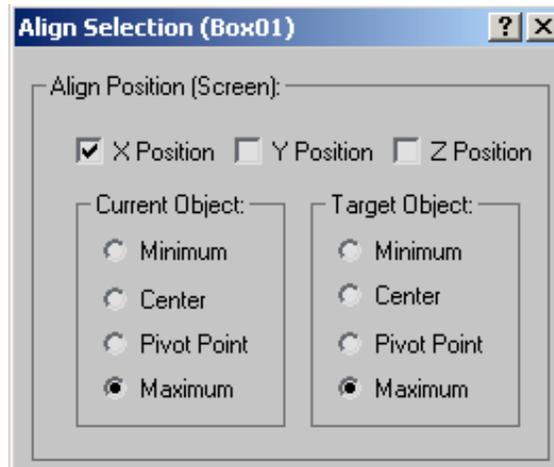
The height of the box object is not important.



- 9 This object, *Box02*, will be used to define the tower floors. You now need to align its right side with the right side of the tower object.



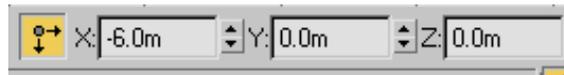
- 10 With the *Box02* object selected, click the Align tool, then choose the *Box01* object.
- 11 In the Align Selection dialog > Align Position group, turn on X Position, so that only the left-right positioning of the two objects is set for alignment.
- 12 In the Current Object group, turn on Maximum and in the Target Object group turn on Maximum. (Choosing Minimum for both Current and Target objects would align the two boxes on their left sides.) Click OK.



- 13 Next, you need to move the aligned side of *Box02* to the left by six meters. To do so, you should first switch the coordinate display from absolute values to local values. Absolute values display the scene in world space, a universal coordinate system for all objects in the scene. World space is constant and immovable. Local values use the coordinate system of the selected object.



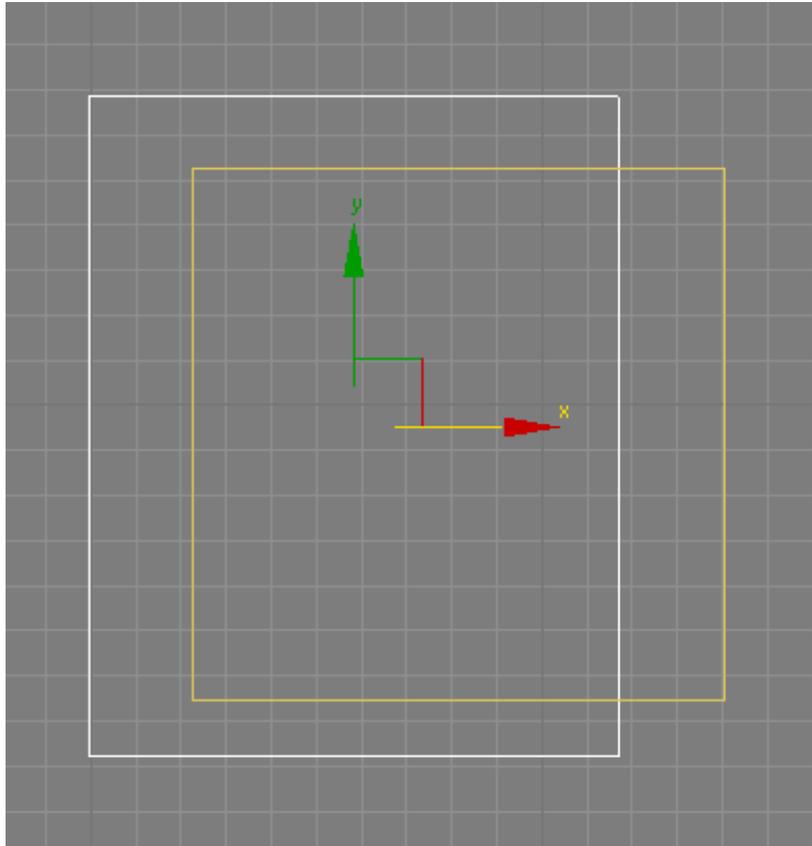
Click the coordinate display button to switch the display from Absolute Mode Transform to Offset Mode Transform.



In Offset Mode, the XYZ coordinate values reset to local values, which is 0.

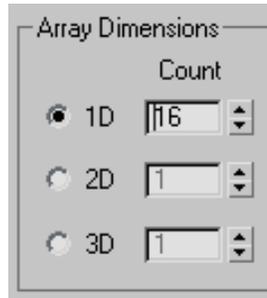


- 14 Select the *Box02* object, then type **-6** in the X coordinate display box and press Enter. The box automatically repositions itself six meters to the left.



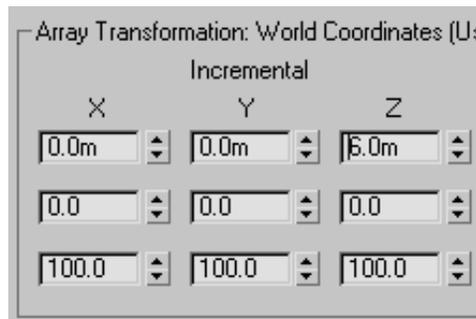
- 15** In the Modify panel > Parameters rollout, set the height of the box to **3.0m**, the standard height for a typical floor of a building.
- 16** You want the first floor to start at an elevation of 40 meters, so in the Z coordinates display box, type **40**. This will become the first floor of a total of 15 that will form the midsection of the model.
You will now create an array of boxes that you will later use in a Boolean operation to create all floors above the current one.
- 17** Right-click the Perspective viewport, press Alt+W to maximize it, and from the main menu, choose Tools > Array.

- 18 In the Array dialog > Array Dimensions group, type **16** in the 1D spinner box.

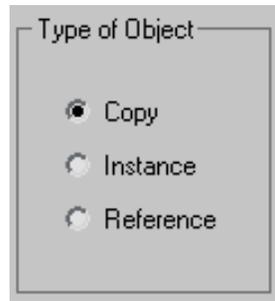


This creates an array of 16 objects to be spread out in one dimension. You want to build your array vertically.

- 19 In the Array Transformation World Coordinates group > Incremental column go to the Move row, find the Z-axis spinner, and type **6.0**.
- 20 A distance of six meters in Z space is inserted between each object in the array. This corresponds to the height differential you want to establish between each floor in the building.



- 21 In the Type Of Object group, choose Copy. Use Copy instead of Instance because one of the array objects will be resized to a height different to the others.



- 22** Click Preview to see how the array will be placed, then click OK to confirm the placement.

- 23 The top array object is already selected and ready for editing. On the Parameters rollout, set Height to **30.0**. This box will be used in the next lesson to create a gap in the top segment of the tower.

Adding Detail to the Upper Floors

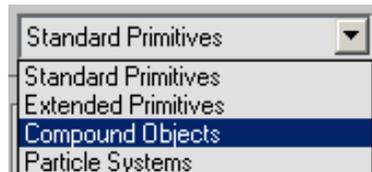
Now that all the array objects have been created, you can use them in Boolean operations to define the tower contours.

Add detail to the upper floors:

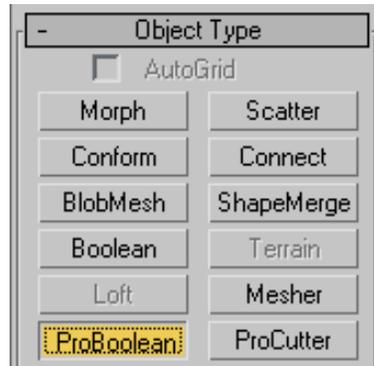
- 1 Continue working on your scene from the previous lesson, or choose File > Open to open *building 2 - floors.max*.
- 2 Maximize the Perspective viewport (if it isn't maximized already), select the *Box01* object, and on the Name And Color rollout, rename it **Tower**.



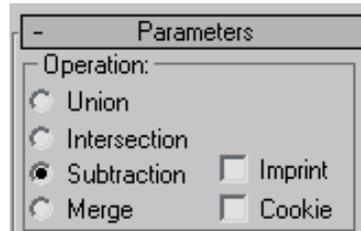
- 3  On the Create panel > Geometry tab, choose Compound Objects from the drop-down list.



- 4 On the Object Type rollout, click ProBoolean.



- 5 On the Parameters rollout > Operations group, choose Subtraction, if it is not already chosen.

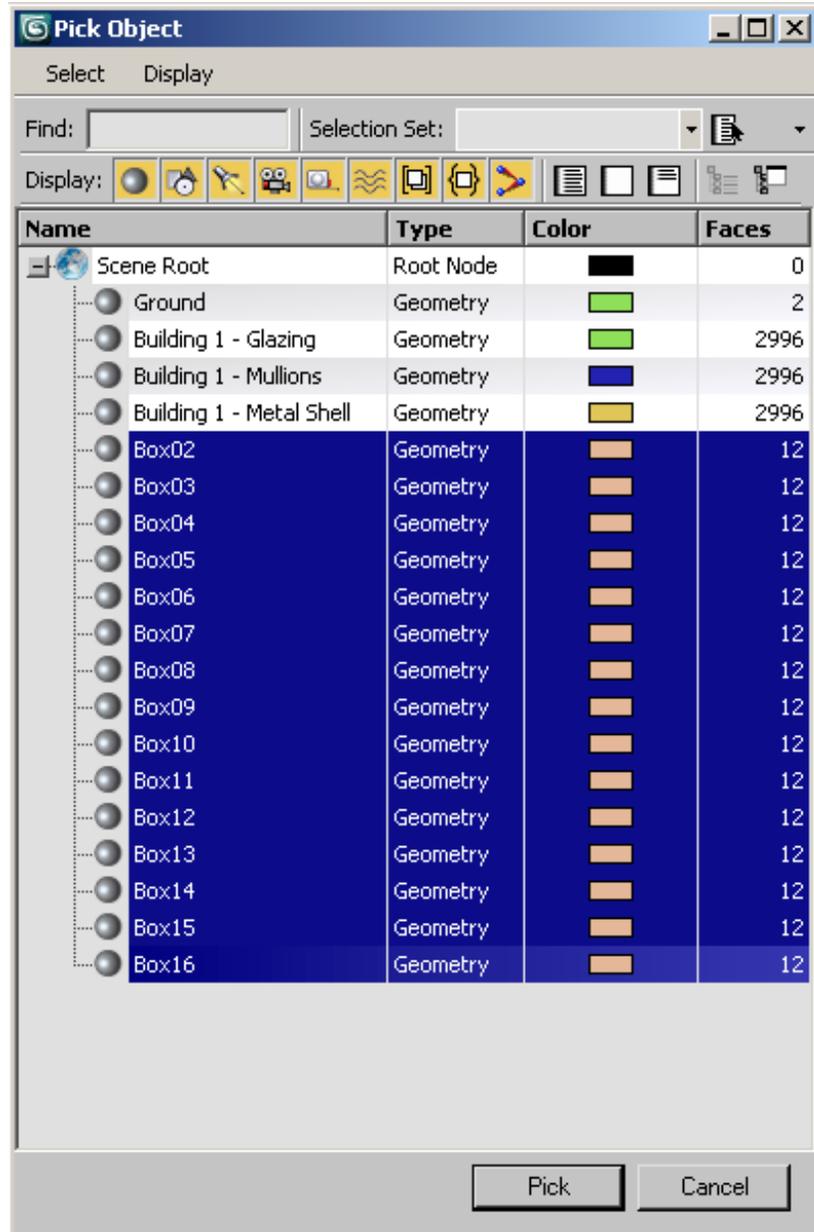


- 6 On the Pick Boolean rollout, click Start Picking and select the large array box at the top of the tower.



