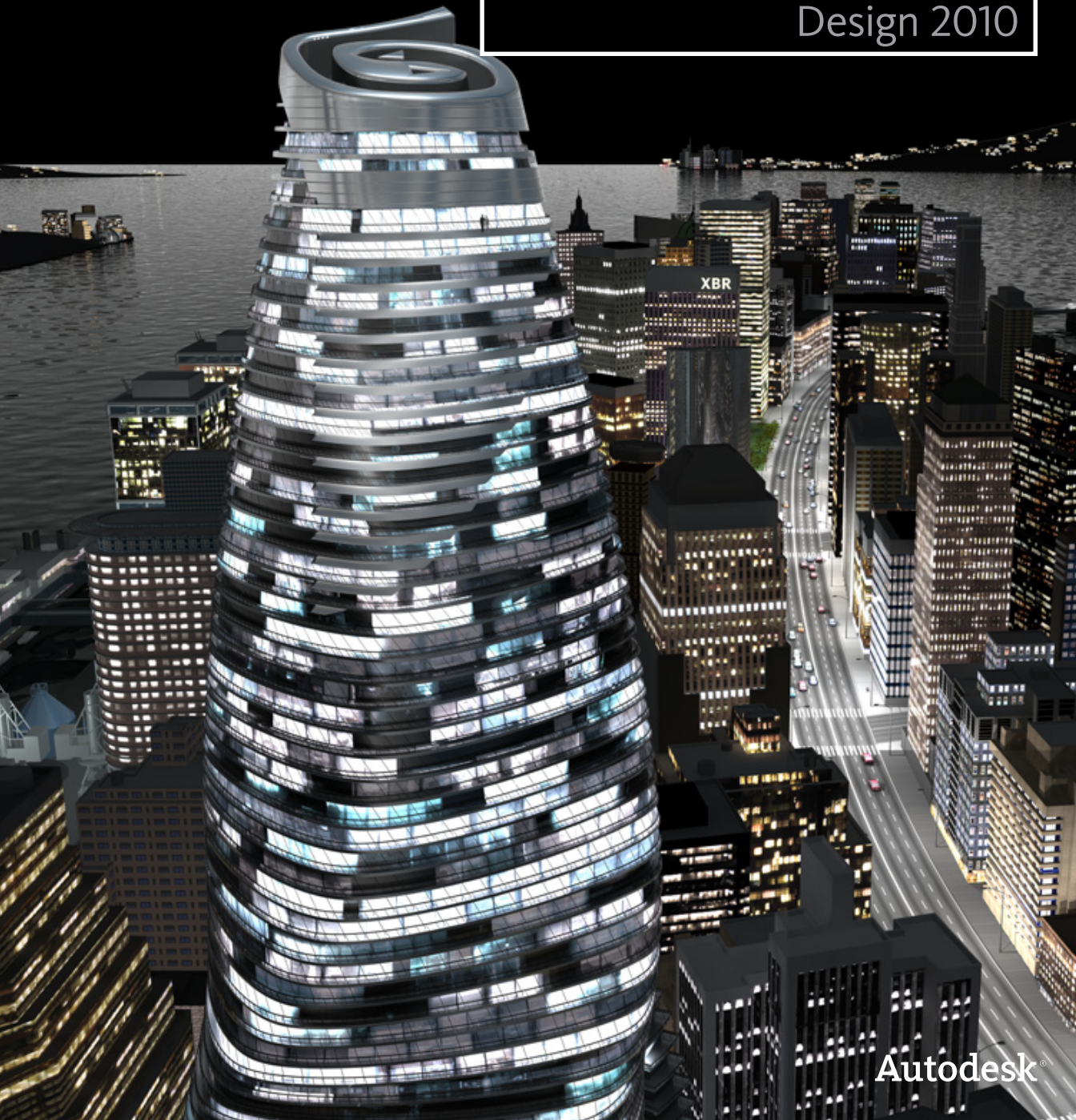# Tutorials:
Getting Started—
Modeling a
Revolving Door

Autodesk®
3ds Max®

Design 2010

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Autodesk® 3ds® Max Design 2010 Software

Getting Started: Modeling a Revolving Door

2

In this tutorial, you will learn how to model and animate in 3ds Max Design. You'll construct an animated revolving door for a hotel lobby. In the course of doing so, you'll learn about creating objects and transforming them. You'll learn about using snaps and pivot points for alignment, as well as general user interface navigation skills. You'll learn to instance objects and link them into an animated hierarchy. You'll also learn to merge files together.
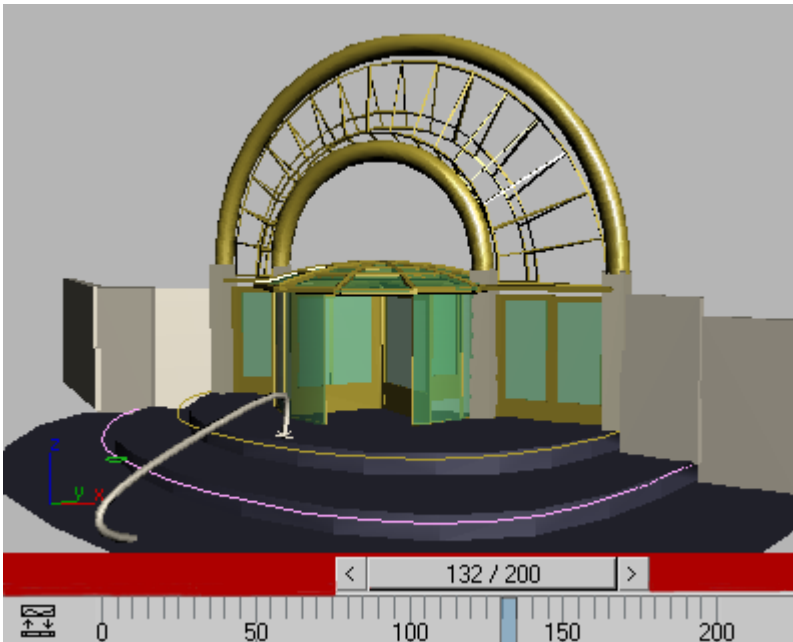
After completing this tutorial, you will be able to:

■ Have a working knowledge of the 3ds Max Design user interface.

- Create a revolving door by using primitive and AEC objects.

- Apply materials to objects and sub-objects.

- Animate the doors in the scene using rotation transforms and parametric animation.

- Merge objects from another file into your scene.

Skill Level: Beginner

Time to complete: 25 minutes

Setting Up Units and Snaps

Before you start to build your revolving door, you will set the display unit scale to feet and inches. You'll also make some changes to the snap options before you create the geometry.

Set up the display unit scale:

NOTE If you're using the product outside of the United States, you can choose to use metric display unit scale in the following steps. What's important is that the scale is a real-world measurement, rather than the default Generic Units setting in 3ds Max.

1   From the Application menu, choose Reset to reset 3ds Max Design.

This tutorial does not require you to load any particular file to begin. As you work through it, if you get lost you can open a snapshot file, so you can complete the tutorial.

2   On the menu bar, choose Customize > Units Setup.

The Units Setup dialog appears.

3   In the Display Unit Scale group, choose US Standard, if necessary.

Set the scale to Feet w/Decimal inches, if necessary.
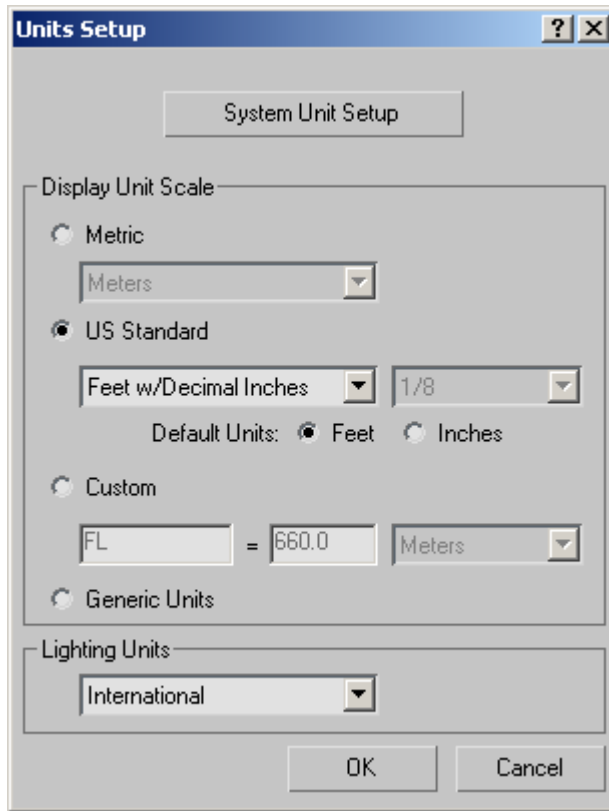
Leave the System Unit Setup as it is. This should be changed only to reset the system unit to the default setting (inches) after loading a file that uses a different system unit, or if you are working on files that are so huge or so tiny that values don't appear correctly in the numeric entry fields.

4 Click OK to accept the change.

Now, when you make something, its measurements are displayed in the command panels in familiar real-world terms.

Next you'll make some additions to the grid and snap settings.

Set up snaps:

1 On the main toolbar, right-click the Snaps Toggle.

The Grids And Snap Settings dialog appears.

2 On the Snaps panel, turn on Grid Points, Vertex, Edge/Segment, and Endpoint. Make sure all the other snaps are turned off.
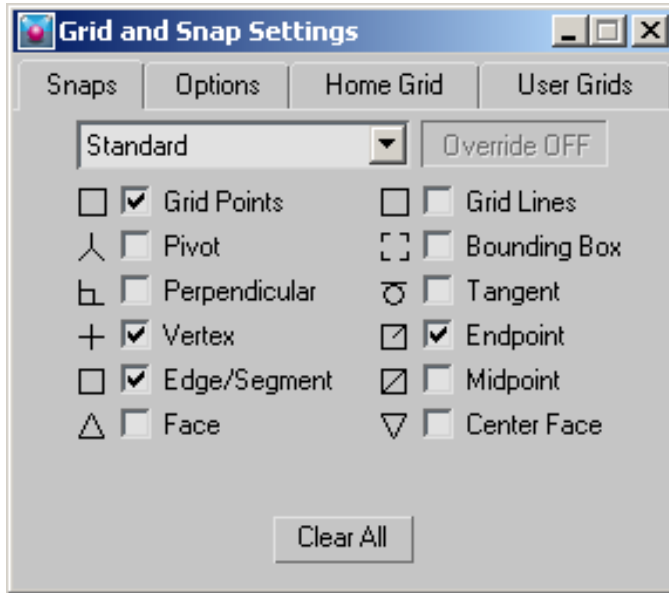
3 Close the dialog by clicking the X button at the upper right of the dialog.

Now, when Snap is on, you'll be able to snap to vertices, grid points and edges.

You're ready to create a cylinder to serve as the central pole that rotates the revolving door.

4 On the Quick Access toolbar, click the Save File button and save your file as *my_revolving_door_units.max*.

Creating the Hub

Using the Cylinder object, you will create a central pole that will act as the hub for the revolving door. First you will create a new layer for the revolving door.

Set up the lesson:

■ Continue with the scene from the previous lesson, or on the Quick Access toolbar, click the Open File button, navigate to the the *startup* folder, and open *revolving_door_hub.max*. If you do start with this file, be sure to set up the snaps as described in the previous lesson.

Create a layer:

You can use the layer management system for display and rendering purposes. Here you will create a new layer for the revolving door.

1 By default, the Layers toolbar is hidden when you start 3ds Max Design. If it is not currently open, right-click a blank space on the main toolbar and choose Layers from the pop-up menu.

2   On the Layers toolbar, click the Create New Layer button.

   This creates a new layer and opens the Create New Layer dialog.

3 Use the Create New Layer dialog to name the Layer **Revolving Door**, and then click OK.
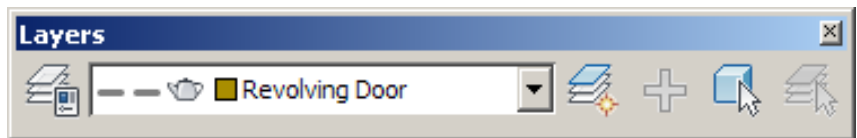
   The Revolving door layer is now current and visible in the Layers toolbar. Whatever you create now will be on this layer.

Create the hub:

Before creating the hub, you will adjust your viewport so you have a better view of the objects you will make.

1   In the viewport navigation controls at the lower-right corner of the user interface, click the Orbit button. In the Perspective viewport,

drag within the navigation orb to change the view of the home grid.
When you are done, right-click the viewport to turn off Orbit.
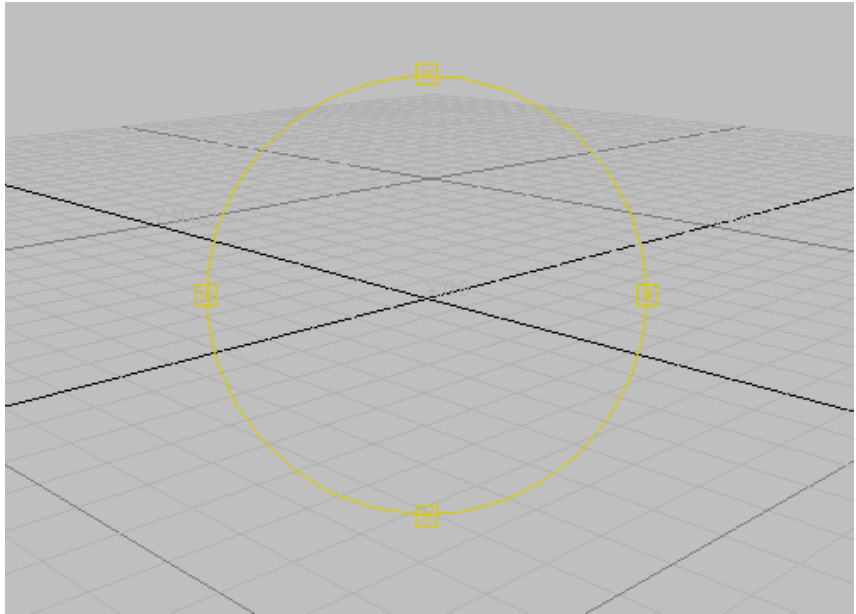
Orbit navigation orb

2 Click the 3D Snap Toggle on the toolbar.

3 On the Create panel > Standard Primitives > Object Type rollout, click
Cylinder.

The Cylinder button highlights to indicate it is active and ready for use.