The subtraction Boolean operation subtracts the common area shared by the array box and the *Tower* object. You will later add a design element in the gap you just created.

- 7 Press **H** and on the Pick Object dialog box, select all Box objects and click Pick.



The subtraction operation creates gaps for all the selected array boxes.

- 8 On the Pick Boolean rollout, exit pick mode by clicking the Start Picking button again to turn it off.

Next, you need to introduce recessed glazing to the first 15 floors created by the Boolean subtraction.



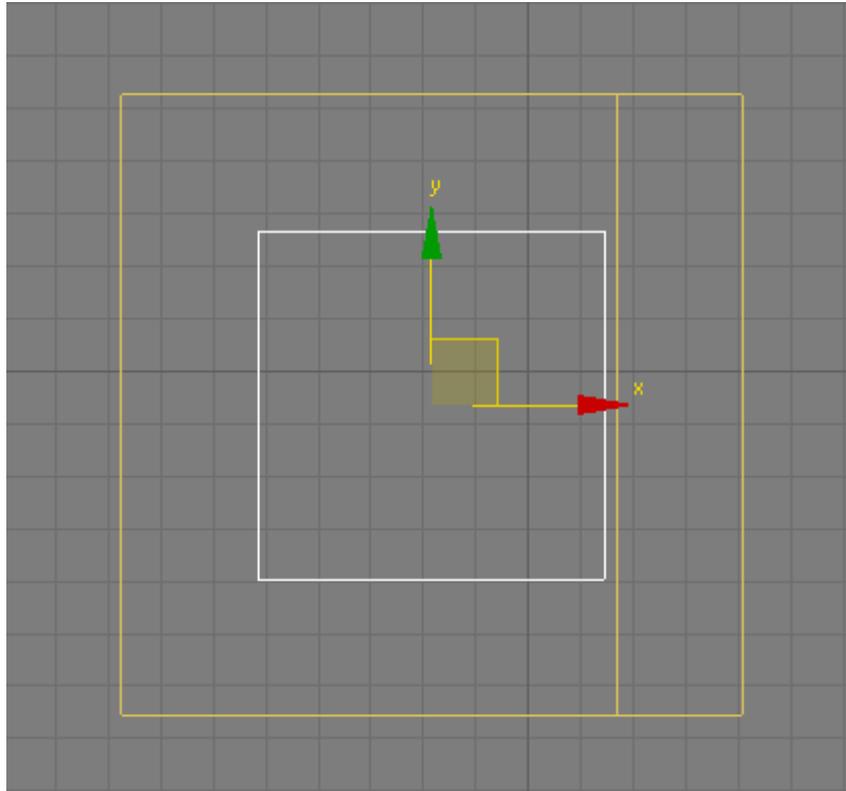
- 9 On the Create panel, Geometry tab, choose Standard Primitives from the drop-down list. On the Object Type rollout, click Box.

- 10 Activate the Top viewport and drag out a box within the tower. Exact dimensions are not important at this point.



- 11 Click the Align tool, then select the *Tower* object to display the Align Selection dialog.

- 12 In the Align Position group, turn on X Position and Y Position, then turn on Center for both the Current Object and Target Object groups. This aligns the box you just created to the center of the *Tower* object, as shown in the next illustration.



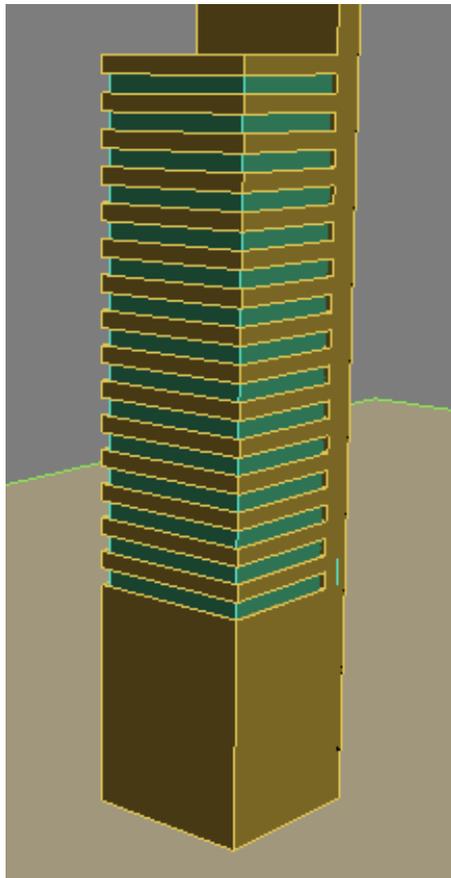
13 Click OK to exit the Align Selection dialog.



14 On the Modify panel > Parameters rollout, set the dimensions of the box as follows:

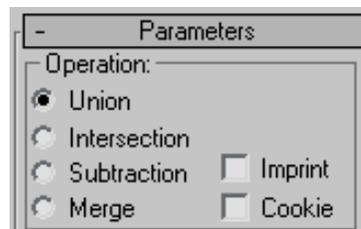
- Length=**28 m**
- Width=**28 m**
- Height=**128 m**

This creates a box object that is two meters inset from the outer walls of the tower, with a height that stops just short of the gap in the tower's upper structure.



The next Boolean operation will join the newly-created box object to the *Tower* object.

- 15 Select the *Tower* object and from the Parameters rollout > Operations group choose Union.



- 16 From the Pick Boolean rollout, click the Start Picking button and select the box you just created. The box is now incorporated into the *Tower* object.
- 17 Click the Start Picking button again to turn it off.

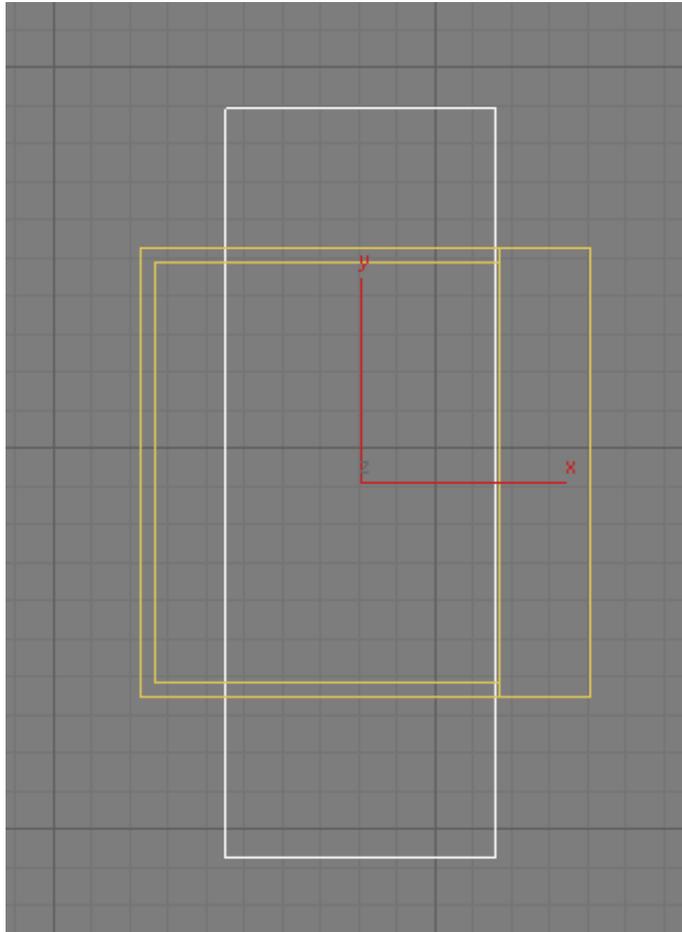
Defining the Lower Floors

In this lesson, you will use the subtraction Boolean operation to add openings to the lower floors of the building.

Add an opening to the building entrance:



- 1 On the Create panel, click the Geometry button, then in the Object Type rollout, click Box.
This box will be used in a subtraction operation to create an opening for the left and right sides of the building.
- 2 Activate the Top view, drag to create a box as shown in the following illustration, with the upper and lower ends of the box protruding from the top and bottom sides of the *Tower* object. Exact dimensions are not important at this point.



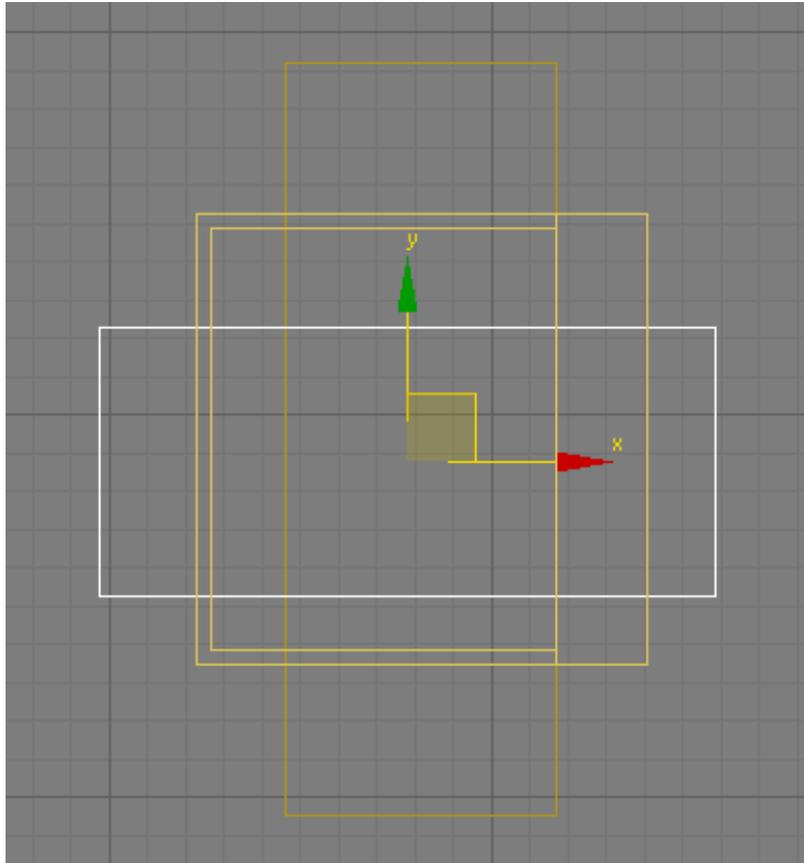
3 On the Modify panel > Parameters rollout, set the dimensions of the box as follows:

- Length=**50 m**
- Width=**18 m**
- Height=**36 m**

- 4  Click the Align tool, then select the *Tower* object to display to Align Selection dialog box.
- 5 In the Align Position group, turn on X Position and Y Position, then turn on Center for both the Current Object and Target Object groups. This aligns the box you just created to the center of the *Tower* object. Click OK.

Next, you need to create a second box that will be used in a subtraction operation to create an opening for the front of the building.

- 6   On the Create panel, click the Geometry button, then in the Object Type rollout, click Box.
- 7 Activate the Top view, drag to create a box as shown in the following illustration, with the ends of the box protruding from the left and right sides of the *Tower* object.



- 8  On the Modify panel > Parameters rollout, set the dimensions of the box as follows:
 - Length=**18 m**
 - Width=**41 m**
 - Height=**36 m**

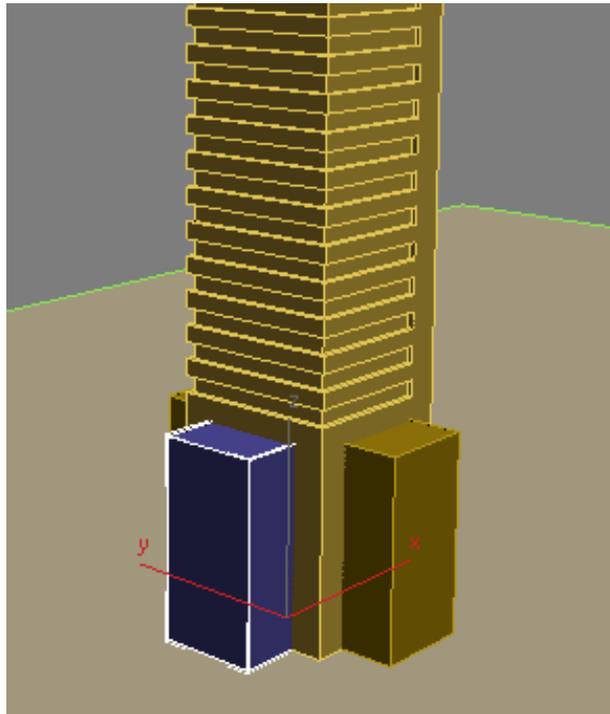
- 9  Click the Align tool, then select the *Tower* object.

- 10 On the Align Selection dialog box > Align Position group, turn on X Position and Y Position, then turn on Center for both the Current Object and Target Object groups. This aligns the box you just created to the center of the box object. Click OK.

Next, you need to align the right side of the box with the right side of the first box object, to create a back wall for the model.

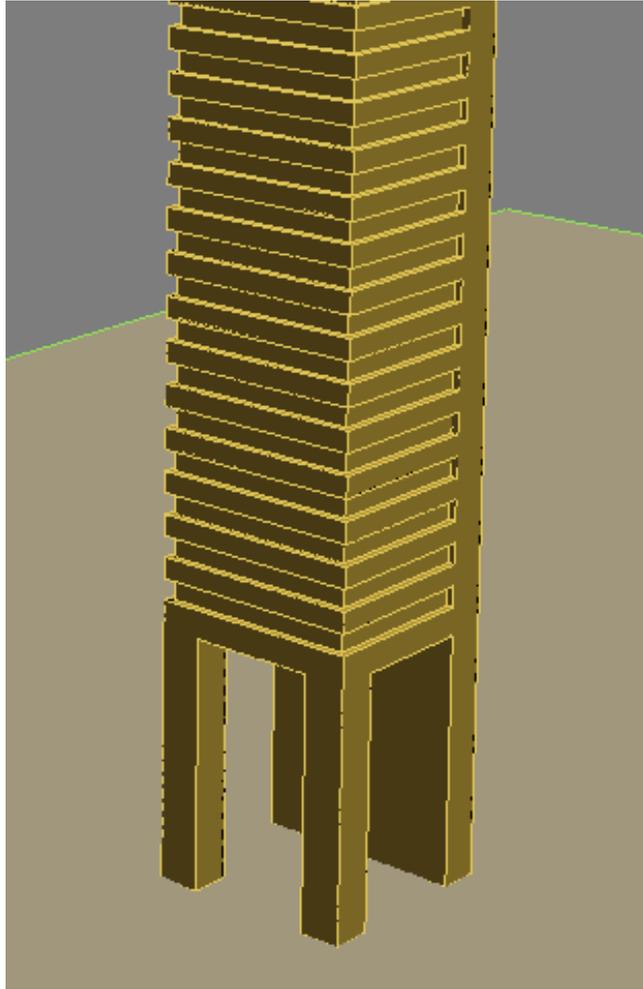


- 11 Click the Align tool once again, then select the *Box01* object you created in step 2.
- 12 In the Align Selection dialog box > Align Position group, turn on X Position, then turn on Maximum for both the Current Object and Target Object groups. This aligns the box to the right-most edge of the first box object. Click OK.



- 13 Select the *Tower* object and on the Modify panel > Parameters rollout > Operation group choose Subtraction.

- 14 On the Pick Boolean rollout, click the Start Picking button, then select the two boxes you created in this lesson. The subtraction operation creates the required gaps for the lower floors.



- 15 Click the Start Picking button again to turn it off.

Next

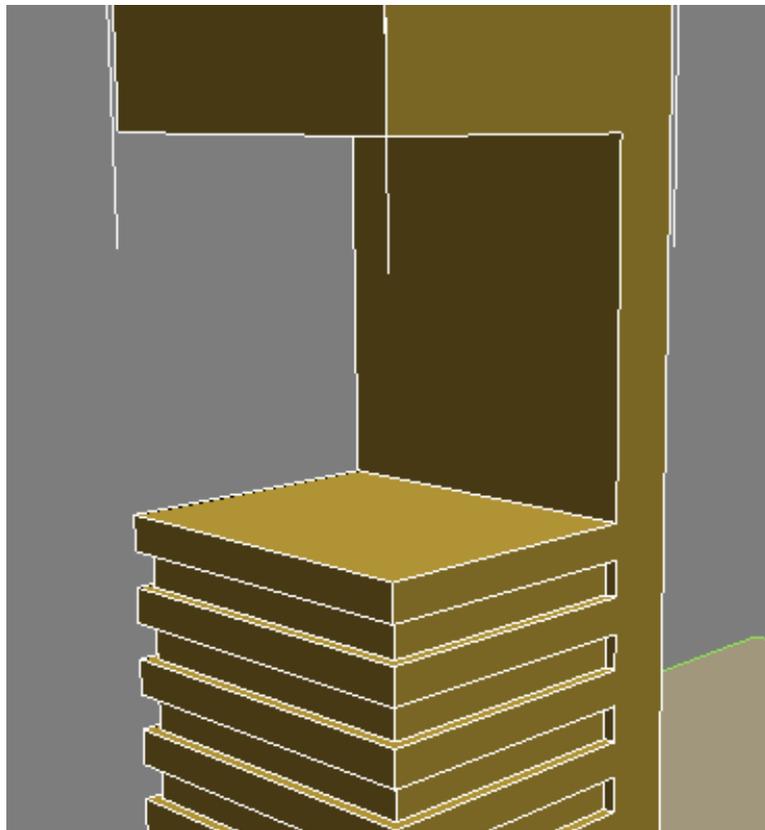
[Adding Cylindrical Elements](#) on page 137

Adding Cylindrical Elements

In this lesson, you will create two cylindrical objects, shape them using polygon edits, then use a union Boolean operation to add them to the *Tower* object.

Add cylindrical elements to the building:

- 1 Continue working on your scene from the previous lesson or choose File > Open to open *building 2 - tower_contour.max*.
- 2 Maximize the Perspective viewport and zoom in to the upper section as shown in the next illustration.



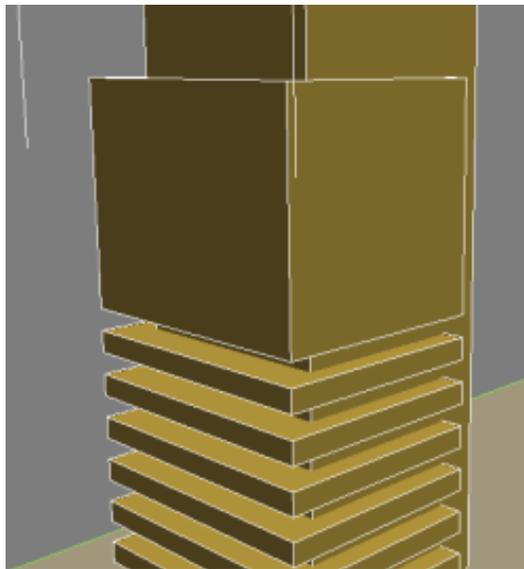
Next, you want to bring the back face of the *Tower* object forward to the midpoint of the structure.