4 Now move your cursor over the grid in the viewport.

The cursor displays a blue snap icon and jumps to the grid points.
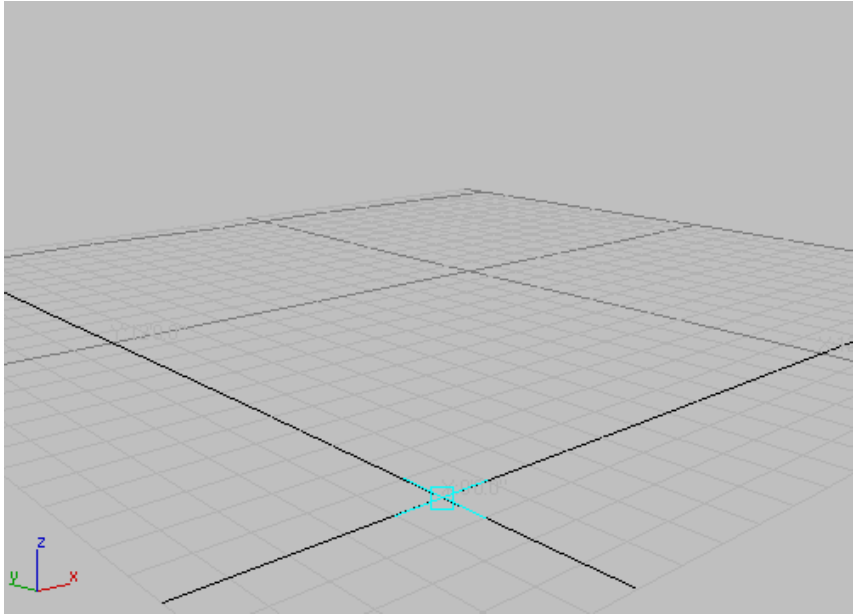
5 Position the cursor over the center of the grid and then click and drag.

As you move the mouse away from the center, a flat shaded circle grows from your cursor. You are defining the radius of the cylinder as you move the mouse.

Notice that as you move away from the center of the grid the mouse will snap to grid points.
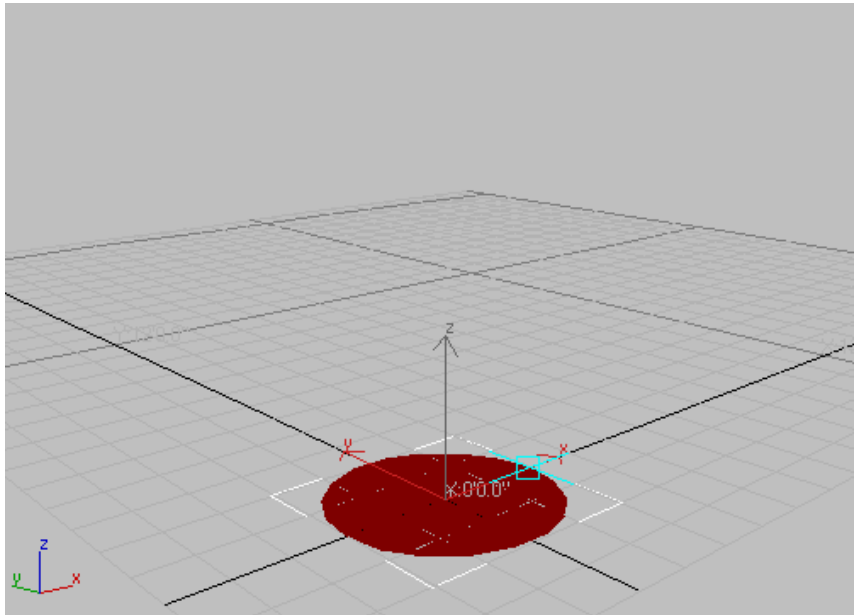
6 Turn off the snap by pressing the S on the keyboard while you are still moving the cursor.

The snap has been turned off, while you are still in the middle of creating the cylinder. Now as you move your mouse, you are free from the snap control.

7 Lift the mouse button, and you have set the radius of the cylinder. The radius is displayed on the Parameters rollout.

8 Now move your cursor upward in the viewport.
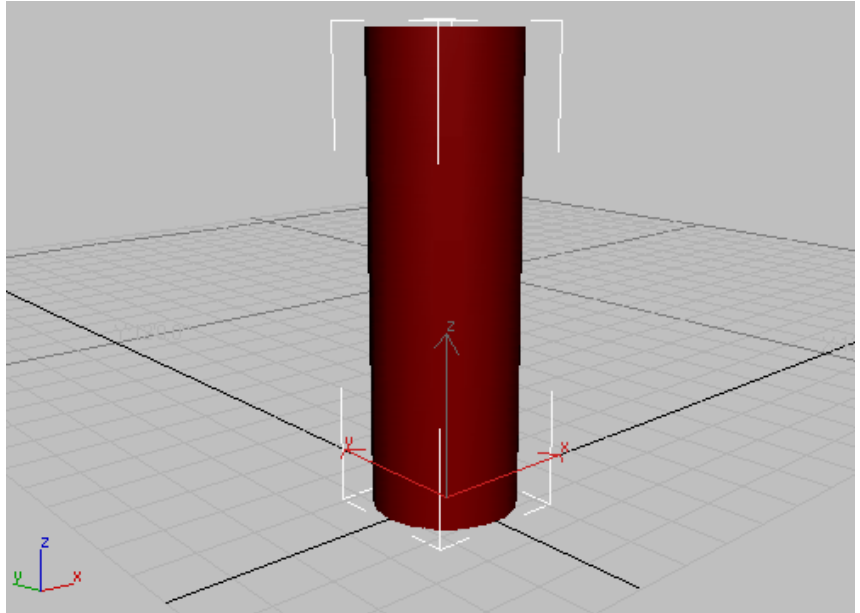
9 The cylinder grows as you move the cursor upward. When you click again you have set the height.

Make the cylinder any size you like. You're going to change the size in the next step.

Adjust the hub:

Immediately after creating an object, you can modify its parameters such as size and shape by changing its values on the Parameters rollout on the Create panel.

TIP If while changing these values you accidentally exit create mode (say, by right-clicking the viewport), the object remains selected but its parameters are no longer available on the Create panel. At this (or any) point you can go to the Modify panel and adjust the parameters there, or you can simply undo the new object (Ctrl+Z) and start over. If that happens during this tutorial, we recommend the latter.

1 On the Parameters rollout change Radius to **0' 3.0**".

2 Change the Height to **7'0.0**".

3 In the Navigation controls, click the Zoom Extents button.

The viewport zooms out so you can see the cylinder.
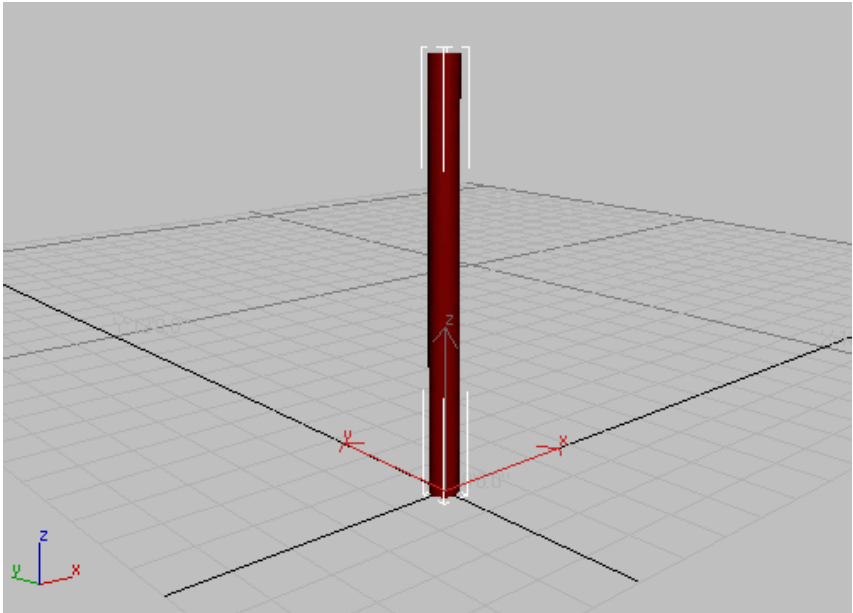
Zoom extents to see it all

4 Click the Perspective viewport Smooth + Highlights label and choose Edged Faces.

The Edged Faces option lets you see the edges that the software uses to create the surfaces of your model.
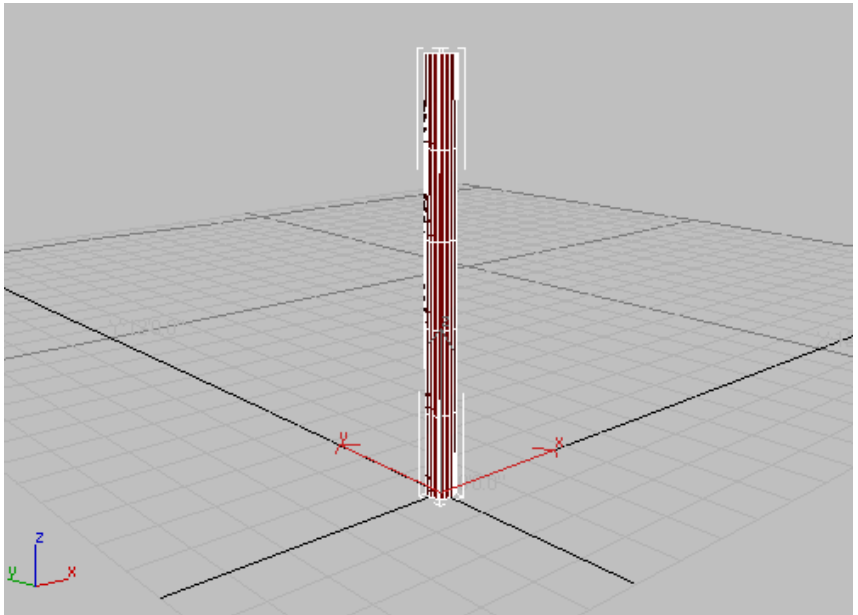
Edged faces show the underlying geometry

5 On the Parameters rollout, change Height Segments to **1**.

6 Change Sides to **4**.

   The Cylinder changes into a tall box with four sides; this will make it
   easier to create the door. Later you'll change the pole back to a cylinder.
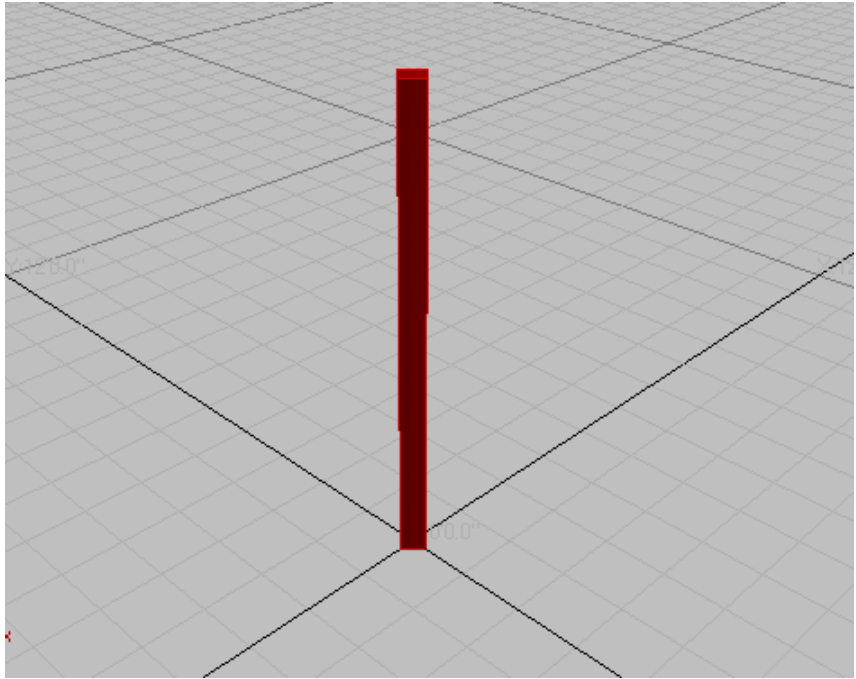
Reduce the segments

Next you'll rotate the cylinder so the four sides line up with the grid.

Rotate the hub:

1   Click the Zoom button in the viewport navigation controls. Position the cursor over the bottom of the cylinder and then press I (the letter "I") on the keyboard to center the viewport on the cursor position.

2   Zoom in so you can see the bottom of the cylinder up close. Use Orbit to rotate the view if you like.
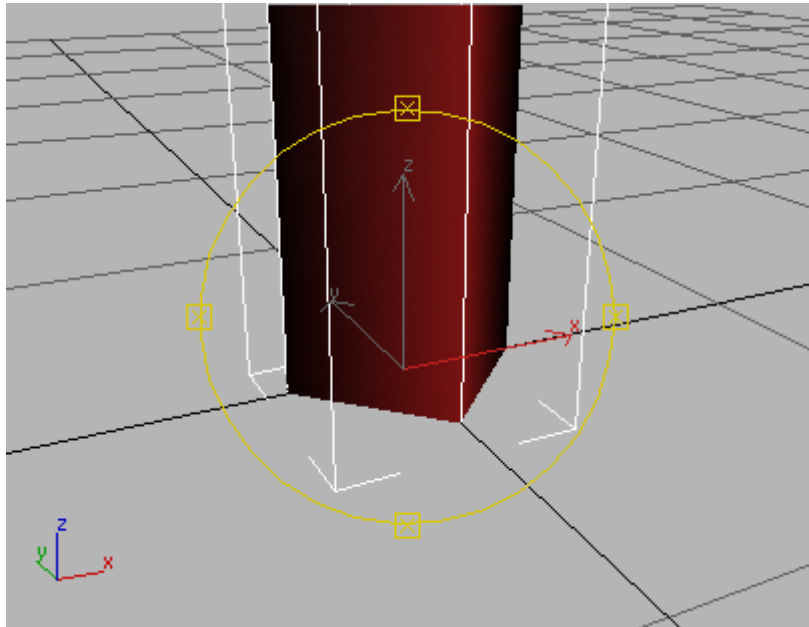
Zoom in and rotate the view.