To accomplish this, you will need to edit the operand that was used to expose the back face.

- 3  Make sure the *Tower* object is selected, and on the Parameters rollout > Display group, choose Operands.

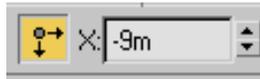


This displays all the box objects, or operands, that were used to modify the *Tower* object.

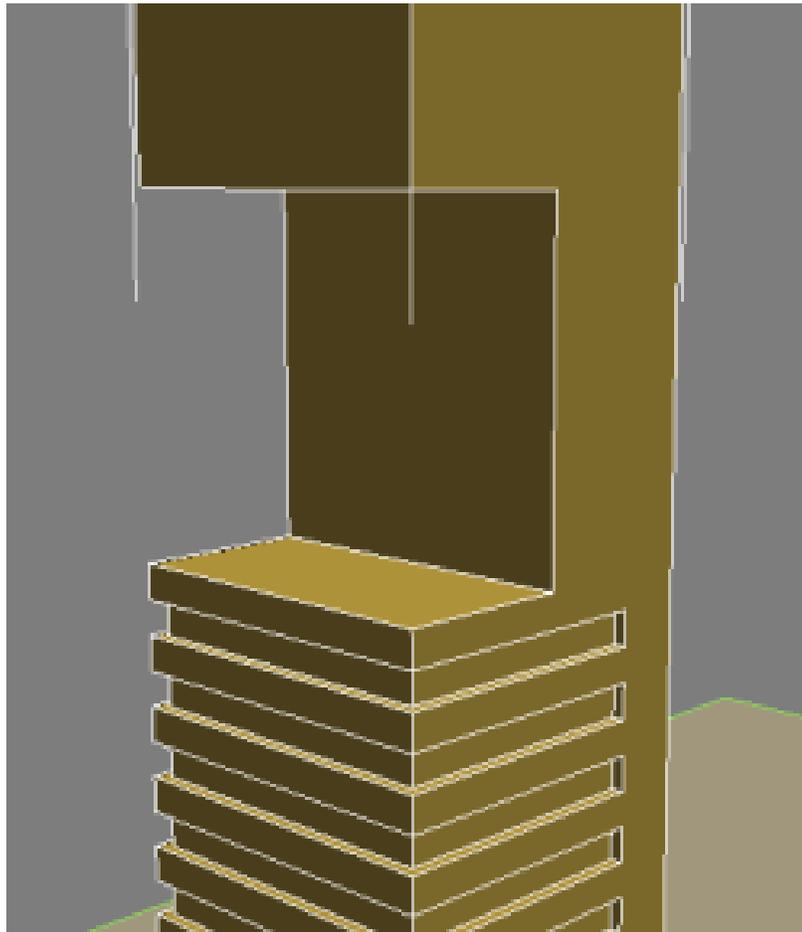


- 4  Choose the Select And Move tool to select the large box that was used to make the top-most gap in the tower.
Repositioning the box to the midpoint of the tower involves a simple calculation: at a depth of 30 meters, the tower's midpoint is 15 meters. Earlier, you offset the box from the back of the tower by six meters, so it needs to be repositioned to the left a further nine meters.

- 5 Make sure the coordinate display is set to relative units of measure (X, Y, and Z spinner boxes all display 0) and type **-9** in the X spinner, then press Enter to move the box to the left by nine meters.



- 6 On the Parameters rollout > Display group, turn on Result. The back face is now where you want it to be, at the mid point of the tower.



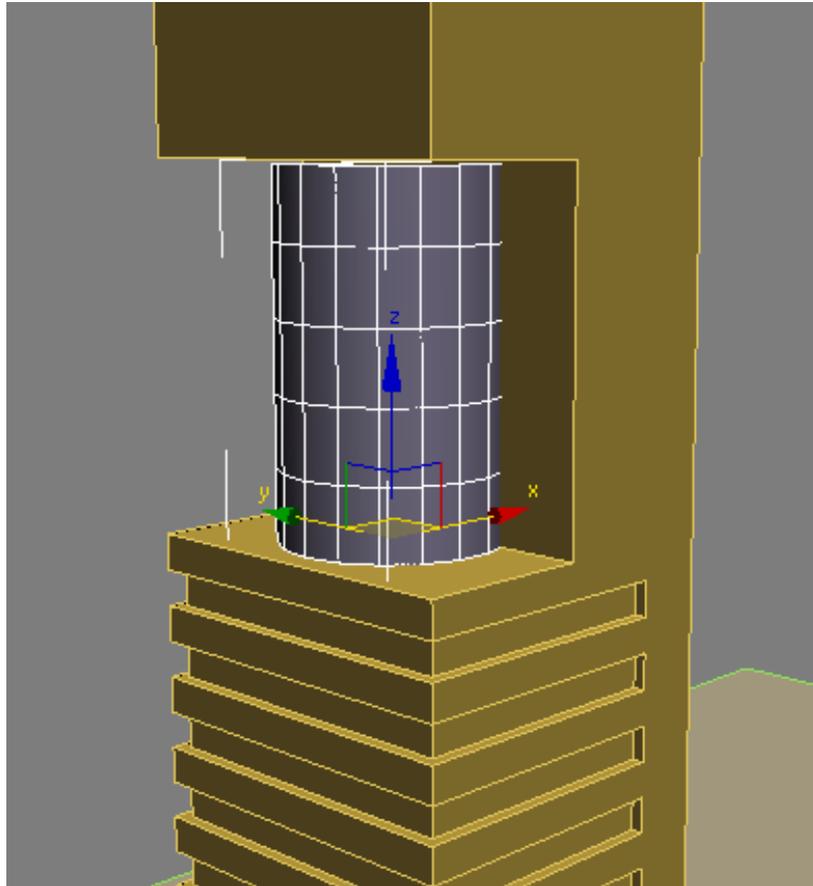
In this step, you want to place a cylinder object. But rather than create this object at the ground plane as you did with all other objects in this tutorial, you will create this object directly on the upper platform.

- 7   On the Create panel, click the Geometry button, then in the Object Type rollout, click Cylinder and turn on AutoGrid.



With AutoGrid on, you can create the object on top of an object you select in the scene.

- 8 Click on the center of the upper platform and drag diagonally to set the cylinder radius. Release the mouse button and drag upwards to set the height, as shown in the next illustration. Click a final time to complete the object. For now, the exact dimensions are not important.



9 Turn off Autogrid.

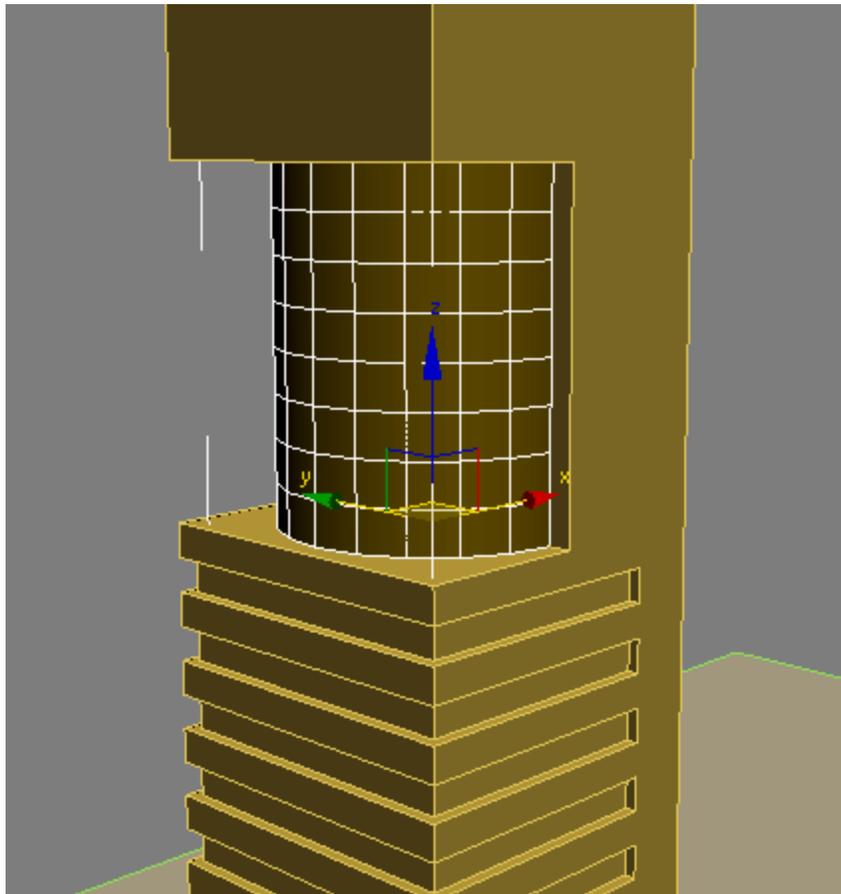


10 Choose the Align tool, then select the *Tower* object to display to Align Selection dialog box.

11 In the Align Position group, turn on X Position and Y Position, then turn on Center for both the Current Object and Target Object groups. This aligns the cylinder you just created to the center of the *Tower* object. Click OK.

- 12  On the Modify panel > Parameters rollout, set the parameters of the cylinder as follows:

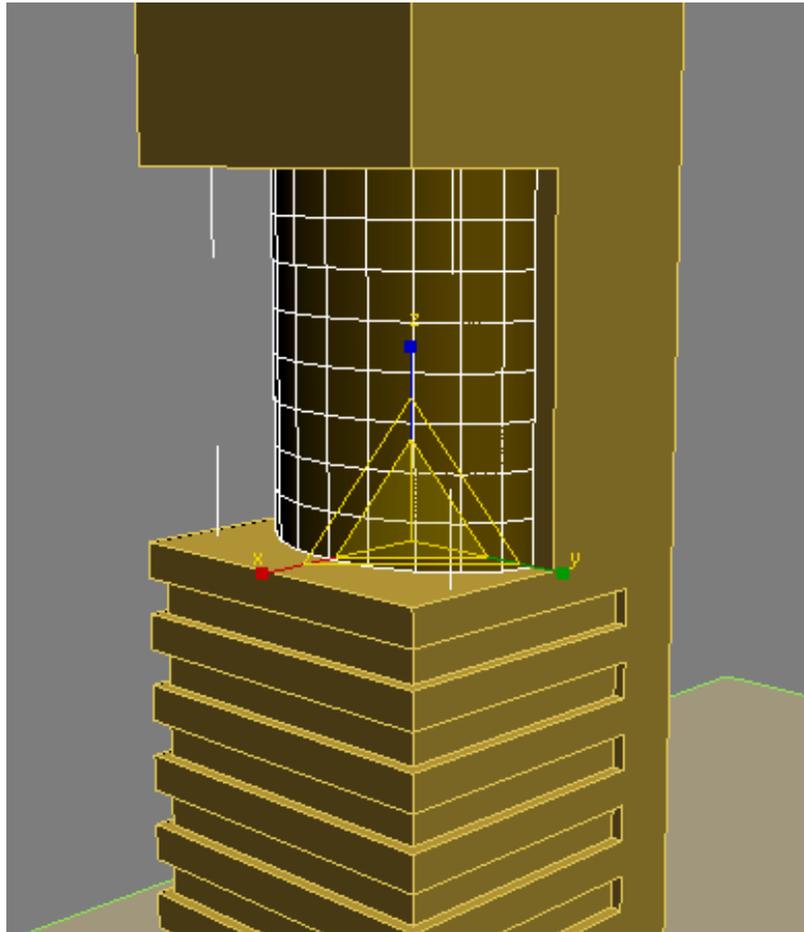
- Radius=13 m
- Height=30 m
- Height Segments=8
- Sides=20





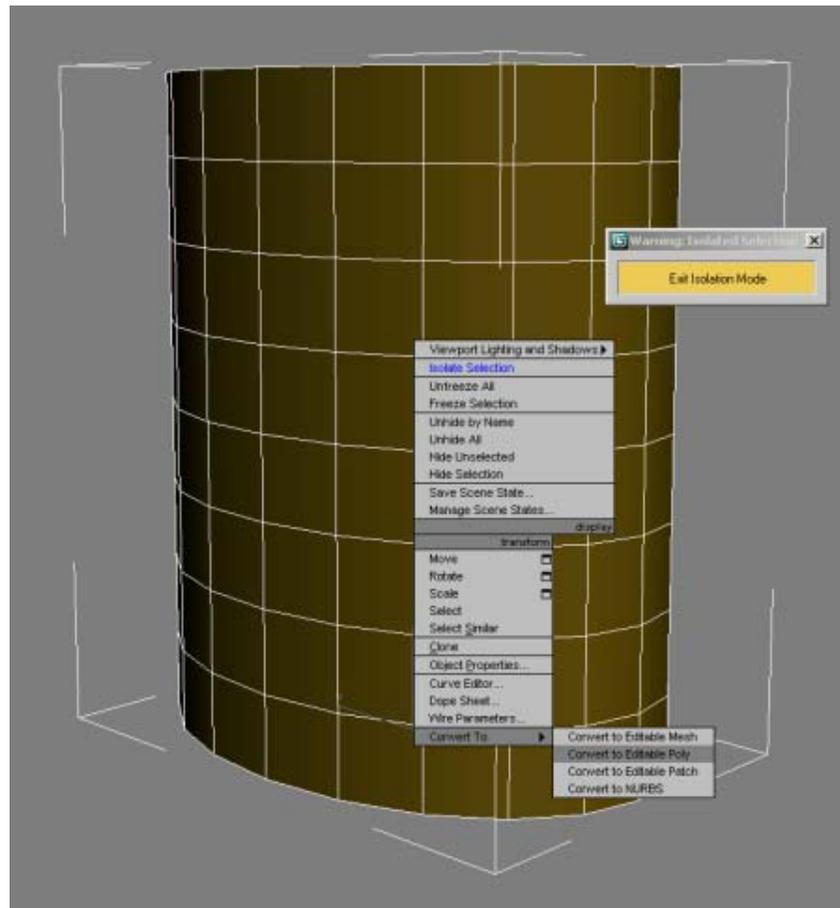
- 13 Click the Select And Uniform Scale tool and in the Top viewport, drag the X gizmo to the right. As you drag the gizmo, the X coordinate spinner box updates dynamically. When the spinner box displays a value of 70, stop dragging.

The cylinder shape should now resemble that shown in the next illustration.



Next, you will use some polygon editing techniques to add architectural detail to the cylinder object.

- 14  Click the Select Object tool.
- 15 Right-click the cylinder object and choose Isolate Selection from the quad menu.
- 16 Right-click the cylinder object again, and from the quad menu choose Transform > Convert To > Convert To Editable Poly.

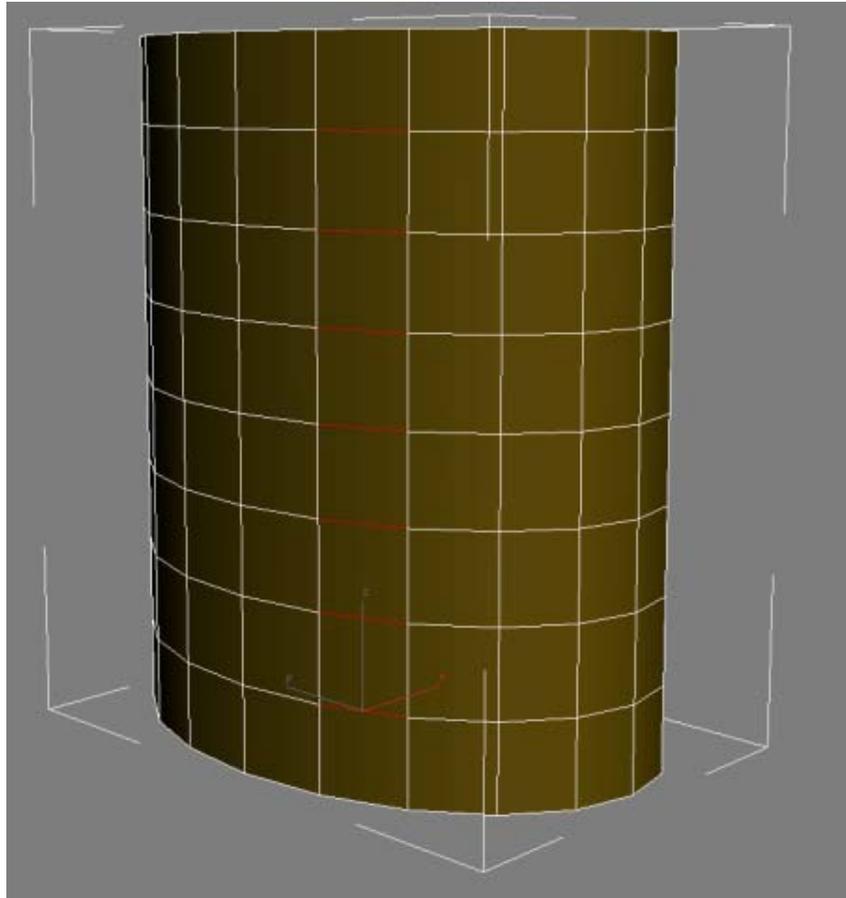


- 17 On the Selection rollout, choose the Edge tool, select any horizontal edge in the cylinder, then click the Ring button.

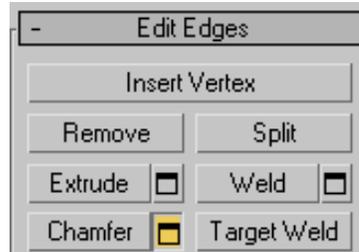


All horizontal edges above and below the selected edge are also selected.

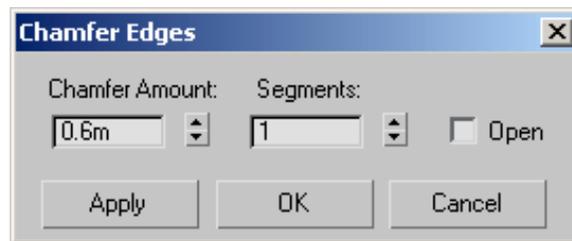
- 18 Alt + select the top- and bottom-most edges to deselect them.



- 19 Click Loop to select all horizontal edges, excluding the top and bottom rows.
- 20 On the Edit Edges rollout, click the Settings button to the right of the Chamfer button.

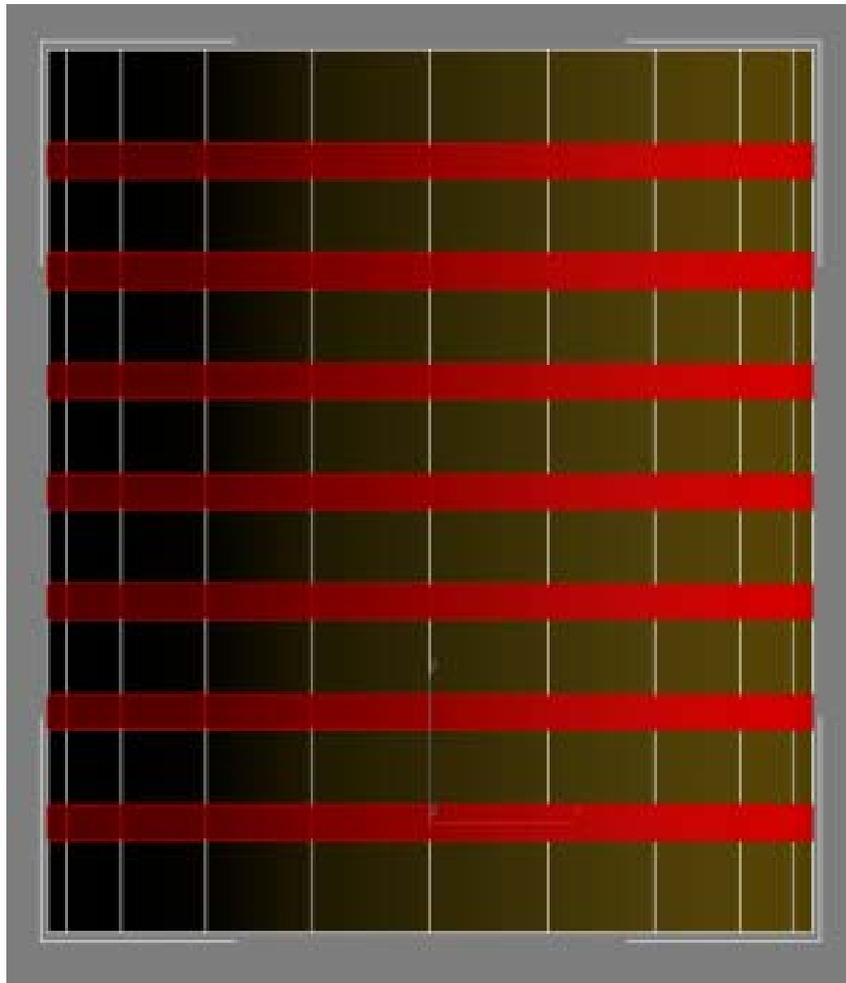


- 21 In the Chamfer Edges dialog, change the Chamfer Amount to **0.6**, and click OK.