3 On the toolbar, click Rotate.

The transform gizmo appears in the viewport.
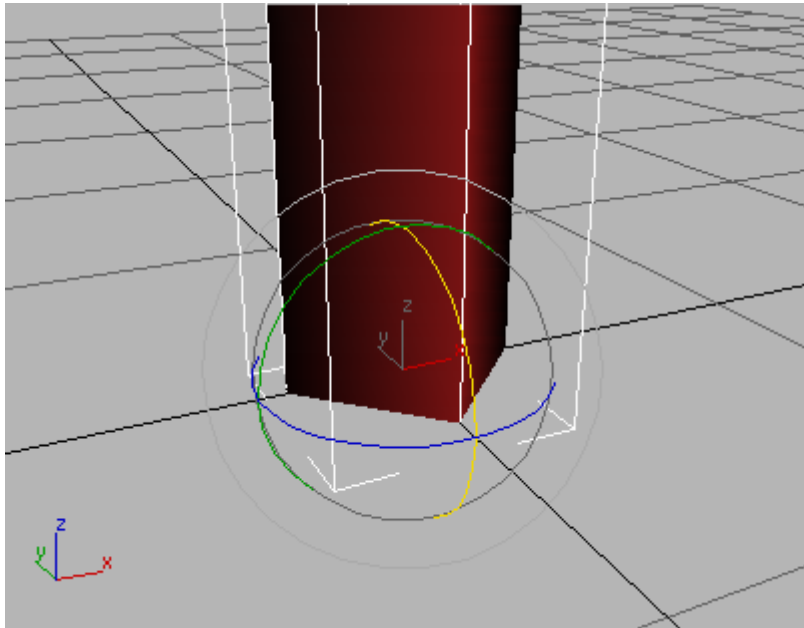
4 In the coordinate display below the Perspective viewport, click in the Z entry field and enter **45**. Click OK to confirm the entry.

The cylinder rotates around the Z axis so the sides line up with the grid.
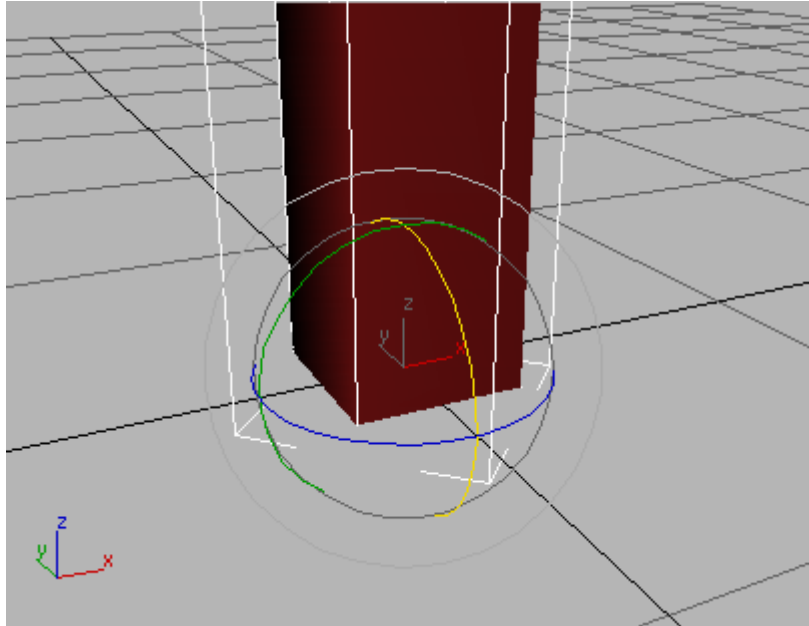
Cylinder rotated

This will be the pole that revolves to turn the revolving door. You'll snap to its sides when you create an initial Pivot door object. After the other doors are cloned, you can increase the number of sides so it will look like a cylinder again.

Next you will create a tube object to make the door enclosure.

5 Save your scene as **My_revolving_door_hub.max**.

Creating the Enclosure

You will use the primitive Tube object with the Slice option to create an enclosure for the revolving door.

Set up the lesson:

1 Continue with your scene from the previous lesson, or open *revolving_door_enclosure.max* from the *startup* folder.

2 Right-click the Perspective viewport to activate it, and then click the Maximize Viewport Toggle button at the lower right extreme of the 3ds Max Design interface to maximize the viewport.

Create another layer:

1 On the Layers toolbar, click the Create New Layer button.

This creates a new layer.

2 Name the Layer **Enclosure**.

The Move Selection to New Layer setting should be off. If you leave this on, the hub will be moved from the previous layer to the new layer.

Click OK.

The Enclosure layer is now visible in the Layer Properties field.

Create the tube:

1 On the navigation controls, click the Zoom Extents button to zoom back so you can see the area around the cylinder.

2 On the Create panel, on the Object Type rollout, click Tube.

The Tube button turns yellow, indicating it is active and ready for use.

3 Drag out a tube anywhere in the viewport.

The size doesn't matter; you'll be changing it in a moment.
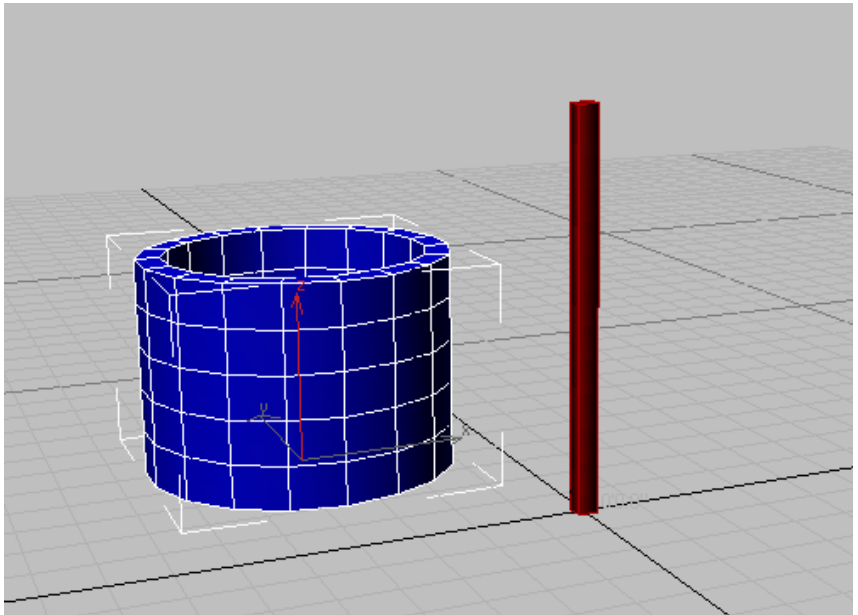
Make a tube.

4 In the Parameters rollout on the Create panel, change Radius 1 to **6'0.0"**.

5 Change Radius 2 to **5'11.0"**

6 Change Height to **7'0.0"**.
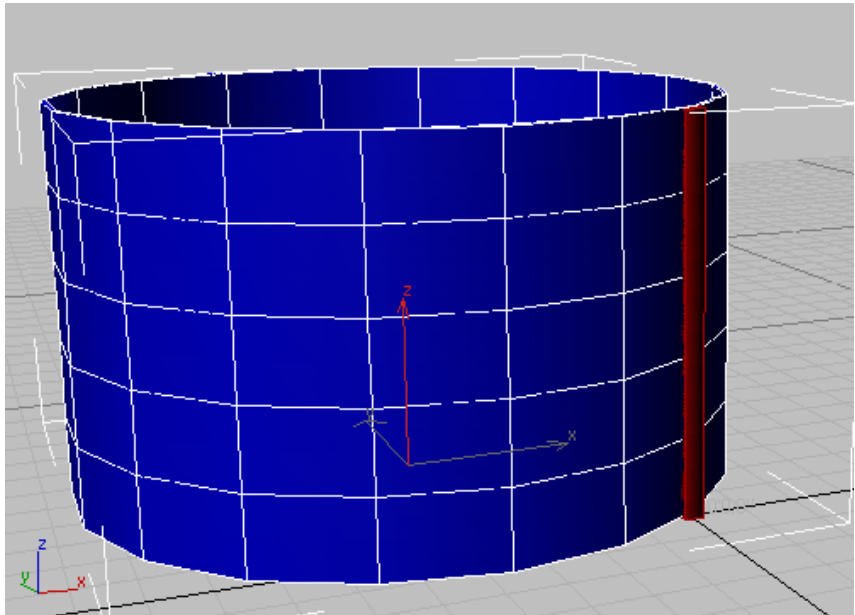
Change the radius and height of the tube.

7 If necessary, zoom out so you can see both the tube and the cylinder.

Align the tube:

Next, you'll center the tube over the cylinder.

1 On the toolbar, click the Align button.

The tube is already selected, so you'll align it to the cylinder.

2 Click the cylinder in the viewport.

3 On the Align Selection (Cylinder01) dialog, turn on X Position, Y Position, and Z Position. Choose Pivot Point for both Current Object and Target Object. Click OK.

The tube is centered over the cylinder.
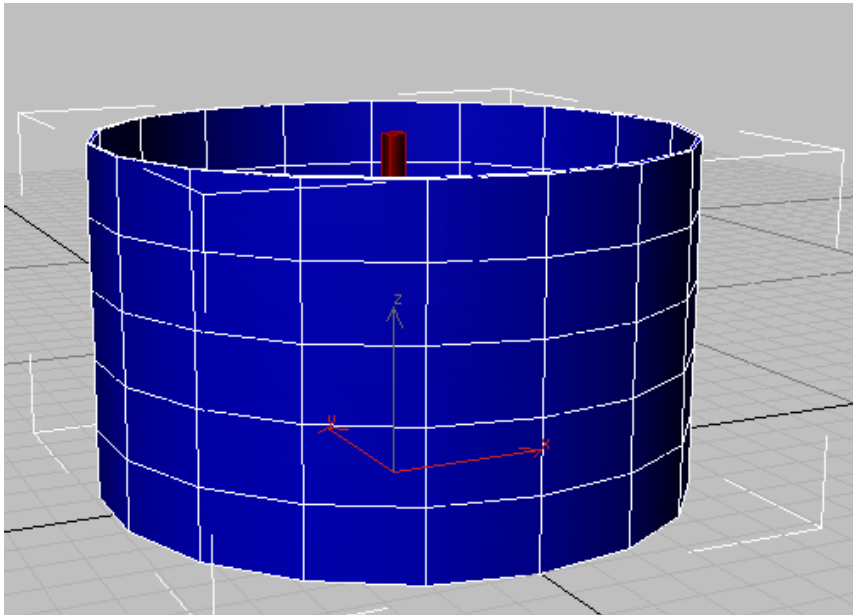
On the Create panel, in the Name And Color group, rename the Tube object **left enclosure panels**.

Slice the tube:

1   Click the Modify panel tab.

2   On the Parameters rollout, turn on Slice On.

3   Adjust the Slice From and Slice To values so you have a half of a tube visible in the viewport, resembling the illustration. Start with **90.0** and **–90.0**, and adjust if necessary. The difference between the two values should be 180.
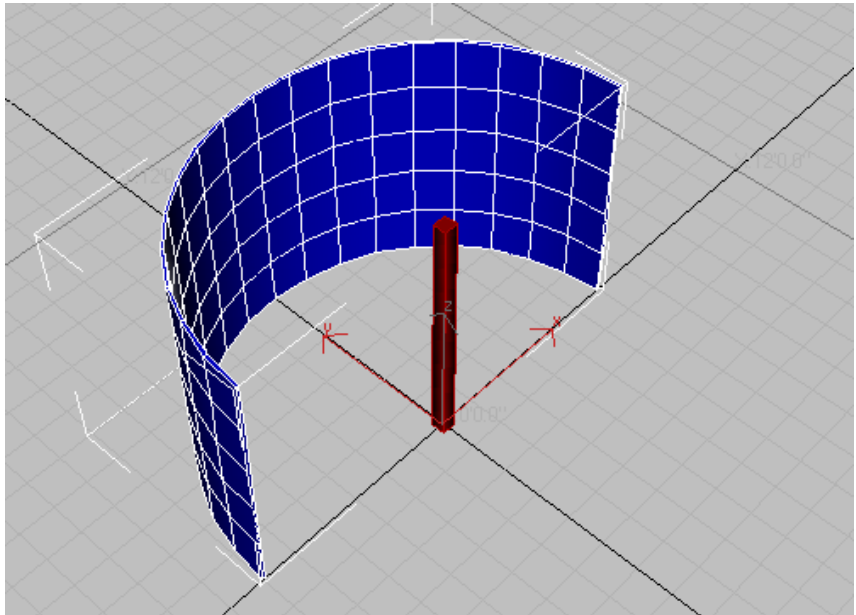
Slice the tube

4 Change Sides to **6**. The enclosure will be created out of flat panels, rather than curved glass.

5 Change Height Segments to **1**.
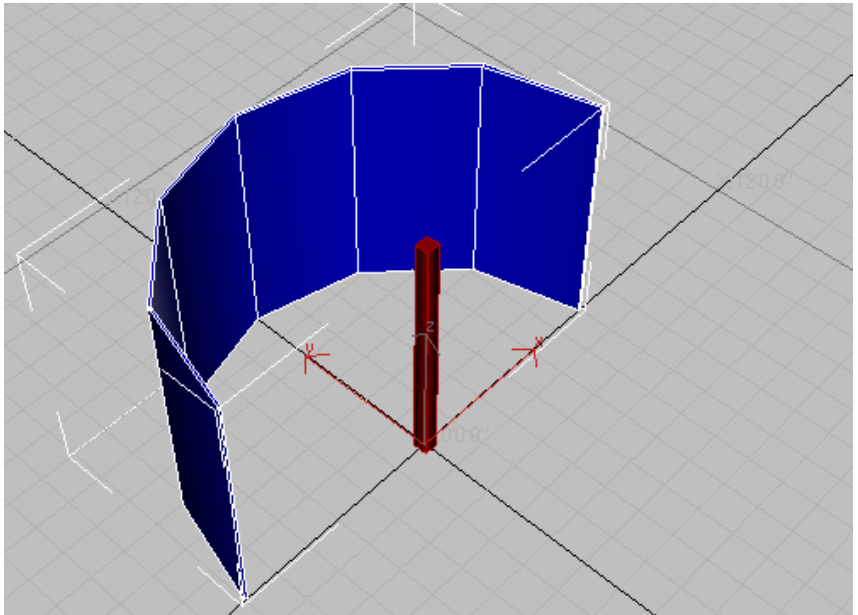
Lower the geometry values.

Next you'll clone the tube to create the other side of the enclosure.