- 22 On the Selection rollout, click the Polygon selection tool.
- 23 Display the ViewCube if it is not already visible, choose the Left face of the ViewCube, then right-click and choose Orthographic.
-
- 24 **NOTE** If the ViewCube is not visible in your viewports, from the main menu choose Views > Viewport Configuration > ViewCube tab > Display Options group > Show the ViewCube.
-

- 25  If the orthographic view zooms in too closely, click Zoom Extents.
- 26 Hold down the Ctrl key, click just outside the cylinder object, and drag across each band created by the chamfer operation, as shown in the next illustration.



27

On the ViewCube, click Home to exit Orthographic view.



28

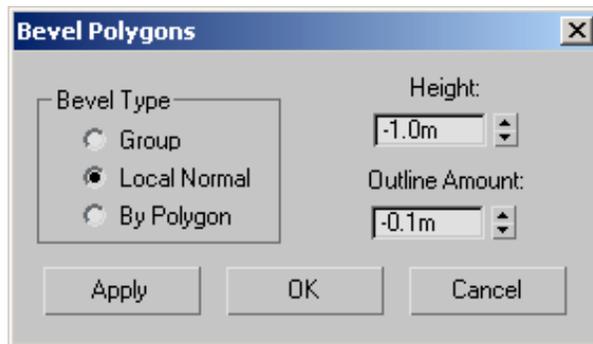
Click Zoom Extents again.

29

On the Edit Polygons rollout, click the Settings button to the right of the Bevel button.



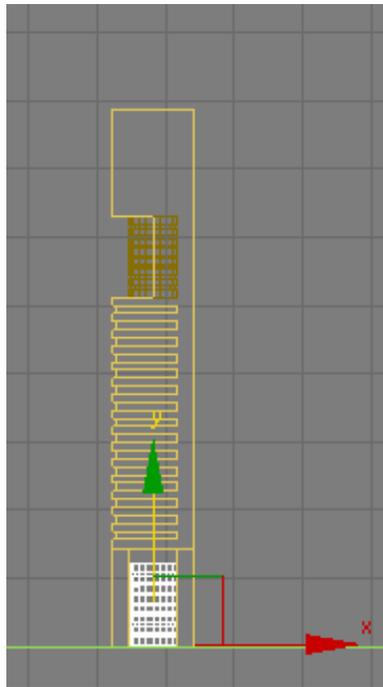
- 30 In the Bevel Polygons dialog box > Bevel Type group, choose Local Normal.
- 31 In the Height spinner box, type **-1.0**, and in the Outline Amount spinner box, type **-0.1** to give the bevel a very slight downward slope. Click OK.



- 32 Click Exit Isolation Mode to redisplay all the scene elements and on the Selection rollout, click the Polygon selection tool to deselect it.
- 33 Minimize the Perspective viewport to see all four views.
- 34 Zoom so you can see all of the tower.



- 35 Turn on Select And Move.
- 36 In the Front viewport, hold down Shift and drag the cylinder on its Y axis to the bottom of the tower.



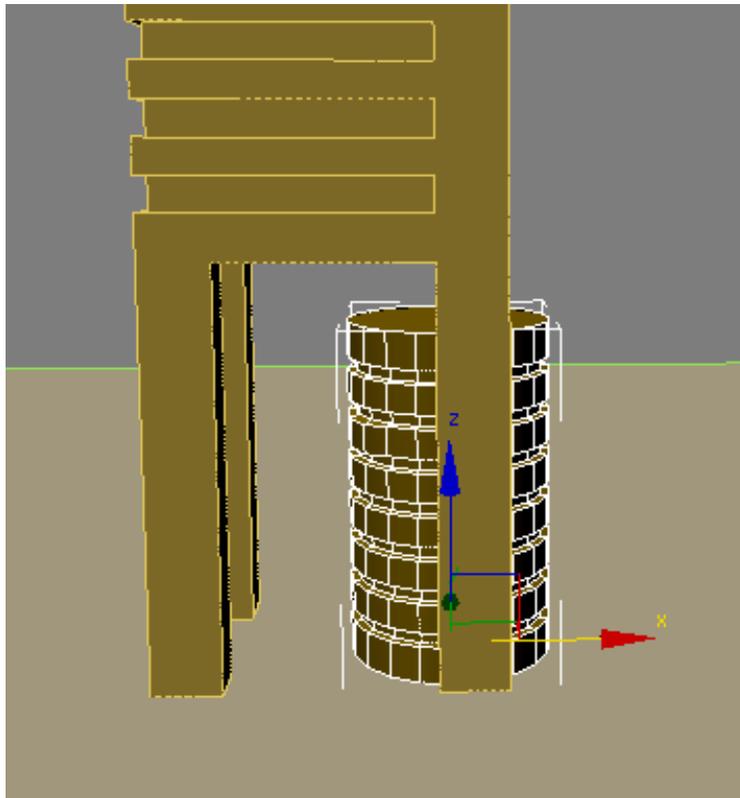
- 37 In the Clone Options dialog box > Object group, choose Copy, and then click OK.

This way, any changes you make to the newly copied object will not affect the upper cylinder.

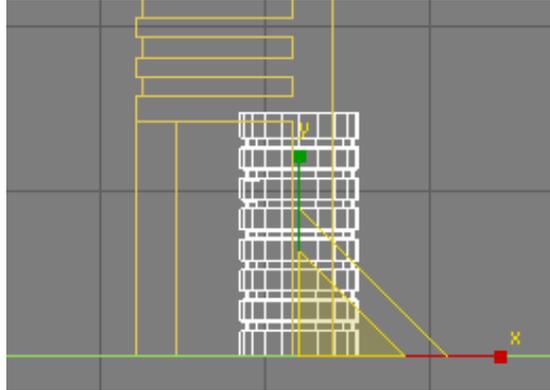
- 38 Switch the coordinates display to Absolute Mode and type **0.0** in the Z coordinates spinner box to position the object at ground level.

TIP You can also right-click the Z spinner arrows to set this value to zero.

- 39 Activate the Front viewport and drag the cylinder to the right on its X axis, until it straddles the back face of the *Tower* object, as shown in the next illustration.



- 40 Choose the Select And Uniform Scale tool and drag the Y axis gizmo upward until the cylinder slightly penetrates the *Tower* object. (The cylinder must come into contact with the *Tower* object before you can perform the next Boolean operation.)



- 41 Select the *Tower* object and on the Modify panel > Parameters rollout > Operation group, choose Union.
- 42 From the Pick Boolean rollout, click the Start Picking button and select the two cylinder objects to join them to the tower.
- 43 Click the Start Picking button again to turn it off.

Next

[Using Extrusion to Shape the Roof](#) on page 151

Using Extrusion to Shape the Roof

In this lesson, you will use polygon edit techniques and the Extrude modifier to create and add detail to a sloped roof.

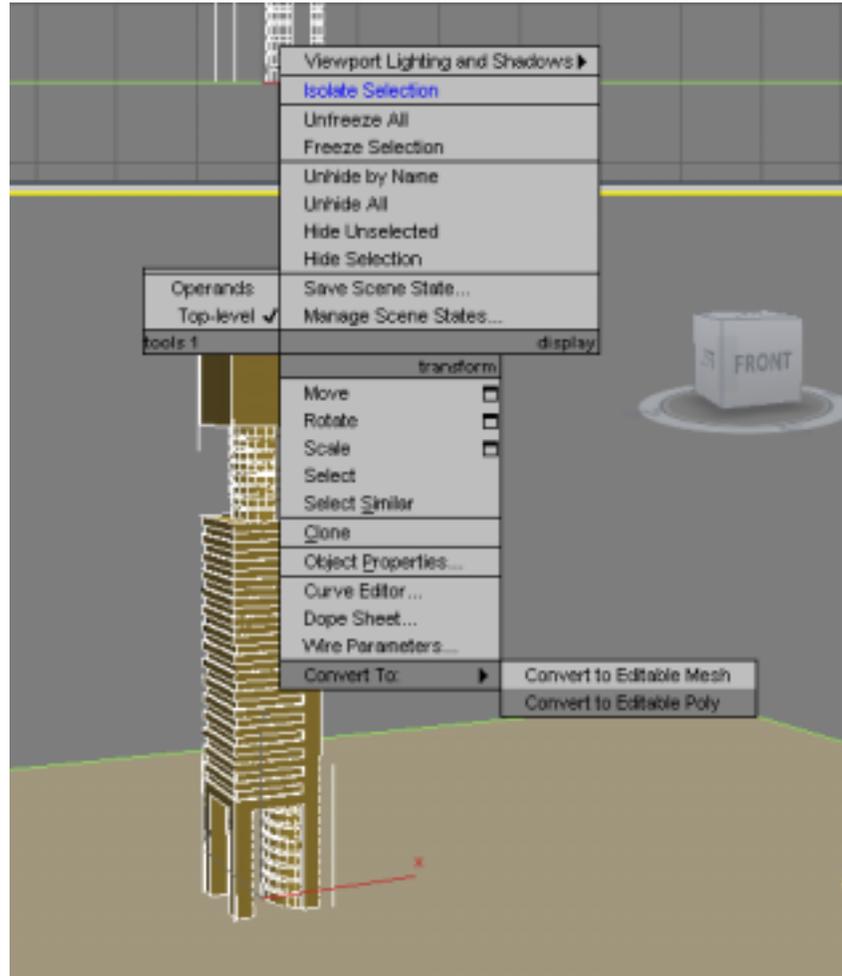
Use extrusion to shape the roof:

- 1 Continue working on your scene from the previous lesson or choose File > Open to open *building 2 - Boolean - complete.max*.

At this point, you could create another box object on top of the *Tower* object, rotate it by 45 degrees, and use it in yet another Boolean operation to create a sloped roof.

In this case however, a simpler approach is to create the roof line by editing the tower as an editable poly object.

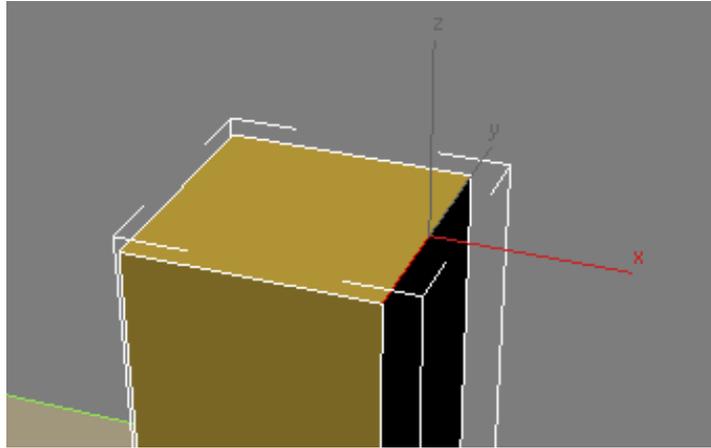
- 2 Activate the Perspective viewport, right-click the *Tower* object, and from the quad menu choose Transform > Convert To > Convert to Editable Poly.



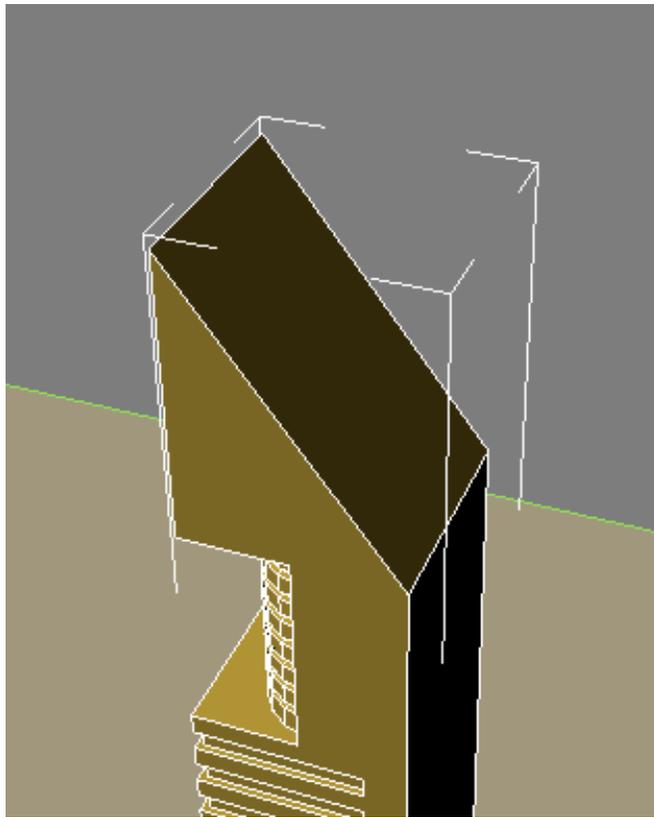
- 3    Zoom, orbit, and pan the Perspective viewport until you can see the roof of the building.



- 4 On the Selection rollout, choose the Edge sub-object level, and then use the Select And Move tool to select the edge at the back of the tower roof, as shown in the next illustration.

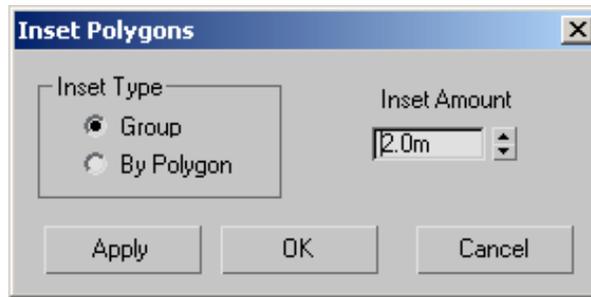


- 5 In the Z coordinates spinner box, change the value from 200 to **160**. This sets the slope of the roof, as shown in the next illustration.



- 6 On the Selection rollout, choose the Polygon selection tool and select the roof polygon.
- 7 On the Edit Polygons rollout, click the settings button next to Inset to open the Inset Polygons dialog.





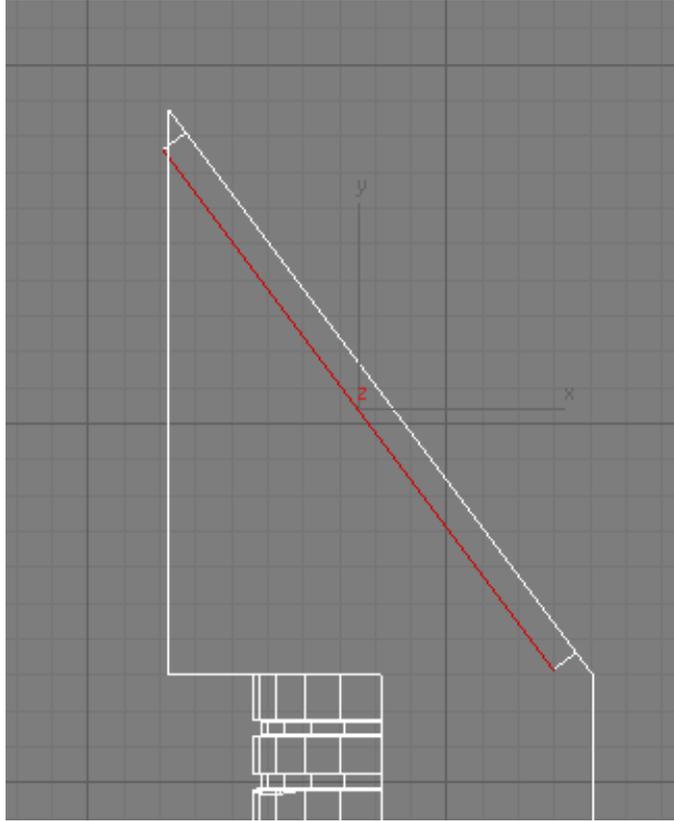
- 8 Set the Inset Amount spinner box to **2.0** and click OK.

The inset operation creates a polygon two meters smaller in X and Y space than the roof polygon, then centers it. You can now extrude this newly created polygon.

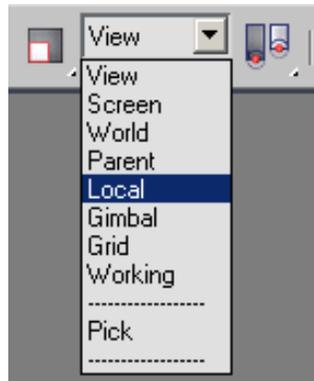
- 9 On the Edit Polygons rollout, click the settings button next to Extrude.

- 10 On the Extrude Polygons dialog box, set Extrusion Height to **-2.0**.

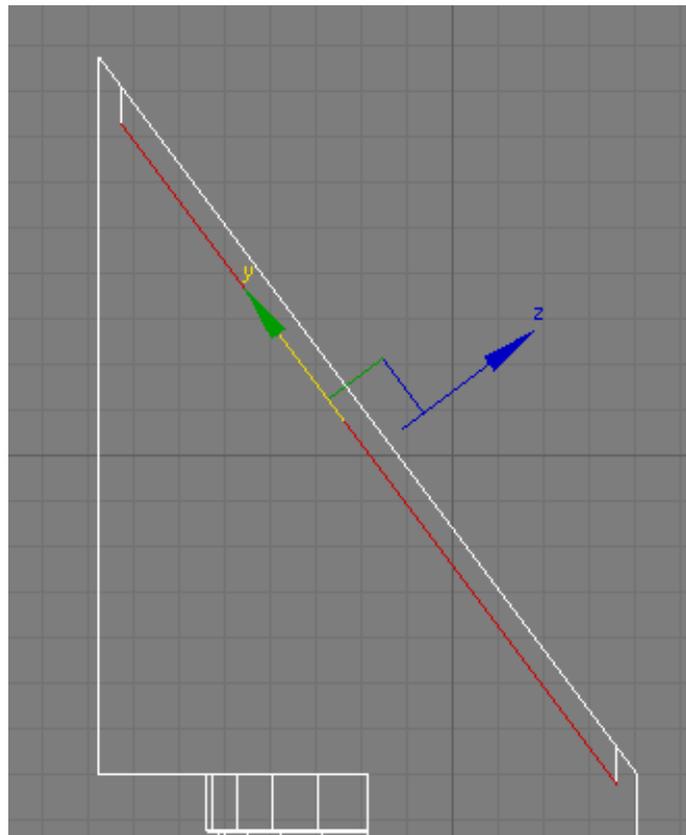
A closer look at the top of the building in the Front viewport shows that the extrusion needs to be fine tuned.



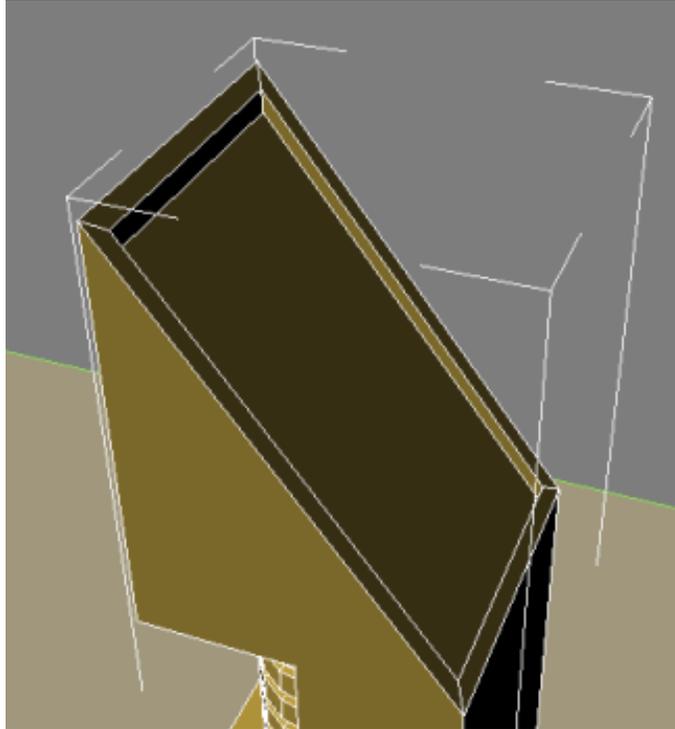
- 11 Click the Select And Move tool, then choose Local from the Reference Coordinates drop-down list.