Clone the tube:

1 On the main toolbar, click Rotate, if it isn't already active.

2 Press the A key on the keyboard to turn on Angle Snap.

3 Hold down the Shift key and rotate the left enclosure 180 degrees about the Z axis.

A copy of the tube rotates into place on the other side of the enclosure.

4 When the copy of the tube is in the proper position, release the mouse button.

The Clone Options dialog is displayed.

5 On the dialog, set the Object option to Copy and name the clone **right enclosure panels**. Click OK.
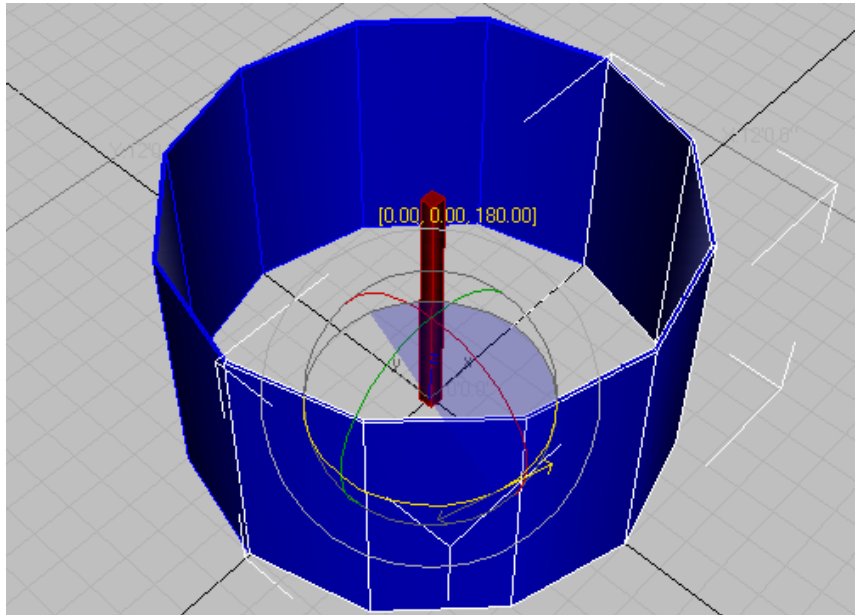
6 Adjust the Slice values so the tube resembles the illustration below. Try setting Slice From=**45** and Slice To=**–45.0**

Depending how you constructed the initial tube, you may have different values. The difference between the two should be a multiple of 90.

7 Change the Sides value to **3**.
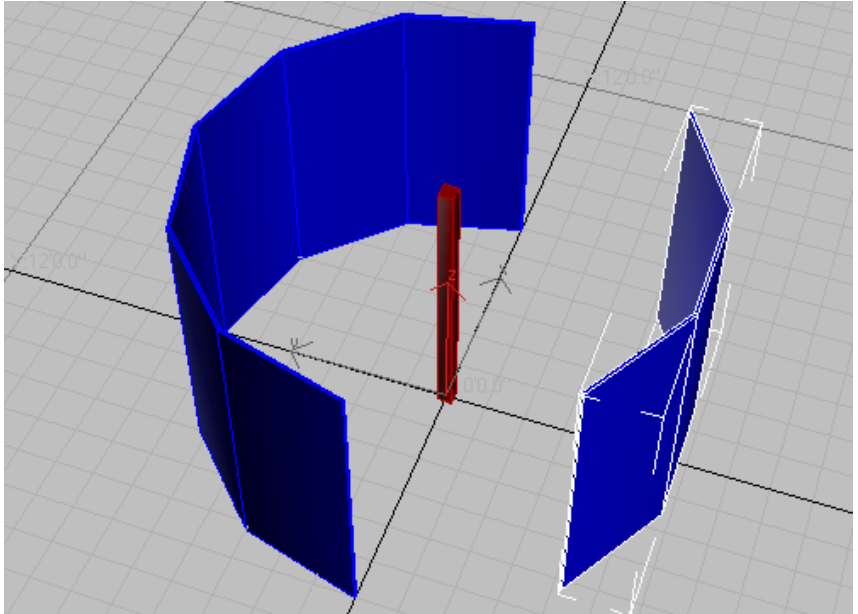
Left and right enclosures

You'll do some more work on the enclosures in a while, but first you'll construct the revolving door.

8 Save your work as **my_enclosure.max**.

Creating the Revolving Door

To create the revolving door, you will rotate the right enclosure panel temporarily into a different position, then you will create a pivot door using snaps between the hub and the right enclosure panels. You can edit the material on the door, then instance the door to create a wheel of four doors.

■ Continue from the previous lesson, or open *add_door.max* from the *startup* folder.

Rotate the right enclosure:

1 Select the *right enclosure panels* object in the viewport.

2 ⟳ On the main toolbar, click the Rotate button, and then move your mouse over the Transform gizmo tripod in the viewport. When the Z axis (the horizontal circle) is highlighted, click and drag to rotate the *right enclosure panels* object 45 degrees about the Z axis until it touches the *left enclosure panels* object, as shown below.

As you rotate, you can see the rotation amount in yellow text in the viewport, just over the transform gizmo. To get the desired result, it should read (0.00, 0.00, 45.00).
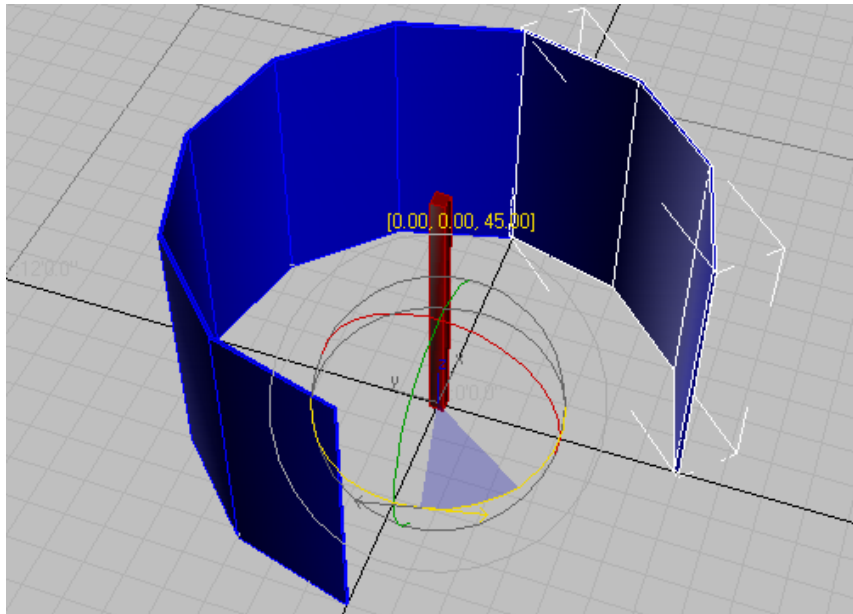
Rotate the right enclosure.

This rotation is temporary, for the purpose of modeling only.

Create a new layer:

1 On the Layers toolbar, click Create New Layer.

2 Turn off Move Selection To New Layer and name the layer **Doors**.

3 Click OK.

The Doors layer is now visible in the Layer Properties field on the Layers toolbar.
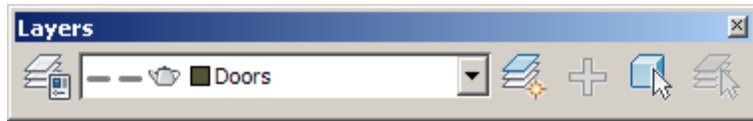
Create a door:

1 Right-click any of the Snap buttons on the main toolbar, or from the menu bar choose Tools > Grids And Snaps > Grid And Snap Settings.

   The Grids And Snap Settings dialog appears.

2 On the Snaps panel, turn on Vertex, Edge/Segment, and Midpoint as necessary, turn everything else off, and then close the dialog.
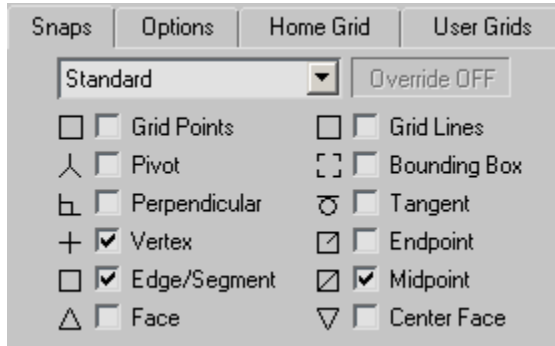
NOTE Even though you've changed the snap settings, you still need to turn on snapping.

3 Press S to turn on snapping.

    The 3D Snap button is highlighted near the center of the main toolbar.

4   On the Create panel click the arrow on the drop-down list and choose Doors. On the Object Type rollout, click Pivot.

On the Create panel, the Pivot button turns yellow, and the pivot door Parameters rollouts appear.

5 In the Perspective viewport, move your cursor over the cylinder in the center.

You can see the blue snap icon that follows the edges of the cylinder as you move.
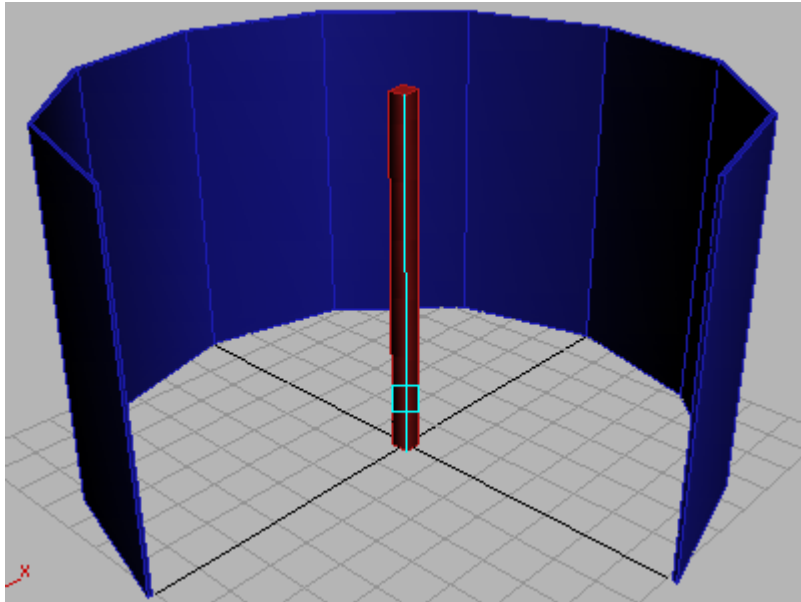
6 Position your cursor so you are snapping to the bottom-right edge of the cylinder.
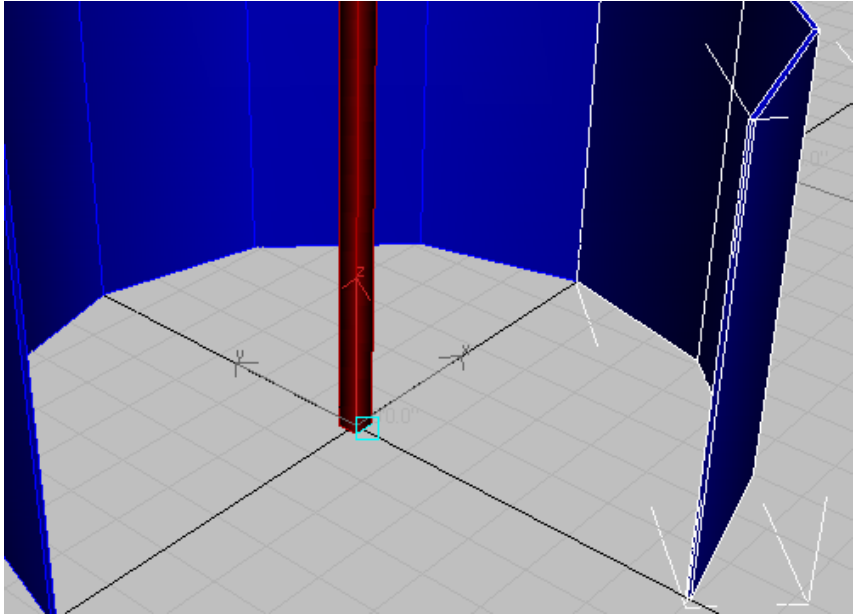
7 Drag to the right, away from the cylinder, *keeping the mouse button depressed*. Snap to the front of the right enclosure object. Release the mouse button to set the width of the door.
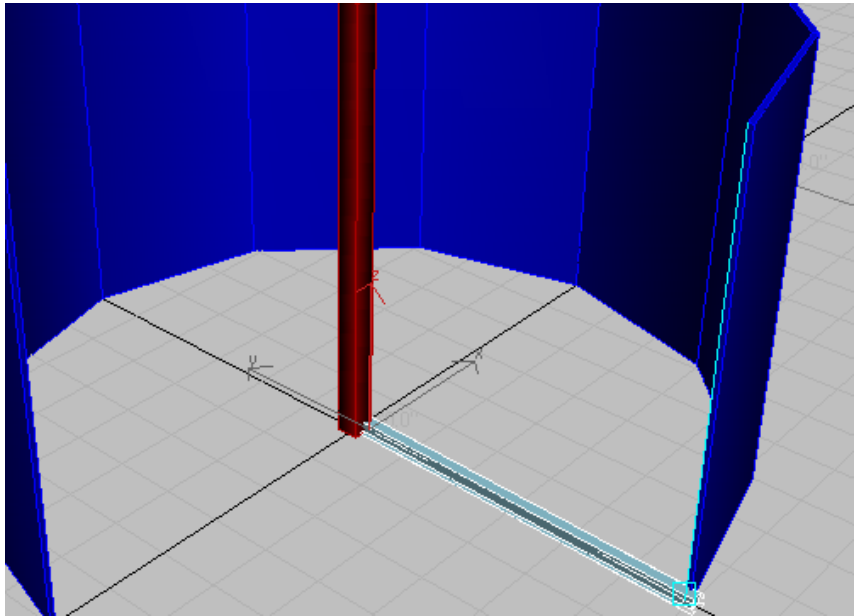
Snap to the right enclosure.

8 Press S to turn snaps off.

9 Without moving the mouse, click to set the depth of the door, and then move the mouse upward to adjust the height of the door. Click to set the height.
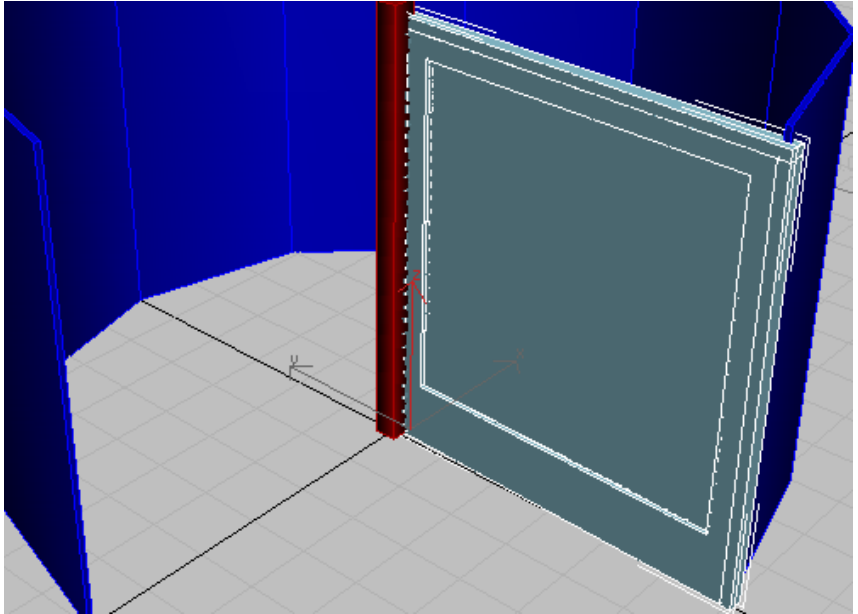
Set the Height last.

Adjust the door parameters:

Immediately after clicking to set the height, make the following parameter adjustments, watching the effects in the viewport. You can adjust these parameters at any time in the future using the Modify panel.

1 In the Frame group, turn off Create Frame.
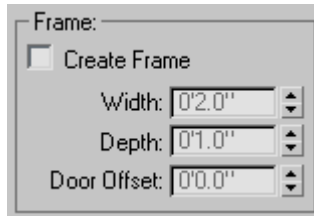
The frame disappears from the door.

2 On the Leaf Parameters rollout, increase the Stiles/Top Rail value to **0'5.0"**.

3 Set the Bottom Rail parameter to **1'6.0"**.

4 Adjust the width of the door so it fits inside the enclosure. If necessary, adjust the height and depth as well.
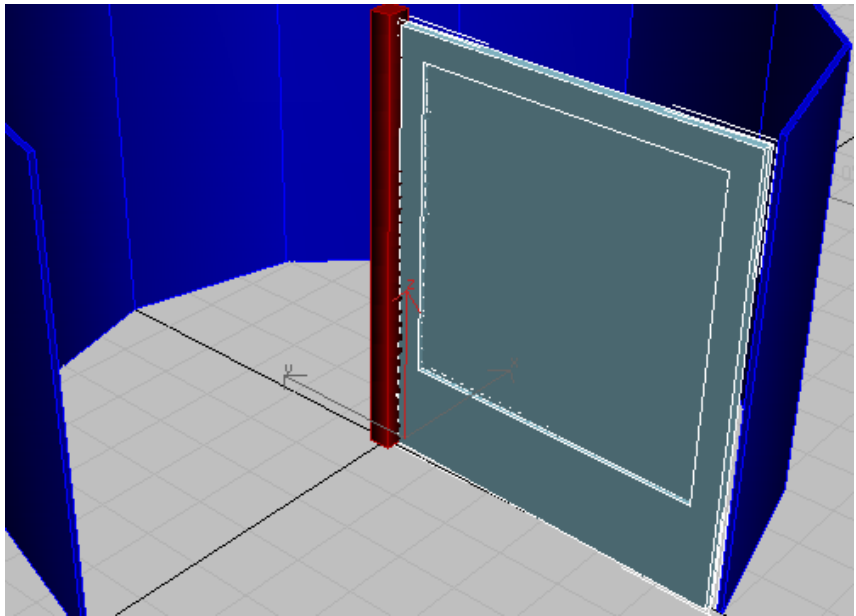
Rotate the enclosure:

1 Select the *right enclosure panels* object; the one you rotated earlier in this tutorial.

2 Rotate the sliced tube back into place; that is, –45 degrees on the Z axis.
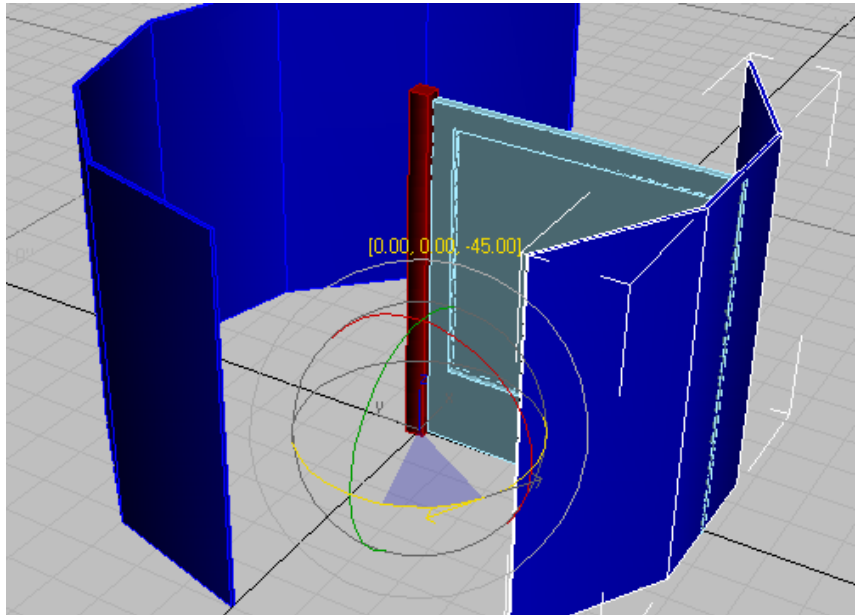
TIP If you prefer, you can enter the rotation in the coordinate display on the status bar.

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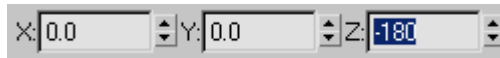
3 If the pivot door is sticking through the enclosure after you rotate it, select the pivot door, and on the Modify panel, reduce its width so it fits within the space properly.

Add struts to the enclosure:

You'll use a Lattice modifier to add struts to the enclosure. The glass panels will be held up by stout uprights that you will create next.

1 On the Layers toolbar, choose the Enclosure layer from the drop-down list.

2 On the Layers toolbar, click Select Objects In Current Layer.

This selects both enclosure objects and deselects any other objects.

3 On the menu bar, choose Edit > Clone.

4 Choose Object group > Copy, and click OK.

The software makes copies of the two enclosure objects and selects the copies.

5 On the menu bar, choose Modifiers > Parametric Deformers > Lattice.

The software applies the Lattice modifier to the selected objects.

6 In the Geometry group of the Parameters rollout, choose Struts Only From Edges.

The right and left enclosure panels now are held up by struts.

7 Adjust the Struts parameters so that:

- Radius=**0'1.0"**

- Segments=**3**

- Sides=**4**

8 In the Struts group of the Parameters rollout, turn on End Caps.
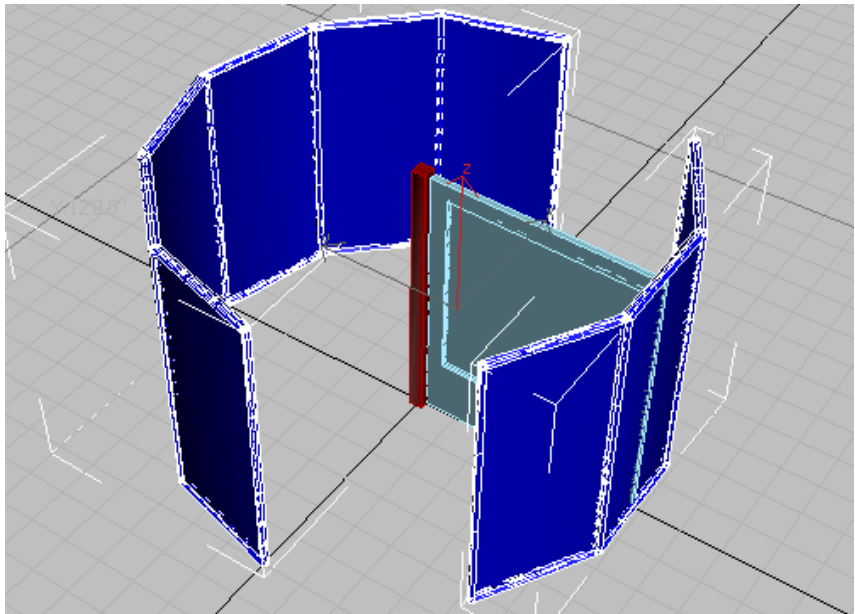
One of the objects with the Lattice modifier is named *left enclosure panel01*, and the other is named *right enclosure panel01*. You'll rename both now.

9 Select the *right enclosure panel01* object, then type **Struts right** in the Name And Color field. Also rename the *left enclosure panel01* object **Struts left**.

Next you'll create, apply, and edit materials for the revolving door.

10 Save your file as *my_add_door.max*.

Applying Materials to the Revolving Door

You'll add some quick materials to help visualize your revolving door. You'll add a shiny black finish for the struts and a green glass material for the glazing in the door and the enclosures. You'll also edit the material that already exists on the revolving door, so it matches your own green glass.

Open the material editor:

1 Continue from the previous lesson, or on the Quick Access toolbar, click Open File and open *add_door_materials.max* from the *startup* folder.

2 Open the Material Editor. You can press M on the keyboard, or click the Material Editor button on the toolbar.

The Material Editor appears in its own dialog.

Apply a door material:

You can choose materials from a material library and apply them to the revolving door so the panel is transparent.

1 On the Material Editor toolbar, below the sample spheres, click the Get Material button.

The Material/Map Browser opens.

2 In the Browse From group, choose Mtl Library.

"Mtl" is an abbreviation for "Material."

3 In the File group, click Open.

4 Open the *AecTemplates.mat* file.

NOTE This library is located in the *\materiallibraries* subfolder of your current project. If it doesn't appear in the file dialog when you click Open, browse to this directory, then open the library.

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5 In the list of materials that appears, double–click the material name *Door-Template.*

The door material appears in the material editor.

6 Drag the material from the sample sphere to the door object in the viewport.

The door now displays with transparent glass. Also, in the Material Editor, the sample sphere is now marked with corners showing that this material has been applied to an object in the scene.

TIP If you loaded the provided scene file, you might get a message that asks you to Replace or Rename the material. Choose Replace and continue.

Create and apply a green glass material:

1 Click any unused sample slot in the Material Editor to activate that slot.

By default, materials in the Material Editor are of the Arch & Design type. You'll change this material to the Standard type.

2 Click the Material Type button button to the right of the material name (its label now says "Arch & Design"), and in the Material/Map Browser list, double-click Standard.

The Standard material replaces the Arch & Design material.

3 Drag the material onto the *left enclosure panels* object. Drag from the material sample sphere to the viewport, and read the tooltip to be sure you have the left enclosure object (*left enclosure panels*) as the target.

The glass panels of the left enclosure change their appearance in the viewport.
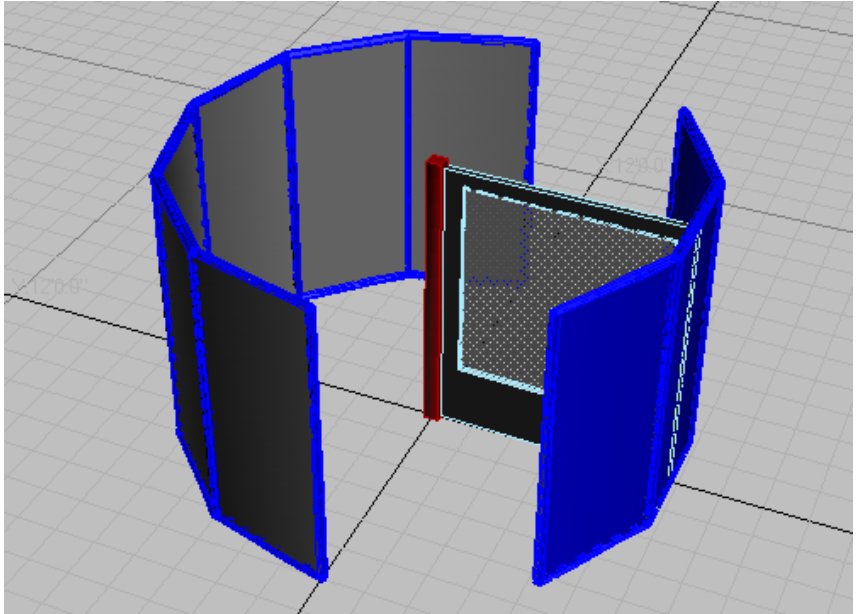
4 On the Blinn Basic Parameters rollout, change the color of this material by clicking the Diffuse color swatch. When the Color Selector opens, pick a green color.

"Blinn," named after computer-graphics pioneer James Blinn, is the default *shader* type used by the Standard material. A shader determines how the material interacts with light. And "Diffuse" refers to the basic material color. You'll find more information about these and about materials in general in the *User Reference*.
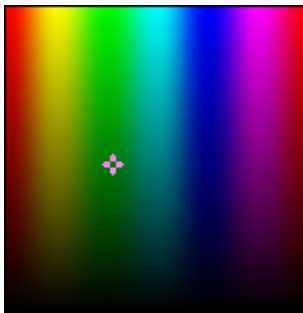
Watch in the viewport; each time you click a different color, the material updates in the viewport. When you've decided on a color, click the Close button.

5 On the Blinn Basic Parameters rollout, change the Opacity value to **66**.

6 Rename the current material to **Green Glass**. Highlight the name and then enter the new name.

7 Drag the Green Glass material from the sample sphere in the material editor to the *left enclosure panels* and *right enclosure panels* objects in the viewport.
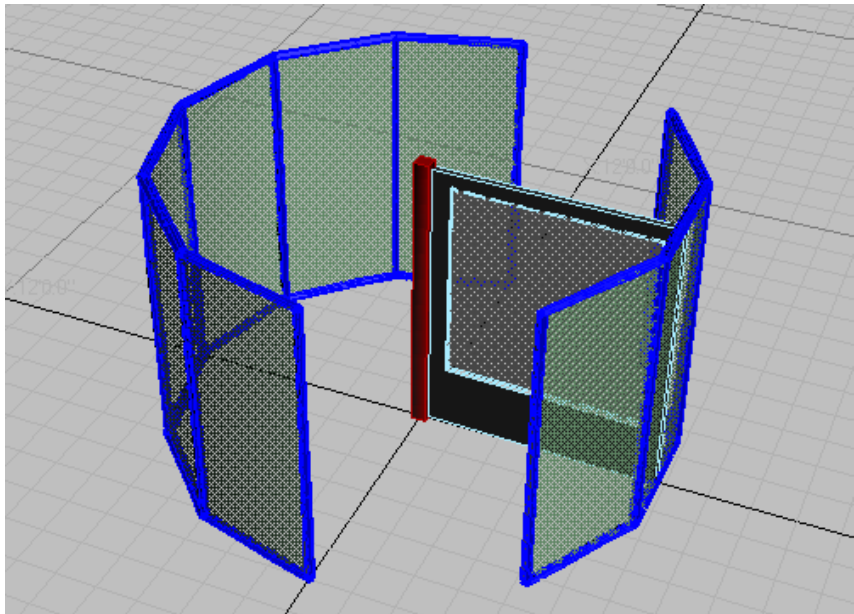
The glass on the right enclosure matches the color and transparency of the left enclosure.

Create a black metal finish:

1 In the Material Editor, activate a different sample sphere by clicking it.

2 Name the material **Black Metal Finish** and change it to the Standard type, as before.

3 On the Shader Basic Parameters rollout, click the drop-down arrow next to Blinn and choose Metal.

This shader is more appropriate for metallic materials.

4 On the Metal Basic Parameters rollout, click the Ambient color swatch. In the Color Selector, choose a dark color close to black. You can use the Whiteness slider to darken the color.

> **NOTE** The Diffuse color changes to the same dark color, since the Diffuse and Ambient values are locked together by default.

"Ambient" refers to the lighting that spreads out within a scene without being cast directly by a light source. Typically it's reflected off surfaces such as walls.

5 Set Specular Level to **128** and Glossiness to **37**.

These two settings determine the brightness and size of shiny highlights, respectively.

All of these settings combine to produce a black, shiny surface treatment.

6 Press H on the keyboard, then select the Struts objects by name. Hold down the Ctrl key and highlight the names, and then click Select to select both objects and close the dialog.

7 Click the Assign Material To Selection button to apply the material to the selection.

8 Drag this material onto the central hub object (*Cylinder01*).

Edit the material:

After you created the pivot door, you assigned a Multi/Sub-Object material from a material library to the door. When you have a single object, such as this door, with different, distinct components (such as glazing, frame, and so on), you can use a Multi/Sub-Object materialto apply different materials to the parts.

You will use the eyedropper to get the material from the door into the material editor. This will give you a second copy of the material to edit, leaving the original available for use.

1 Click another sample sphere, to make it active.
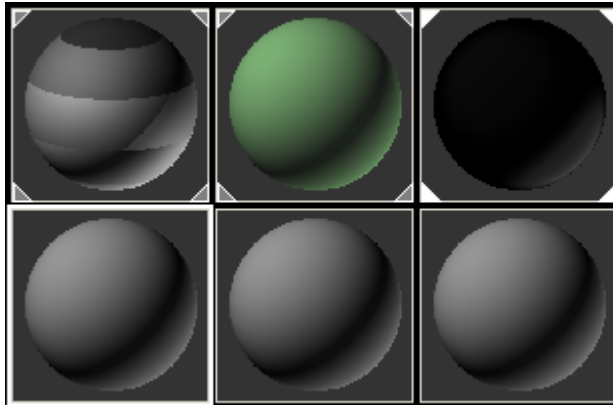
2 In the Material Editor, click the eyedropper button to activate it, and then in the viewport click the pivot door.

The sample sphere is replaced with a sphere that shows five stripes of different materials. This indicates that the selected material is a Multi/Sub-Object material.
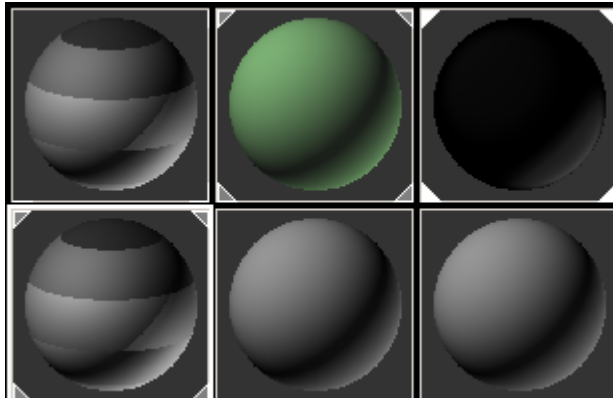
On the Multi/Sub-Object Basic Parameters rollout you can click and access each individual material.

3 Drag the Green Glass sample sphere to the Inner Bevel (Standard) button. On the Instance (Copy) Material dialog choose Instance, if necessary, and click OK.

When you copy something using the Instance option, changing one instance changes all of them. For example, if you then made the glass a neutral color, all the instances would reflect that change.

This is the material that is applied to the glazing. The glass on the revolving door turns green in the viewport.
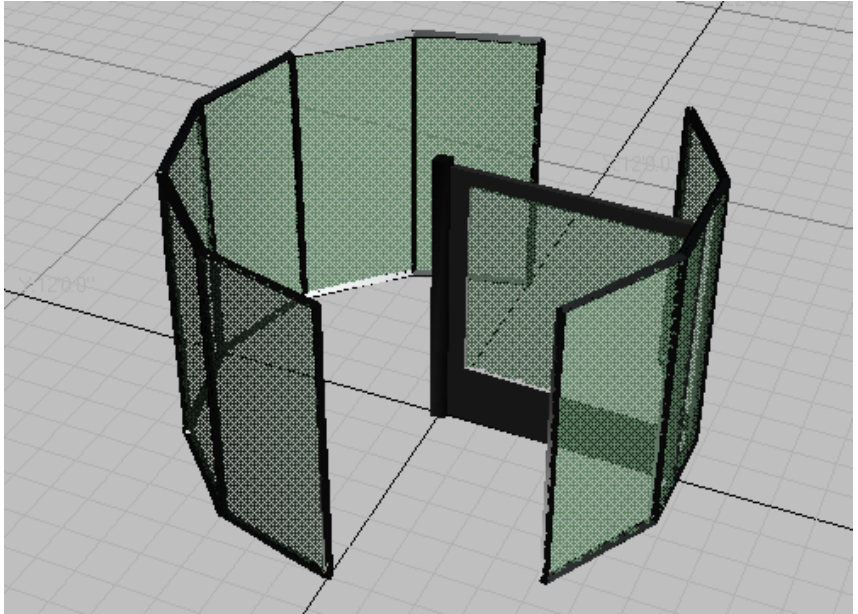
4 Drag the Black Metal Finish material to the other material slots in the Multi/Sub-Object material. In each case choose Instance.

Change the material:

Now make changes to the material and watch them update on the objects in the viewport.

Change the Black Metal Finish to a shiny gold instead. Do the following:

1 Click the Black Metal Finish sample sphere.

2 Click the Diffuse color swatch, and then change the black material to a gold material. Use RGB values of approximately **176, 157,** and **52,** respectively, to achieve a nice gold tone.

3 Rename the Black Metal Finish material to **Burnished Gold**.

4 Click the Perspective viewport Smooth + Highlights label and turn off Edged Faces.

Close the Material Editor when you're done.
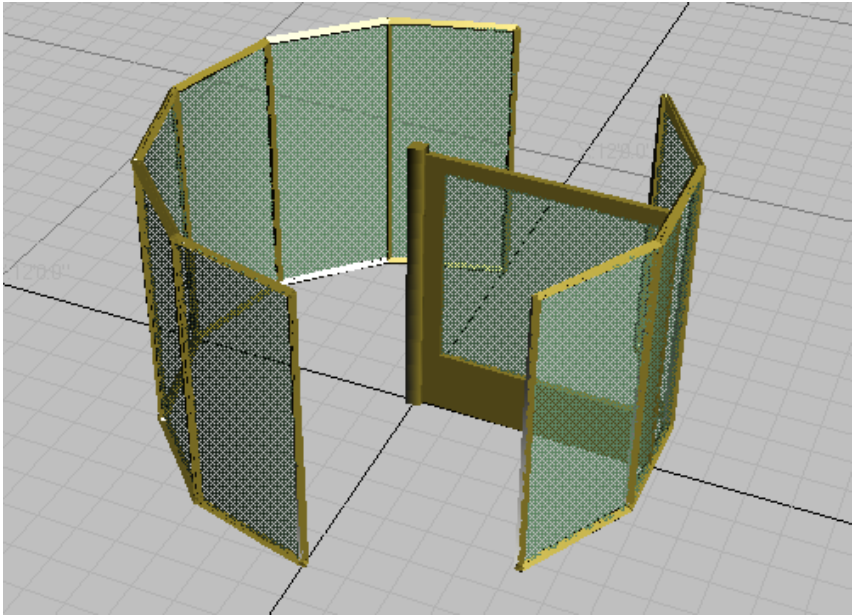
5 Save your file as **my_add_door_materials.max**.

Cloning the Door

There will be four doors revolving around the central hub. You have one door so far, and you will make three instances of the door to complete the wheel.

■ Continue from the previous lesson, or open *start_door_clone.max* from the *startup* folder.

Adjust the door position and rotation:

1 Activate the Top viewport or press T on the keyboard to change to a Top viewport.

2 Make sure the viewport is set to Wireframe shading mode.

3 Zoom in and select the pivot door.

4 Move the pivot door, if necessary, so it is centered on the edge of the hub, as illustrated. Rotate the door, if necessary, so it is square to the hub. One way to accomplish the latter is to click the Select And Rotate button, and then set the Z coordinate under the viewport to **0.0**.
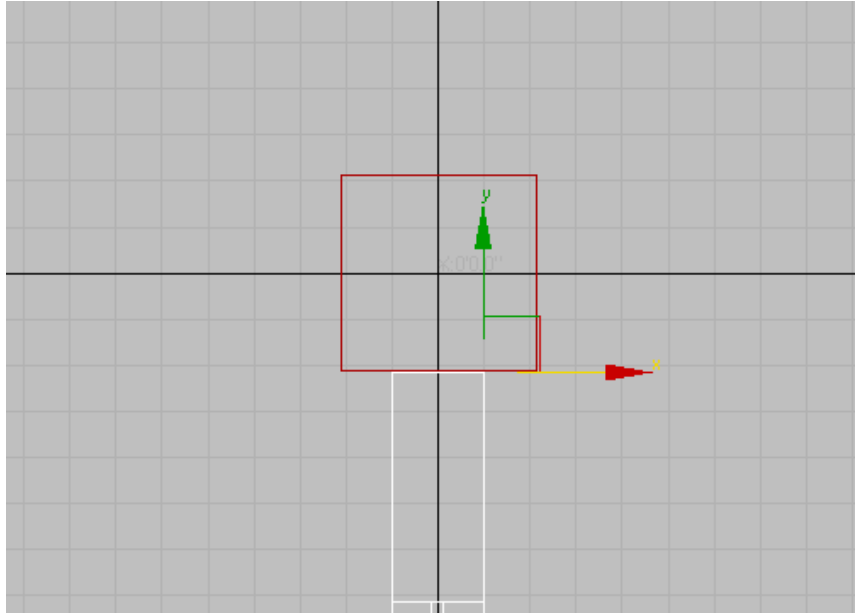
5 Press P on the keyboard to return to the Perspective viewport.Press P on the keyboard to return to the Perspective viewport, or right–click anywhere within the Perspective viewport to activate it without changing the selection.

Create the cloned doors:

1 Right-click the viewport and choose Rotate from the menu.

This right-click menu is called the quad menu. You can use it to access tools from the toolbar and command panel for quicker workflow. You can even customize it to keep your favorite tools right under your fingertips.

2 On the toolbar, click the drop-down arrow for the Reference Coordinate System (View is the default). Choose Pick, then click the *Cylinder01* object (the hub) in the viewport.

3   On the toolbar, directly next to the Reference Coordinate system drop-down, choose Use Transform Coordinate Center.

This allows you to rotate the pivot door around the cylinder's pivot point, rather than its own.

4   Press A on the keyboard to turn on Angle Snap, if it isn't on already.

The Angle Snap button activates on the toolbar.

5   Hold down the Shift key and position your cursor over the Z axis in the transform gizmo in the viewport until the axis turns yellow. Then click and drag slowly to rotate the door until Z= **90** degrees in the Coordinate display. Release the mouse button.

Holding down Shift as you transform an object serves as a quick way to clone the object.

6   On the Clone Options dialog, set Number Of Copies to **3**, choose Instance (if necessary), and click OK.

Now there are four doors within the enclosure.
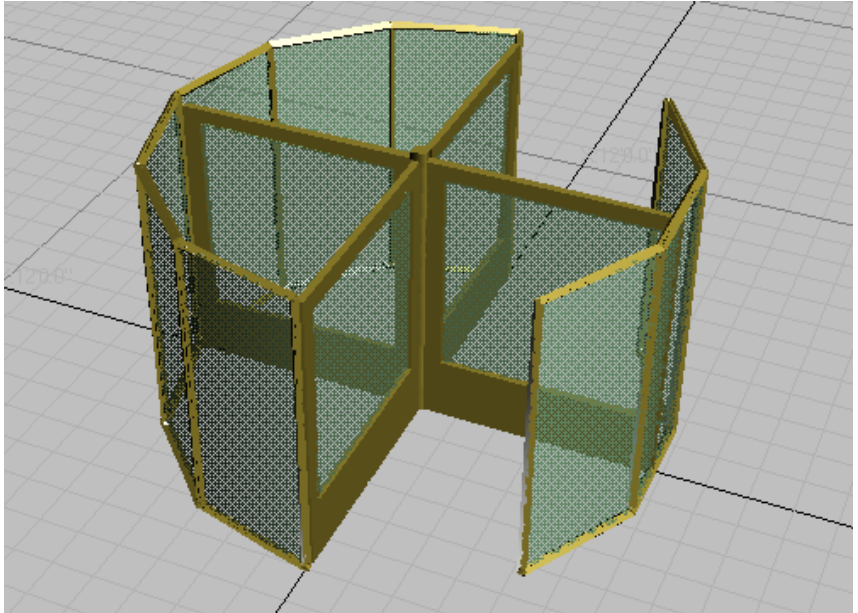
Clone the door to create a wheel of doors
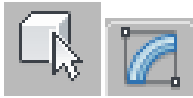
7   Select the hub in the viewport, and then on the Modify panel, change its Sides value to **12**.

The hub now resembles a cylinder rather than a box.

8   Save your work as **my_fourdoor.max**.

Animating the Revolving Door

To make the revolving door spin, you'll first link the four doors to the hub. Then, using the time slider, you'll animate the rotation of the hub to spin the doors.
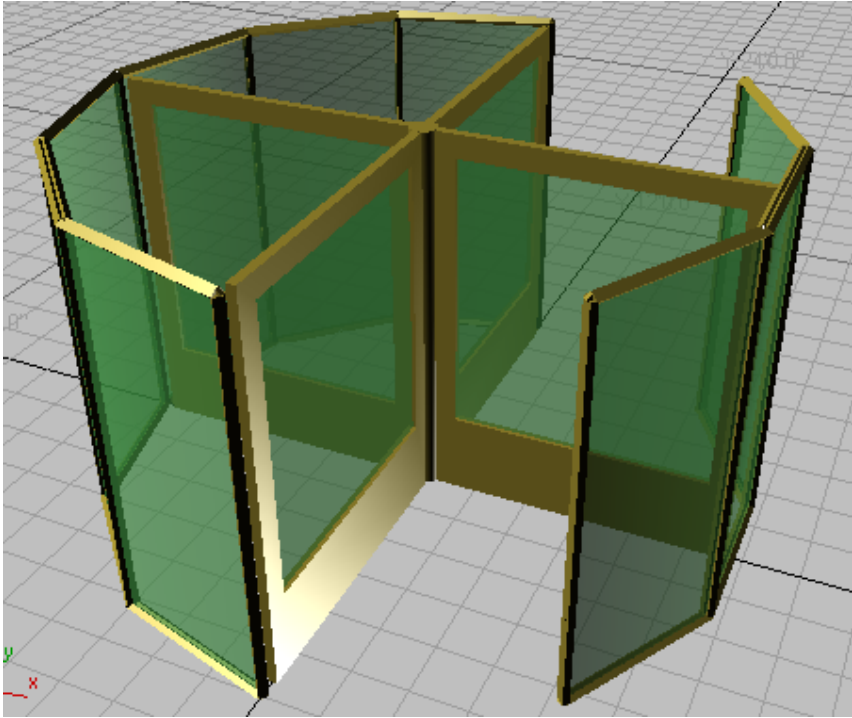
■ Continue from the previous lesson, or open *start_door_link.max* from the *startup* folder.

> **NOTE** If you see the *File Load: Units Mismatch dialog*, choose the default option: Adopt The File's Unit Scale.

Link the doors to the hub:

1 Zoom in the viewport so you have a close-up view of the hub and the four doors.
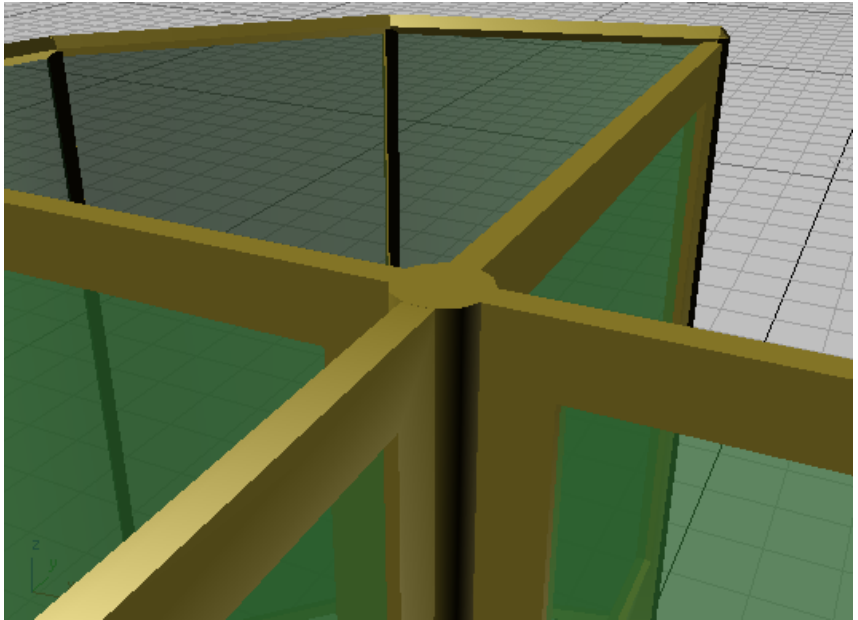
2 On the toolbar, click the Select And Link button.

3 In the viewport, drag from one of the pivot door objects to the hub. You will see a dotted line drawn between your cursor and the original door as you move.

4 Repeat the operation for each of the other three doors.

5 To verify that you correctly linked the four doors to the hub, do the following:

- On the toolbar, click the Select Object button.

- Click Select By Name, or press H on the keyboard.

- On the Select From Scene dialog, turn on Display Children if necessary, and expand the *Cylinder01* object node.

All four Pivot Door objects should be indented below the *Cylinder01* object in the list. If any aren't, re-link them to the hub.

Now you are ready to animate the revolving door.

Replace the rotation controller

3ds Max Design performs animation by means of software devices called *controllers* that are assigned to individual objects. Typically an object has three types of controllers assigned, for position, rotation, and scale. The default rotation controller is good for character animation, but you'll replace it with a controller that is better for design-visualization animation.

1   Select the hub in the viewport.
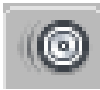
2   Open the Motion panel, and expand the Assign Controller rollout if necessary.

3   In the Assign Controller window, highlight the Rotation: Euler XYZ item.
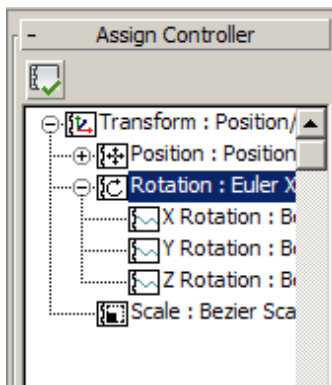
Click the Assign Controller button.

4   In the Assign Controller dialog click TCB Rotation, and click OK.
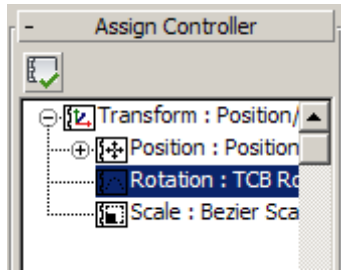
The rotation controller listed in the Assign Controller rollout changes to TCB Rotation.

5 Scroll down to the bottom of the Key Info rollout and turn on Rotation Windup. This will allow you to set rotation keys greater than 180 degrees.

IMPORTANT You must turn on Rotation Windup, or the animation won't work correctly.

Animate the hub:

1 Auto Key Turn on the Auto Key button.

2 Move the time slider to frame 100.

3 Click the hub in the viewport to select it.
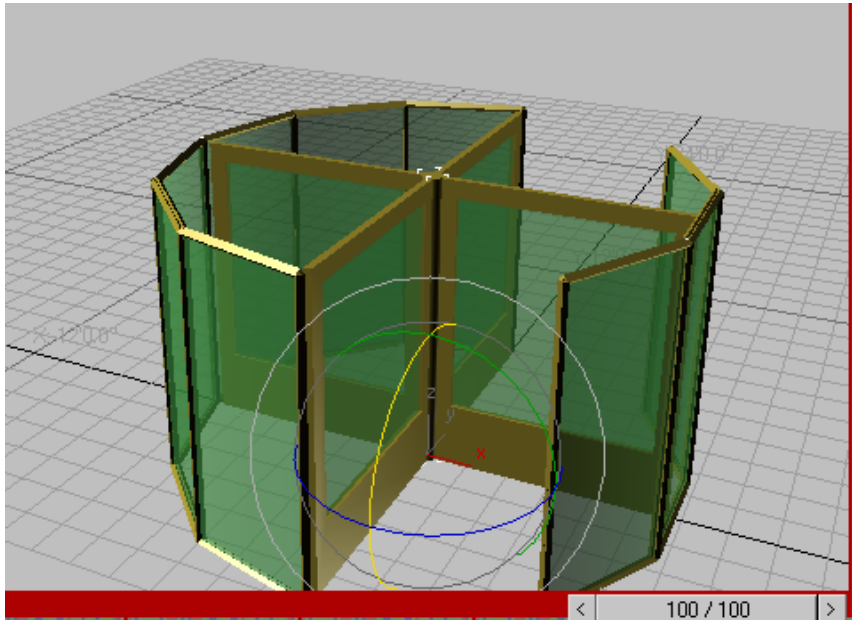
4 Right-click and choose Rotate, then rotate the hub **360** degrees about the Z axis. Watch the coordinate display to get the correct rotation.
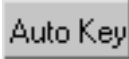
TIP To make setting even rotations easier, turn on Angle Snap by pressing the A key.

The Time Slider now shows keyframes as small squares at the beginning and at the end of the time segment.

5 On the VCR controls, rewind the animation by clicking the Go To Start button, and then click the Play button.

Watch your revolving door rotate in the viewport.

Save your work:

■ From the Application menu, choose Save As and save your work as **myrevolvingdoor01.max**.

You can use the plus button (+) to increment the file name.

Slow down the animation:

To slow down the rotation of the revolving door, do the following:

1 [icon] Click the Time Configuration button.

2 In the Animation group, click Re-scale Time.

3 On the Re-scale Time dialog, change End Time to **200**, then click OK.

4 Click OK to close the Time Configuration dialog.

   The Time Slider now displays 200 frames, with a key at frame 0 and frame 200.

5 Click the Play button and watch the revolving door go around.

   The animation plays slower than before.

6 Stop the playback in the viewport, and click the Auto Key button to turn it off.

7 Save your work as **myrevolvingdoor02.max**.

Merging Files

The revolving door seems lonely, spinning by itself in the viewport. You can use the Merge File function to put this revolving door into context, by merging in another scene of an entranceway.
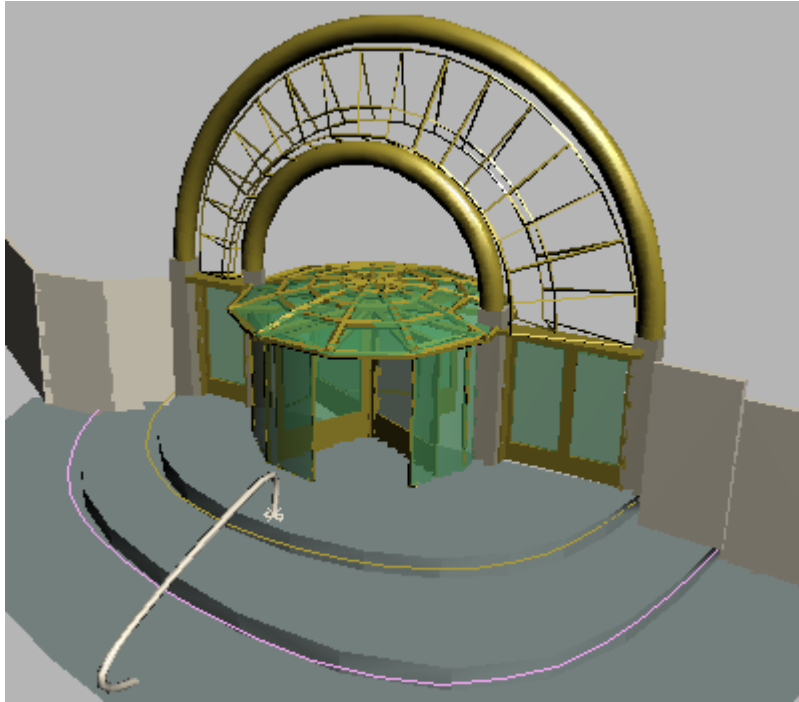
You'll also learn to animate the opening of parametric doors.

■ Continue from the previous lesson, or open *startup\revolving_door.max*.

Merge a scene:

1 ![3DS icon] From the Application menu, choose Import > Merge, browse to *revolving_door\entranceway.max*, and click Open.

After you click the file name, the Merge File dialog displays a thumbnail of the scene.

2 In the Merge dialog, click the All button to select all the objects in the scene, and then click OK.

3 If the Duplicate Name dialog appears, click Skip for any duplicate objects.

The revolving door is now in the middle of the entranceway.

NOTE If you've been modeling in metric units you might need to scale the revolving door so it matches the new scene. You can use the *Rescale World Units utility* if you need to accomplish this.
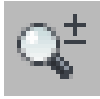
4 Click the Zoom button in the viewport navigation controls, and then zoom back so you can see the double doors.

Animate the double doors:

1 Turn on the Auto Key button.

2 Move the Time Slider to frame 100.

3 Select the *Double doors* object in the viewport.

4 On the Modify panel, in the Parameters rollout, set Open to **75.0** degrees.
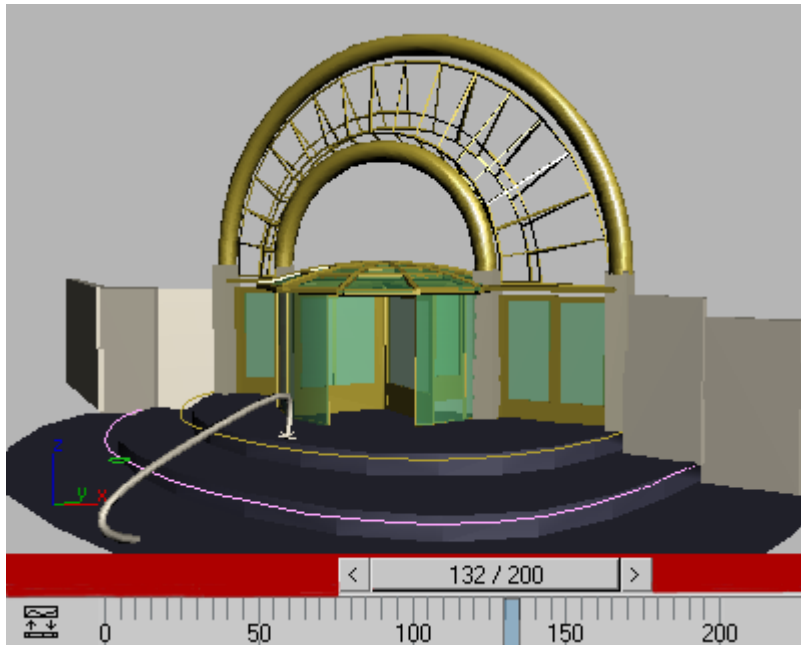
NOTE The spinner is now outlined in red, indicating it is an animated parameter that has a key on the current frame.

5 Move the Time Slider to frame 200.

6 On the Modify panel, set Open back to **0.0** degrees.

7 Play the animation using the Play button in the VCR controls.

The revolving doors go around and the double doors swing open.

Fine-tune the animation:

You can use the track bar to make the double doors open and close faster.

1   Make sure the double doors are selected, and then on the track bar, drag the key at frame 100 to frame 25. Watch in the status bar for the frame number.

2   Similarly, move the key at frame 200 to frame 50, and then play the animation.

The doors open and close more quickly.

You can make the doors open and close repeatedly throughout the rest of the animation by using Track View.

3   On the Modify panel find the animated Open parameter, and right-click within the numeric field. From the menu that appears choose Show In Track View.

A Track View – Curve Editor window opens with the Double doors Open parameter highlighted.
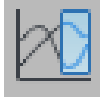
4   On the Track View toolbar click the Parameter Curve Out-Of-Range Types button.

5 On the Parameter Curve Out-Of-Range Types dialog, click the Ping Pong graph diagram.

Click OK to accept the change and close the dialog, and then close the Selected track view dialog by clicking the close (X) box in the upper-right corner.

6 Play the animation again.

Now the doors open and shut throughout the animation.

**7** Turn off Auto Key before continuing.

The glass on the revolving doors is going to get covered with fingerprints from all the people pushing on the glass. You'll add a push bar to the doors. You can easily make a single push bar out of a torus and attach it to the door.

Isolate the doors:

1   On the Layers toolbar, click the Manage Layers button.

2 In the Layer dialog, click the gray box next to the Doors layer to make it the active layer.

3 Also in the Layer dialog, click in the Hide column next to each layer except Doors. Close the Layer Manager.

The doors are isolated. Everything else in the scene goes away and only the doors are displayed.
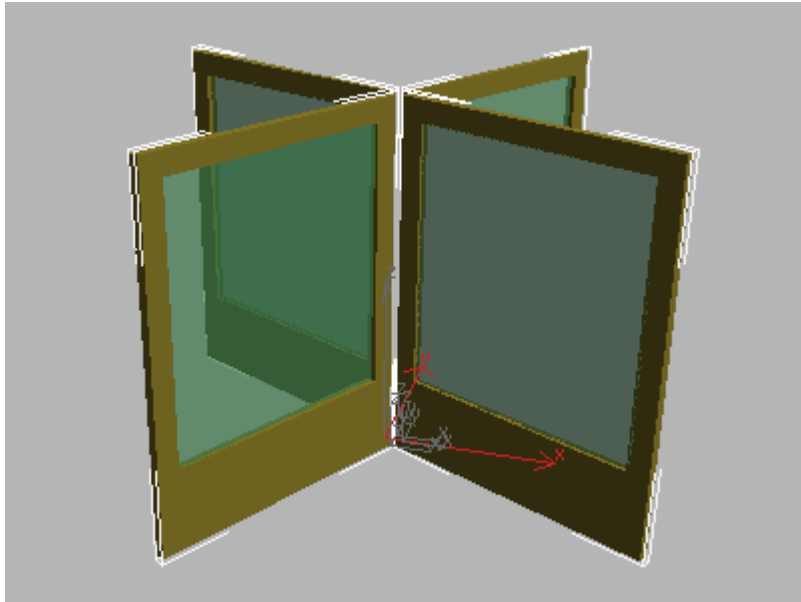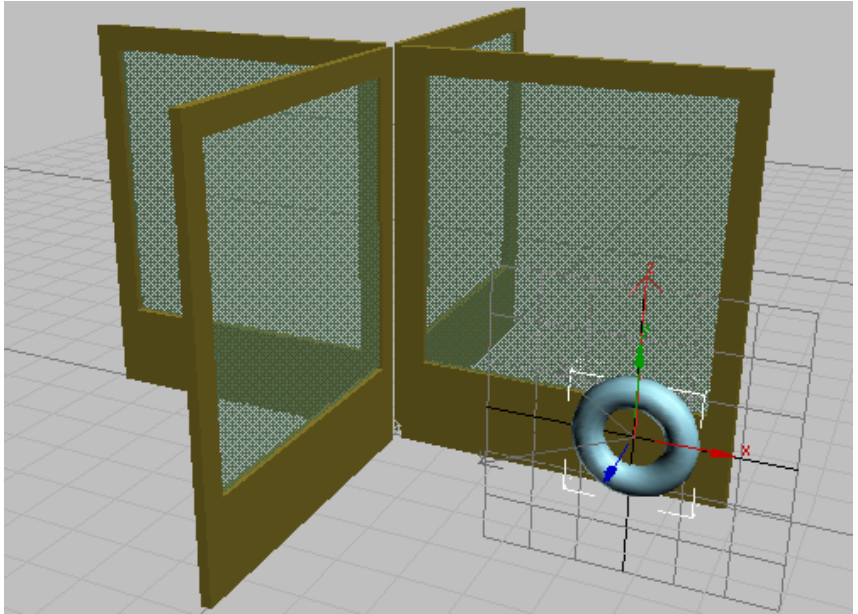
Create the push bar:

1 Zoom in on the doors, if necessary.

2 Make sure the Doors layer is active.

3 On the Create panel, in the Standard Primitives category, click Torus.

4 On the Object Type rollout, turn on AutoGrid.

5 Turn off Auto Key and go to frame 0, if necessary.

6 Move your cursor over the front of the door facing you and drag out a Torus.

   A Torus is created on the plane of the door.

7 Right-click in the viewport to exit Create mode.

8 Go to the Modify panel, and on the Parameters rollout:

- Set Radius 1 to **0'8.0"** and Radius 2 to **0'1.5"**.

- Change the Rotation setting to **45.0**.
  Now the geometry will work for the push bar.

- Change Segments to **3**.

- Change Sides to **4**.

- Set Smooth to **None**.

- Turn on Slice On.

- Set Slice From to **180.0** and Slice To to **0.0**.

9 Right-click and choose Move from the quad menu, then move the push-bar object using the transform gizmo to the right center of the door, as shown below. Rotate it if necessary.
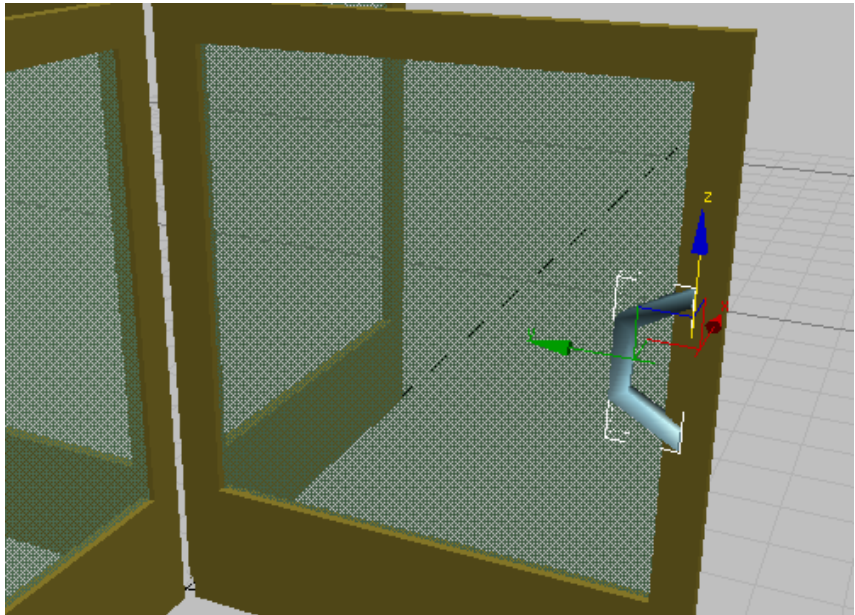
Attach the push bar:

1 In the viewport, click the door to select it.

   The name *PivotDoor01* appears at the top of the Modify panel.

2 From the Modifier List choose Edit Mesh.

   An Edit Mesh modifier is added to the Modify stack.

3 On the Edit Geometry rollout, click Attach, then click the push bar in the viewport.

   The push bar changes color in the viewport. Click the Attach button again to turn it off.

4   Click the Play button on the VCR controls.

   The revolving door spins around. There are four push bars, one on each door. Since the other three doors are instances of the first, adding geometry to one adds geometry to all.
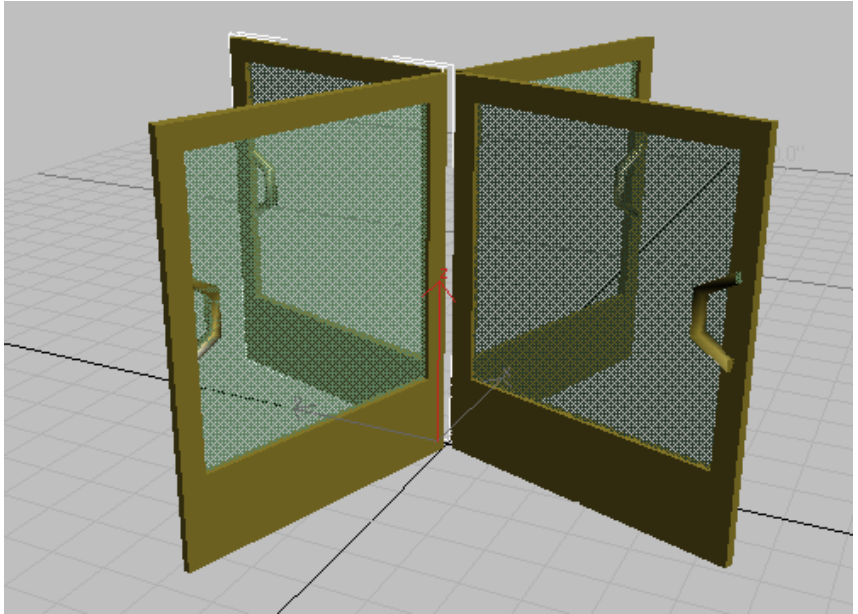
5 Open the Layer Manager and unhide all layers.

The entire scene is visible now. You can find an example of the finished scene in *\startup\revolving_door_final.max* for comparison purposes.

Summary

In this tutorial you learned to get around the 3ds Max Design user interface, and to do some simple modeling and animation. You learned to work with primitive objects and apply and edit materials. You created a door object, made clones of it, and linked the doors to a parent object in order to make an animation. Lastly, you learned to merge files together to create a more complex scene.