- 12 Drag the roof polygon until its top and bottom bevels are at a 90-degree angle to the ground plane, as shown in the next illustration.



Your roof should look something like this:



Next

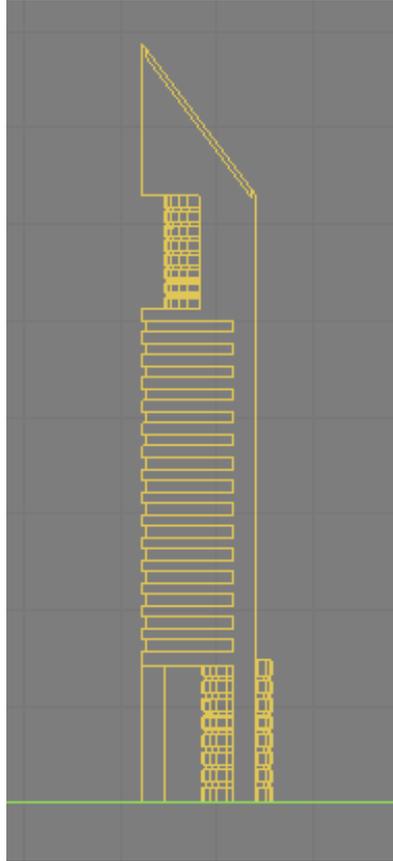
[Assigning Materials to the Building](#) on page 158

Assigning Materials to the Building

In this final lesson, you will assign a material identification number to each polygon in the model. You can then use these ID numbers to assign materials to specific parts of the model.

Assign materials to the building:

- 1 Maximize the Front viewport and zoom out until the entire tower is visible. Make sure you are in View mode.



- 2 Select the *Tower* object and on the Modify panel > Selection rollout, choose the Polygon selection tool, then press Ctrl+A to select all the polygons in the *Tower* object.



- 3 Scroll down to the Polygons: Material IDs rollout and in the Set ID spinner box, check that all polygons are assigned a value of 1.

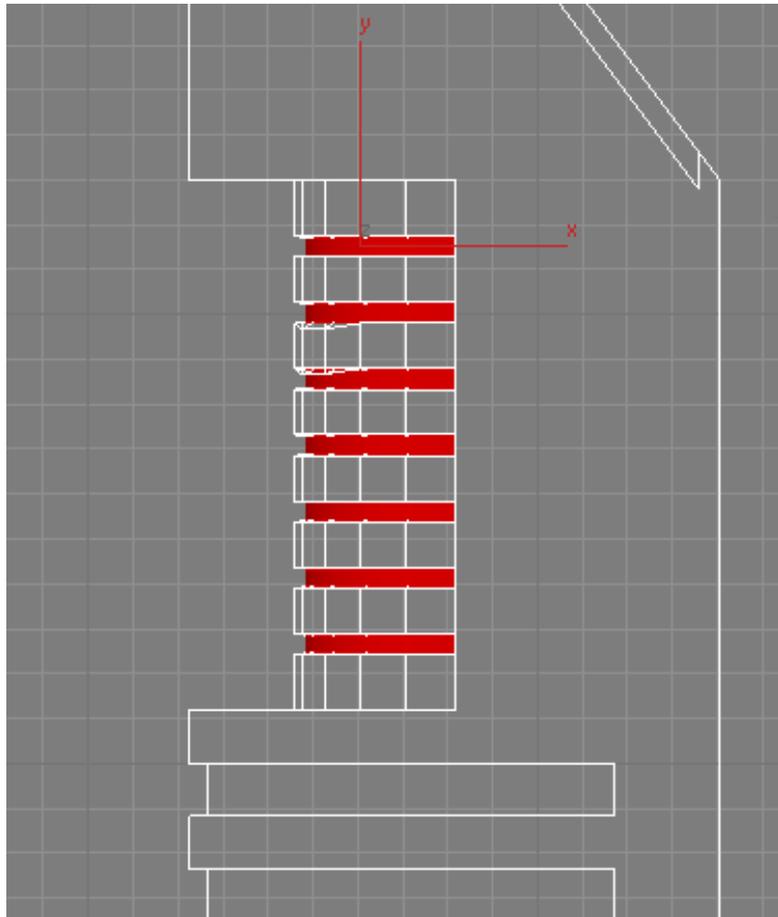


In its current state, if a material was assigned to any part of the *Tower* object, all its polygons would receive the same material. This is because they all have the same material ID number.

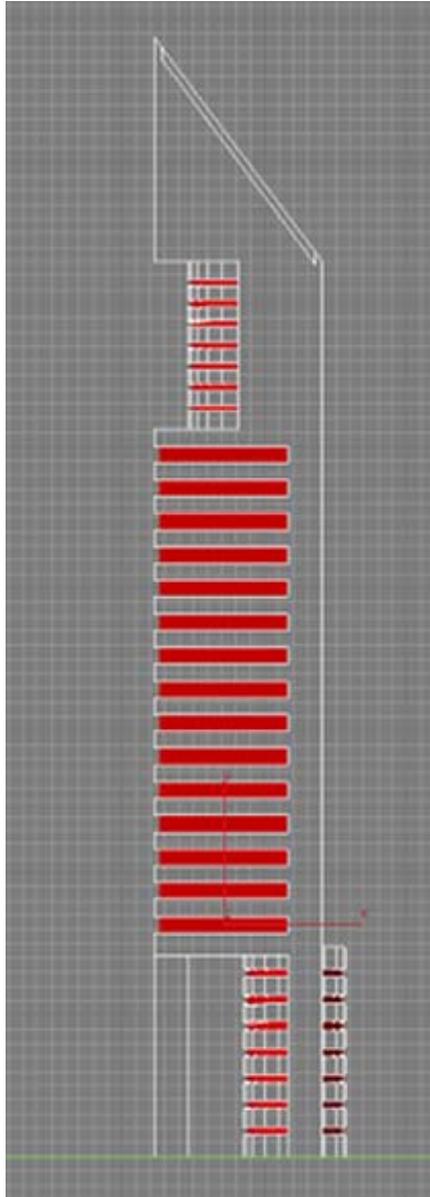
- 4 Click anywhere outside the *Tower* object to deselect the polygons.

- 5 Zoom in to the upper section of the tower and begin to Ctrl + select the polygons that represent the glazing in the cylinder, as shown in the next illustration.

Start your selection by clicking outside the tower and dragging right, across all the glazing polygons. Starting your selection outside the tower ensures that all glazing polygons on the other side of the *Tower* object are also selected.



- 6 Zoom out and continue to Ctrl + select all the glazing in the lower floors using the same selection technique as described in the previous step. Be sure to include the glazing polygons in the bottom cylinder. The result is shown in the next illustration.

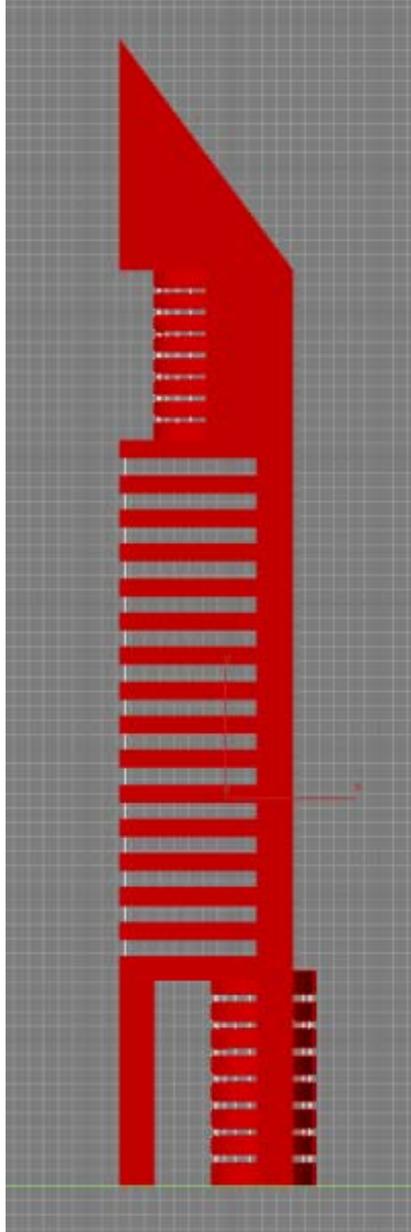


- 7 On the Polygon: Material IDs rollout, click the Set ID up spinner arrow once, so the box is set to 2.



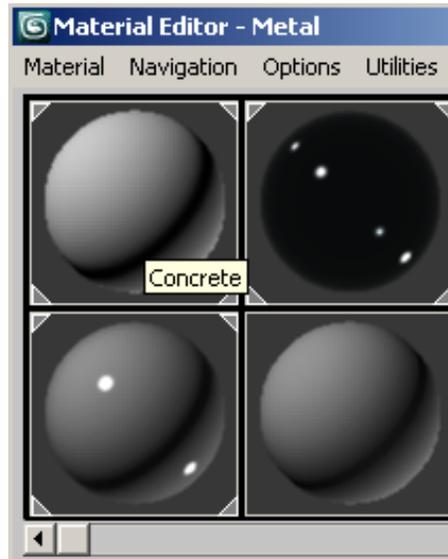
Now, the *Tower* object can be assigned up to two different materials.

- 8 On the Polygon: Material IDs rollout > Select ID spinner box, type **1** and click Select ID. All the material 1 polygons are now selected in the viewport.



9 Press M to open the Material Editor.

-  10 Choose the Concrete material from the sample slot and click the Apply Material To Selection button.



Concrete material is applied to all polygons that have ID 1 assigned to them.

- 11 Repeat the previous three steps for material ID 2 and apply the glass material to the selected polygons.
- 12 On the Selection rollout, deselect the Polygon selection tool and maximize the Perspective viewport.

-  13 Adjust the perspective so that the two tower models are clearly visible, then click Render to view the result.

Your rendered image should look something like this:

