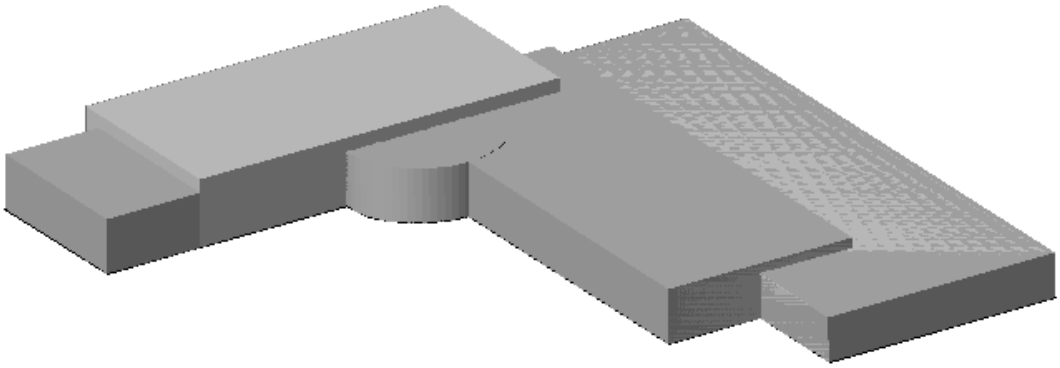
Lesson 2
Mass Elements and Mass Groups

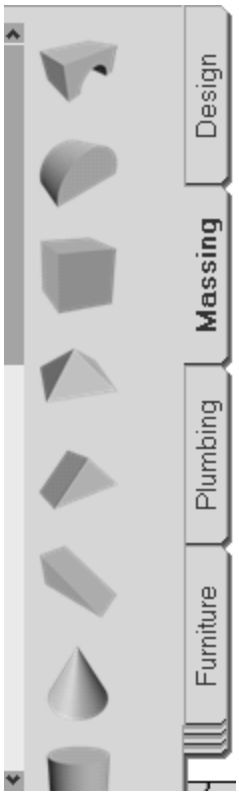
Architects usually start the design process with a conceptual idea of how the building model will look. To create this concept, they often use the mass elements and mass group tools available inside of ADT.



The conceptual idea is used to convey to the customer how the building will look.

The building model can be overlaid on top of a photograph of the proposed building site, so you can get an idea of how the building will fit in with the surrounding environment.

Once you have the basic shape of the building, you can move forward with creating the basic building elements: walls, doors, windows and openings.

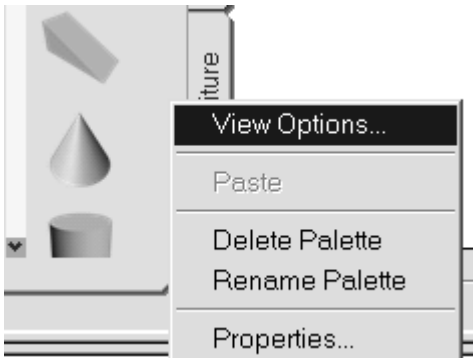


The Mass Elements tools include a suite of primitive solids that can be used to create your conceptual design.

The tools are available on the Massing Palette.

For our building design, we will use the Cylinder, Box, and Right Triangle.

TIP: You can control the appearance of the tools on your palette by right clicking on the palette and selecting View Options.



Exercise 2-1:

Creating Mass Elements

Drawing Name: ex1-3
Estimated Time: 20 minutes

This exercise reinforces the following skills:

- Mass Elements
- Views
- Shade

1.  Open *ex1-3.dwg.*

2. 

Open the Project Navigator Palette.
Select the Sheets Tab.
Highlight the Massing sheet under Architectural.
Right click and select **Open**.

3. 

Select the Model tab.

3.  Switch to a SW Isometric view.

4. Press **Ctl+3** to launch the Tool Palette if it is not visible.

5. 

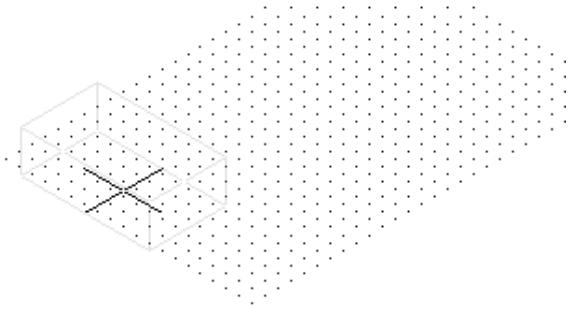
Select the Box tool from the Massing Palette.

6.

BASIC	
General	
Description	
Style	Standard
Shape	Box
Attached to	*NONE*
Dimensions	
Specify on s...	No
Width	58'-8"
Depth	98'-9"
Height	32'-0"
Location	
Rotation	0.00
Elevation	0"

For Width, enter 58′-8″.
For Depth, enter 98′-9″.
For Height, enter 32′.

Place the box in the upper left corner of the grid as shown.



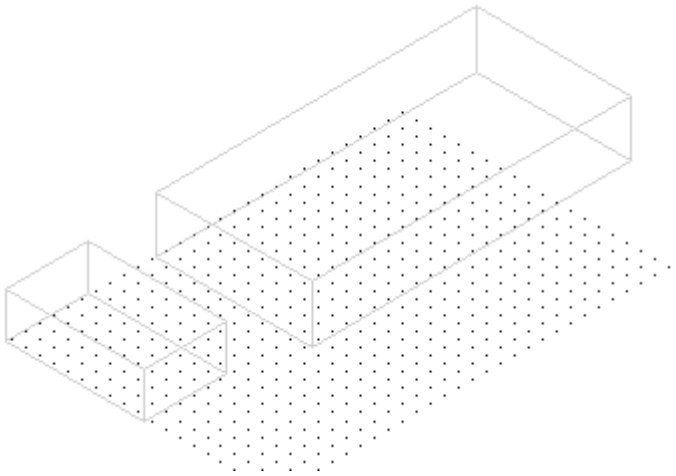
7.

General	
Description	
Style	Standard
Shape	Box
Attached to	*NONE*
Dimensions	
Specify on s...	No
Width	228'-5"
Depth	110'-9"
Height	40'-0"
Location	
Rotation	0.00
Elevation	0"

Select the Box tool again.
For width, use 228′-5″.
For depth, use 110′-9″.
For Height, use 40′-0″.

When prompted for rotation, press ENTER for zero degrees.

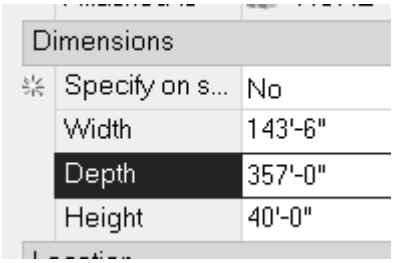
8.



Place the second box next to the first box.

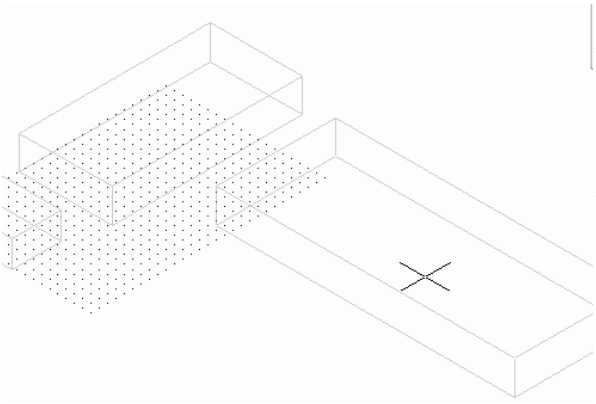
You can use the MOVE command later to position them next to each other.

9.



Add a third box.
For width, use 143′-6″
For depth, use 357′-0″.
For Height, use 40′-0″.

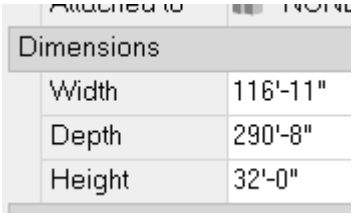
10.



Place the box next to the second box. You can use the MOVE command later to position them next to each other.

When prompted for rotation, press ENTER for zero degrees.

11.

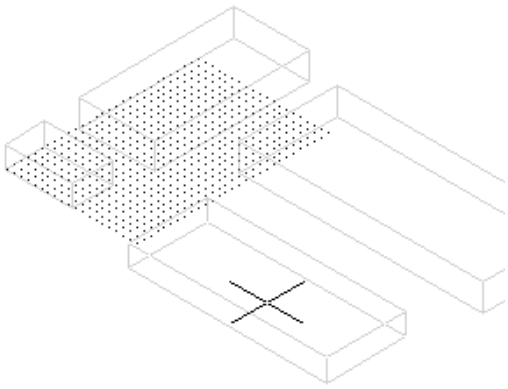


We place a fourth box.

For width, use 116′-11″
For depth, use 290′-8″
For Height, use 32′-0″

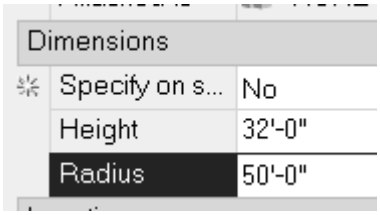
When prompted for rotation, press ENTER for zero degrees.

12.



Place the box anywhere in the drawing. We will use the MOVE command to position it later.

13.

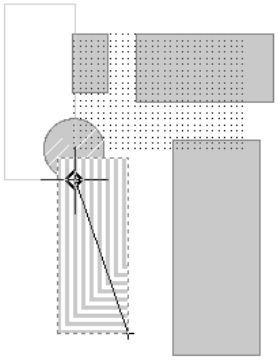


For Height, enter 32′-0″
For Radius, enter 50′-0″.
When prompted for insertion point, enter 0,0.

For rotation, press ENTER for zero degrees.

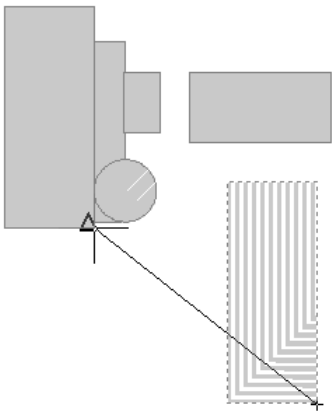
14.  Switch to a top view.

15.



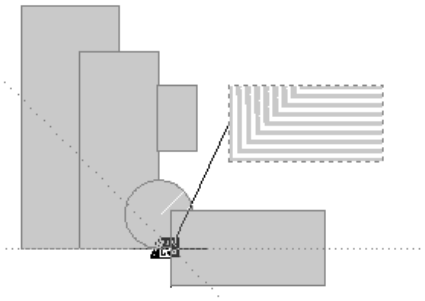
Using the MOVE tool, move the fourth box so that the lower right corner is coincident to the lower quadrant of the circle.

16.



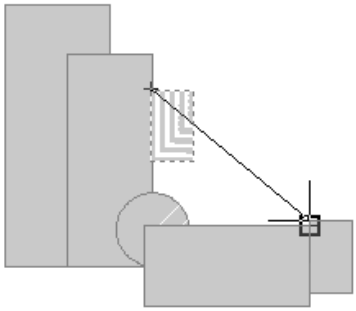
Move the third box so that its lower right corner is coincident with the midpoint of the bottom horizontal line of Box 4.

17.



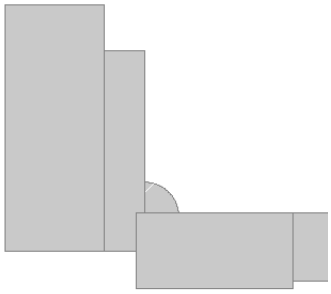
Move Box 2 so the mid-point of the left side of the box is coincident with the lower right corner of Box 3.

18.



Move Box 1 so the upper left corner is coincident with the upper right corner of Box 2.

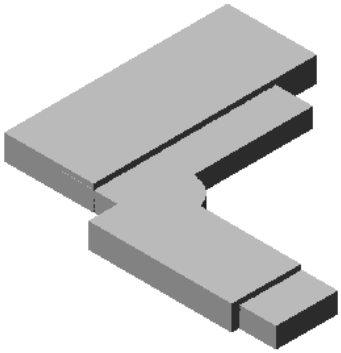
19.



Our completed conceptual design.

Use the 3D Orbit tool or the Views tools to inspect the building from different viewpoints.

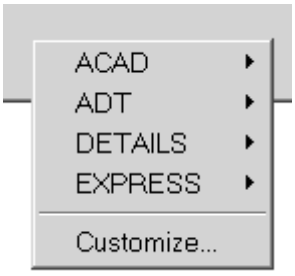
20.

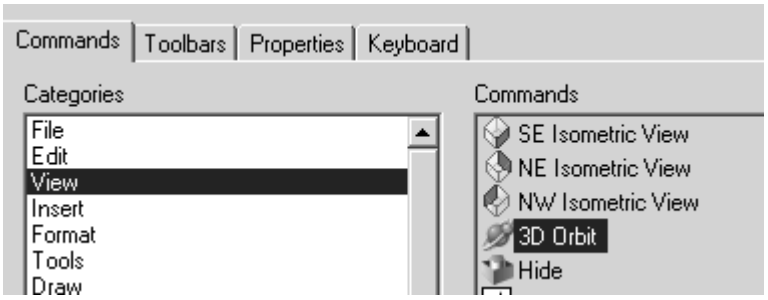


Switch to an isometric view.

Go to View→3D Orbit to rotate your design in three dimensions.

TIP: You may want to add the 3D Orbit tool to your View toolbar. To add the 3D Orbit tool, right click in the grey area of the toolbar and select **Customize.**





Select the Commands tab.
Highlight the View Category,
Select the **3D Orbit** tool.

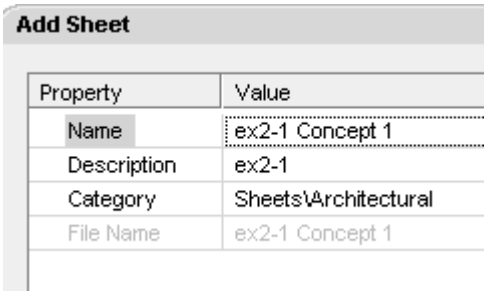
Drag and drop onto your View toolbar.
Press **Close.**

21.  Select the **Flat Shaded** tool from the View toolbar to get a better visual concept of the building.

22. Save as *ex2-1.dwg*.

23. 

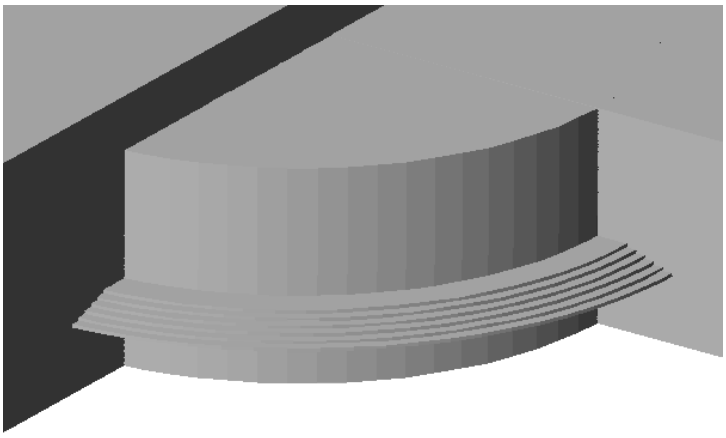
Activate the Project Navigator Palette.
Highlight Architectural.
Right click and select **Save Current Dwg As Sheet**.

24. 

Edit the Name field.

Press **OK**.

We can add concrete steps leading up to our building using a series of cylinders. All the cylinders are placed at 0,0, but the Z or elevation of the cylinders is different. The first step is placed at an elevation of 10′ to accommodate the basement floor of our building. Each cylinder has a height of 6″.



CYLINDER	RADIUS	INSERTION PT
1	55′	0,0,12′-6″
2	56′-6″	0,0,12′-0″
3	58′-0″	0,0,11′-6″
4	59′-6″	0,0,11′-0″
5	61′-0″	0,0,10′-6″
6	62′-6″	0,0,10′-0″

All cylinders have a height of 6″.

TIP: If you make a mistake in placing a cylinder, you can use the UNDO option to undo the placement and then retype it in. Simply type ‘U’ at the command line when prompted for the insertion point and the previous cylinder placed will be erased.

Exercise 2-2:

Creating Entry Stairs

Drawing Name: ex2-1.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

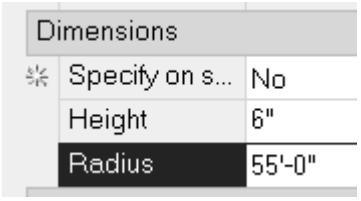
- Mass Elements

1.  Open *ex2-1.dwg*.

2.  Switch to a top view.

3. 

Select the **Cylinder** tool.

4. 

Enter 6″ for the Height.
Enter 55′-0″ for the Radius.

5. At the command line, enter 0,0,12′6″ for the insertion point.
Press **ENTER** for Rotation Angle.

6.

CYLINDER	HEIGHT	RADIUS	INSERTION PT
1	6″	55′	0,0,12′-6″
2	6″	56′-6″	0,0,12′-0″
3	6″	58′-0″	0,0,11′-6″
4	6″	59′-6″	0,0,11′-0″
5	6″	61′-0″	0,0,10′-6″
6	6″	62′-6″	0,0,10′-0″

Using the table, create Cylinders 2-6 without exiting the Cylinder command.
(You already created Cylinder 1.)

TIP: You can place these cylinders quickly by changing the radius value in the Properties dialog and then use the Up ↑ arrow on your keyboard to copy the previous insertion point. You can then modify the insertion point and press ENTER.

7. Save as *ex2-2.dwg.*

Exercise 2-3:
Modifying Mass Elements

Drawing Name: Ex2-2.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

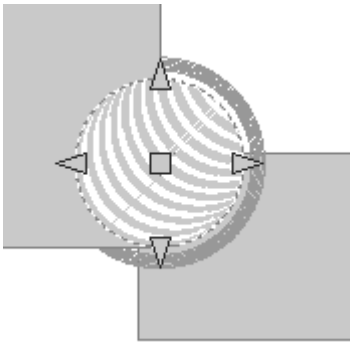
- Mass Elements
- Modify Mass Element

The curved front of the building is very attractive, but unnecessary for the basement level.

We can modify the cylinder by changing the height and insertion point.

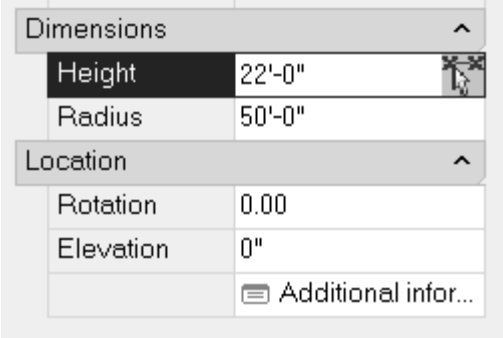
1. Open *ex2-2.dwg.*

2. Switch to a top view.

3. 

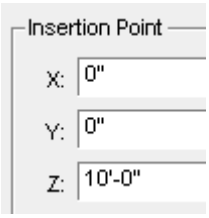
Select the large cylinder.

Right click and select **Properties**.

4. 

Change the Height to **22′-0″.**

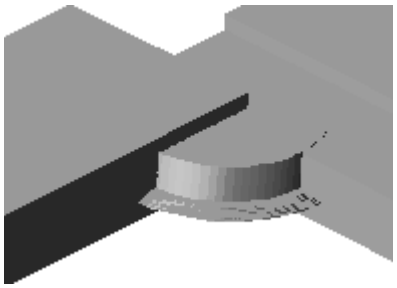
5. Select the field that shows Additional information.

6. 

Change the Z value to **10′-0″.**

Press **OK**.

Close the Properties dialog.

7. 

Use **3D Orbit** to inspect the change.

9.  Save as *ex2-3.dwg.*

Exercise 2-4

Adding Mass Groups

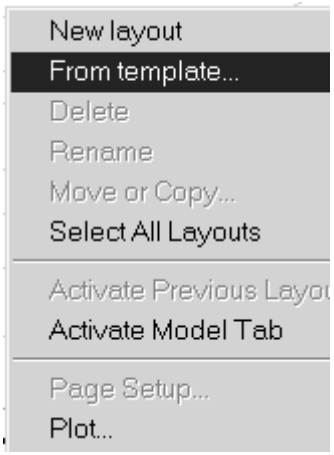
Drawing Name: Ex2-3.dwg, AEC (Imperial) Massing.dwt
(Download from the publisher's website.)
Estimated Time: 10 minutes

This exercise reinforces the following skills:

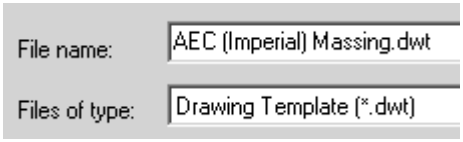
- New layout from Template
- Mass Groups
- Add Mass Group

1.  Open *ex2-3.dwg.*

2. In order to control the visibility of our mass groups, we should create a layout tab and configure the viewport for mass elements and mass groups.

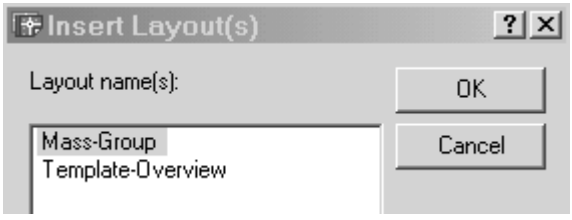


Place your cursor over the model tab.
Right click and select **From template.**

3. 

Locate the *AEC (Imperial) Massing. Dwt* file downloaded from the publisher's website.

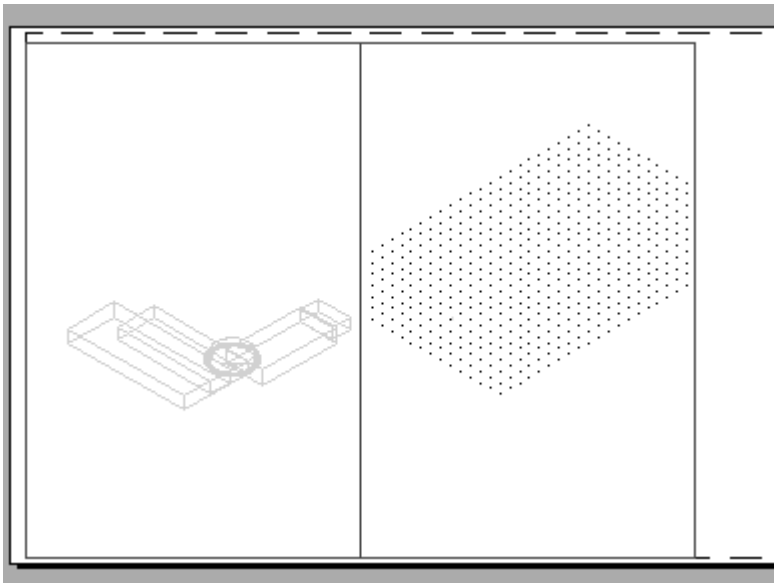
Press **Open**.

4. 

Select the **Mass-Group** layout and press **OK**.

5. 

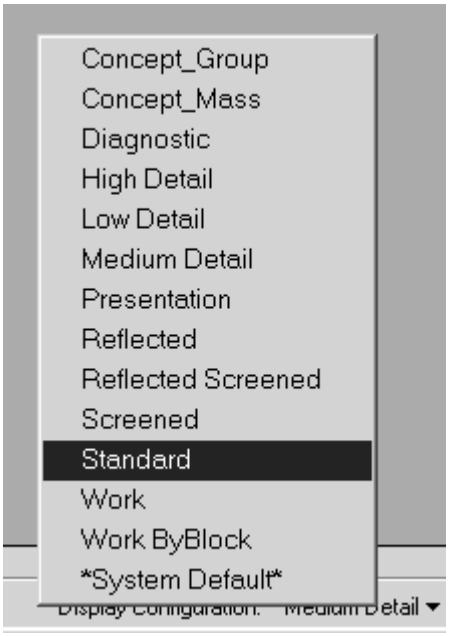
Select the **Mass-Group** tab.

6. 

You see two viewports.
The left viewport uses a mass element display configuration.

The right viewport displays mass groups.

We see nothing in the left viewport because we don't have any mass groups defined yet.

6. 

If you click on the Display Configuration down arrow, you see that two display configurations have automatically been added by the template: Concept_Group and Concept_Mass.

7.  Activate the left viewport.
Switch to a top view.

8. 

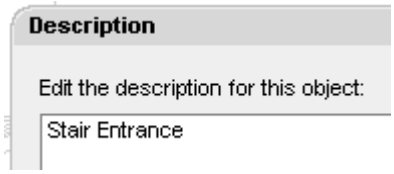
Select the **Mass Group** tool.
You'll be prompted for a location.
Place the Mass Group marker anywhere in the viewport.
Press **ENTER** when prompted for a rotation angle.

9. 

Go to **Tools→Quick Select**.

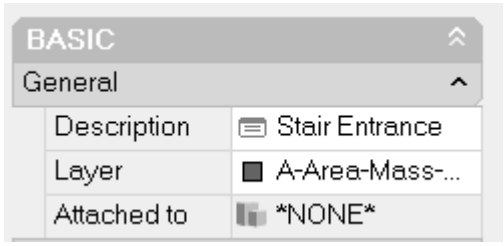
10. 

Set the Object Type to **Mass Group.**
Press **OK.**

11. 

Right click and select **Properties**.

Select the General field.
In the Description field, enter **Stair Entrance.**
Press **OK.**

12. 

The Description updates.

13. Save as *ex2-4.dwg*.

Exercise 2-5

Adding Elements to Mass Groups

Drawing Name: Ex2-4.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- Mass Groups
- Add Elements to a Mass Group

Open or continue working in Ex2-4.dwg.

Start the Attach Elements command.

You will be prompted for the Mass Group to use. Select the blue Mass Group icon.

You then will be prompted for the mass elements to attach. Select the step cylinders.

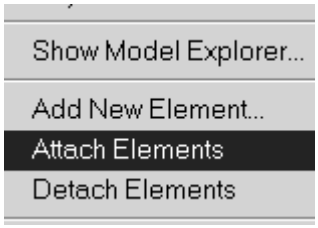
1. Open *ex2-4.dwg.*

2. 

Go to **Tools→Quick Select**.

3. 

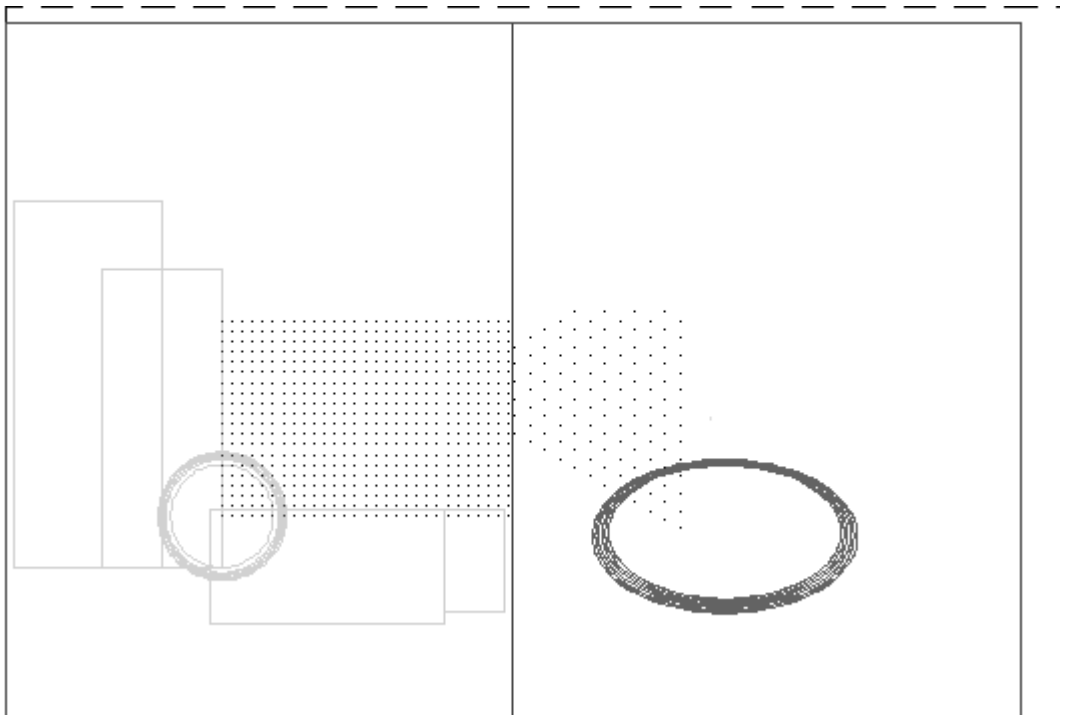
Set the Object Type to **Mass Group.**
Press **OK.**

4. 

Right click and select **Attach Elements**.

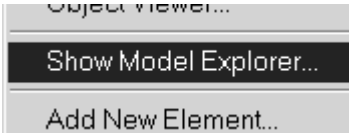
Select the cylinders that make up the stairs.

5. The mass group appears in the right viewport.

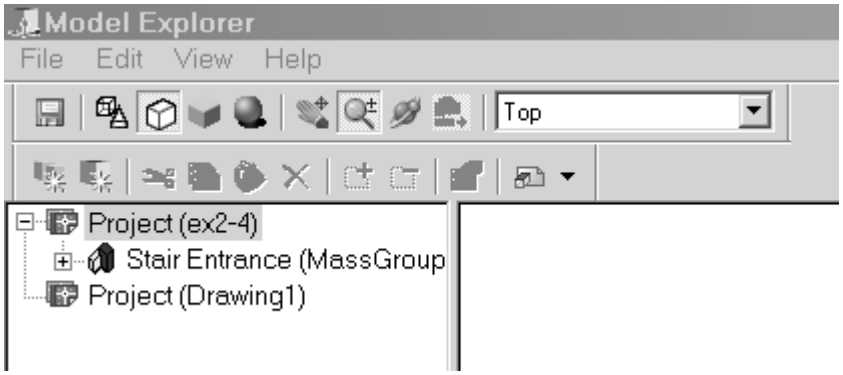


6. Save the file as *ex2-5.dwg*.

ADT comes with a Model Explorer that allows you to view your conceptual model. Additionally, you can edit your model inside the Explorer.

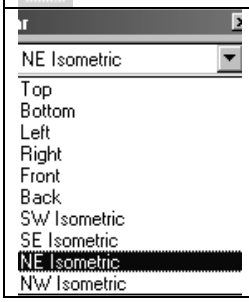


To access the Model Explorer, select a mass group. Right click and select Show Model Explorer.



The Model Explorer is divided into three sections: the Menu and toolbars across the top, the graphics viewer on the right, and a browser in the left pane.

The top pane contains menus and toolbars.

Tool	Description	Purpose
	Save	Creates a png, jpg, bmp, or tiff file (image) file
	WireFrame	Change the View mode of the model
	Hidden	
	Flat Shaded	
	Gouraud Shaded	
	Pan	These tools allow you to change your view of the model in the graphics window.
	Zoom Realtime	
	3D Orbit	
	Adjust Distance	
	Predefined 3D Views	

Tool	Description	Purpose
	New Grouping	Creates a Mass Group
	New Element	Add a new mass element
	Cut	Cuts or deletes a Mass Element or Group
	Copy	Places a Mass Element or Group on the clipboard as a copy.
	Paste	Pastes a Mass Element or Group
	Delete	Deletes a Mass Element or Group
	Attach Element	Attach a Mass Element to a Group
	Detach Elment	Remove a Mass Element from a Group
	Properties	Modifies the properties of a Mass Element or Group
	Display Configuration	Brings up a drop down list of display configurations

The graphics area displays the mass elements or groups that are selected in the tree view.

The order of the objects and mass elements in the browser determines the result if you decide to combine mass elements using additive, subtractive, or intersection. The Model Explorer can be used to re-order of objects and elements to control the result of Boolean operations.

TIP: You can only view Mass Groups in the Model Explorer. Mass Elements that are not attached to a Mass Group cannot be seen. You can use this to control visibility of mass elements.

Exercise 2-6

Using the Model Explorer

Drawing Name: Ex2-5.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- Mass Groups
- Model Explorer
- Mass Elements

Often, architects like to try out different design ideas. The Model Explorer allows you to quickly and easily try out different conceptual ideas using Mass Groups and Elements.

The Model Explorer is a powerful to tool to allow you to manage your Mass Groups and Elements.

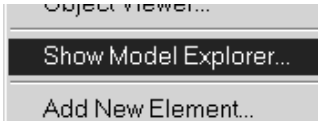
1.  Open the Ex2-5.dwg.

2. 

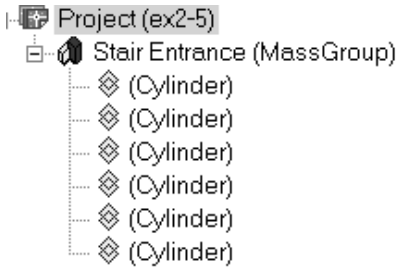
Go to **Tools→Quick Select**.

3. 

Set the Object Type to **Mass Group.**
Press **OK.**

4. 

Right click and select **Show Model Explorer.**

5. 

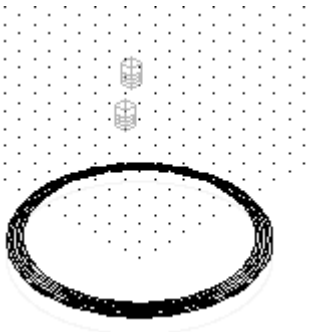
In the Browser Pane, we see the Stair Entrance we created in the previous lesson. The right pane displays the stair entrance we defined.

If you select a cylinder in the browser, only the selected element(s) are visible.

6. 

Go to **File→New Grouping.**

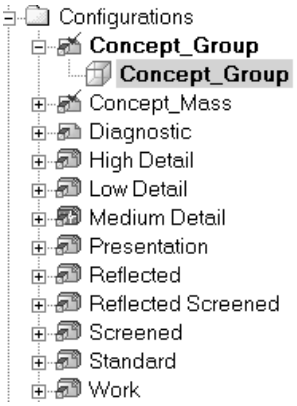
7. Your screen will switch to your ADT window.
Place a mass group in the right viewport.

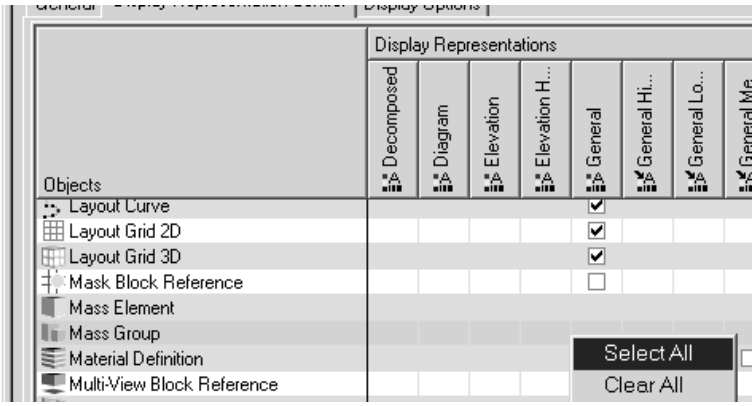
8. 

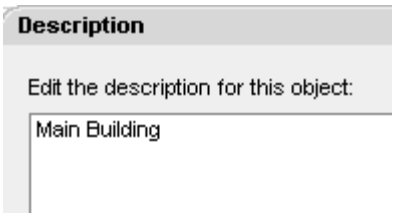
Mass group icons appear as small blocks in your viewport.

If your mass group icons are not visible, go to **Format→Display Manager.**

9. Highlight the Concept Group under Concept Group.
Select the Mass Group object line.
Right click and select **Select All.**
Press **Apply** and close the dialog.

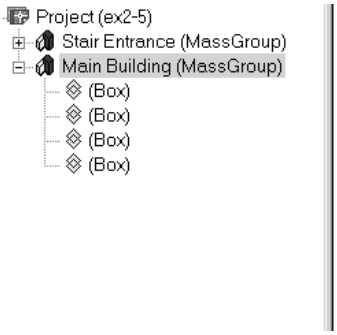


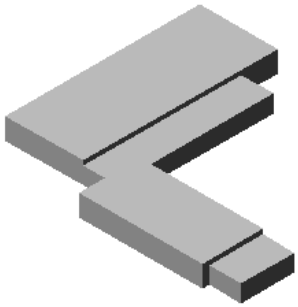


10. 

Select the second mass group you placed.
Right click and select **Properties**.
Select the General tab.
Enter **Main Building** in the Description field.

Press **OK** to close.

11. 



Activate the Model Explorer window.

The name of the Main Building appears in the Browser.

Right click and select **Attach Elements.**

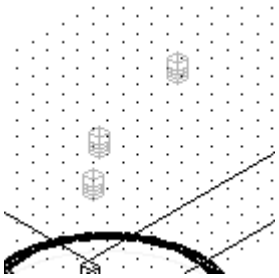
Switch to the main graphics window.

Select the four boxes we placed in the previous lesson.

Switch back to the Model Explorer.

12. Now when we highlight the Main Building, we can see the wings for the Main Building.

Highlight the Main Building Mass Group.

13. 

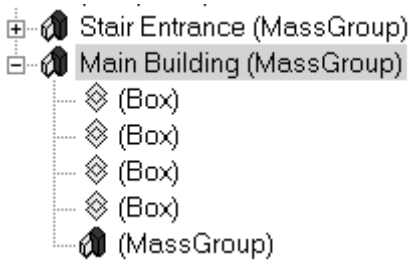
Select the New Grouping tool.

Switch to ADT's graphics window.

Place the group icon anywhere in the graphics area.

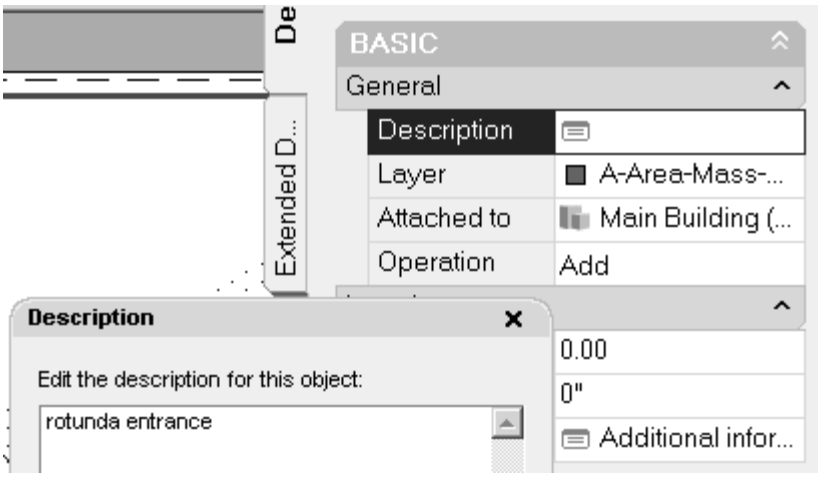
Note that you now see the main building mass group in the right viewport.

Switch back to the Model Explorer.

14. 

We see that this Mass Group is located below the Main Building Mass Group in the browser.

Highlight this mass group and select Properties.

15. 

Select the Description field. In the Description dialog, enter **rotunda entrance.**

Press **OK.**

Note that this mass group is attached to the Main Building mass group.

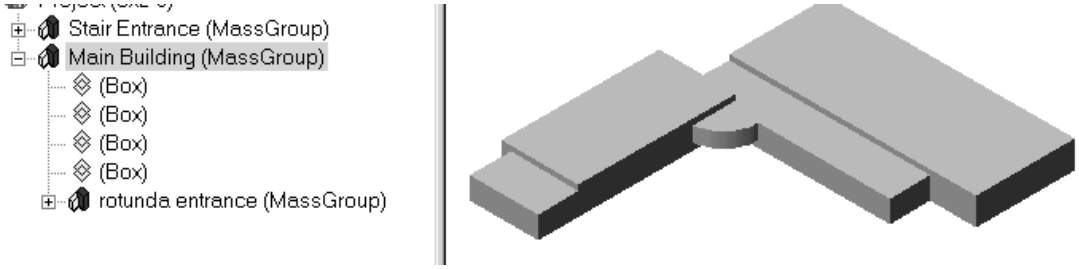
16. Switch back to the Model Explorer.

Highlight the rotunda entrance in the browser.

Select **Attach Element**.

Switch to main ADT window and select the cylinder for the building entrance.

Switch back to the Model Explorer.

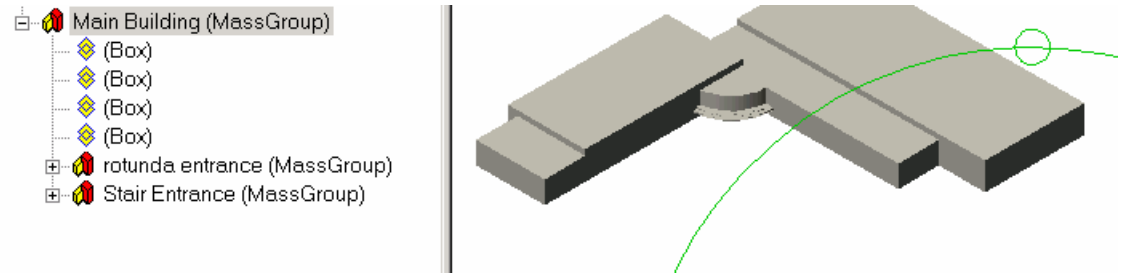


We see that the Main Building now includes the rotunda entrance.

17. Activate the Model Explorer.

Highlight the Stair Entrance, right click and select **Cut.**

Highlight the Main Building, right click and select **Paste.**



The main building has now been redefined with the stair entrance.

18. Save the file as *ex2-6.dwg*.

Exercise 2-7

Creating a Profile

Drawing Name: Ex2-6.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- Mass Groups
- Model Explorer
- Mass Elements
- Profiles
- Extrusions
- Style Manager

We are going to create an Atrium entrance that will be an alternative version of our building design.

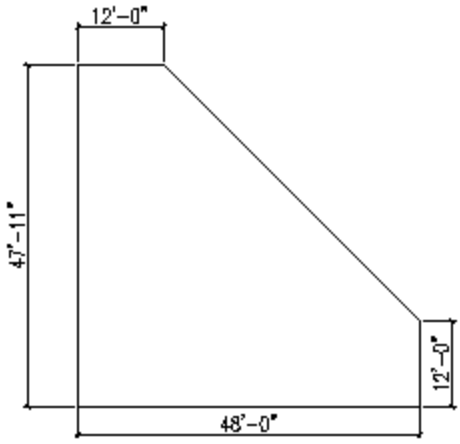
We see that ADT comes with several standard shapes that we can use for our Mass Elements: cone, arch, cylinder, etc. Sometimes we need a shape that does not fall in this list. To create those shapes, we use a custom profile to create our mass element. The entrance to our atrium will use a custom profile.

ADT comes with several standard profiles.

1.  Open the Ex2-6.dwg.

2. Select the left viewport.

3. In an area away from the model, create the following sketch using LINE.



ADT will not recognize the four lines as profile unless it is a closed figure. The easiest way to do that is to use the PEDIT command and JOIN all the lines.

Type **PEDIT** at the command line.

Select one of the lines.

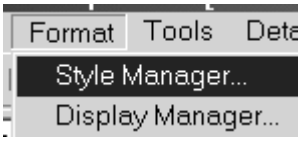
You will be asked if you want to turn the line into a polyline. Press Enter for **Y**.

Right click and select the JOIN option.

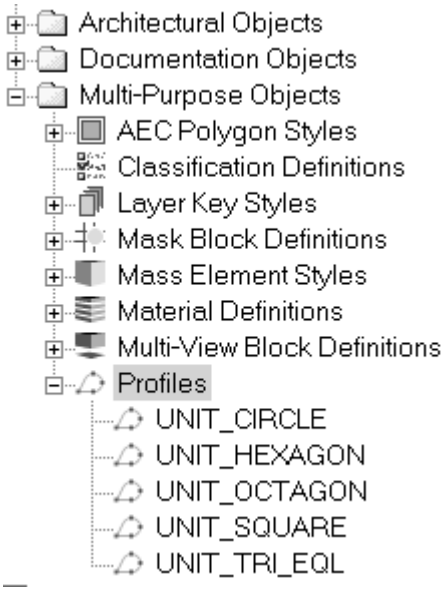
Window around the entire sketch to add the remaining lines.

Press ENTER to exit the PEDIT command.

Select the sketch and you see that the entire sketch highlights as a single profile.

4. 

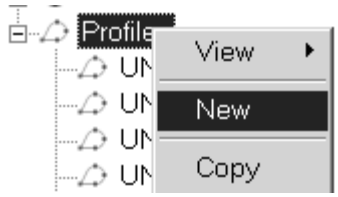
Go to **Format→Style Manager.**

5. 

Scroll down and expand **Profiles.**

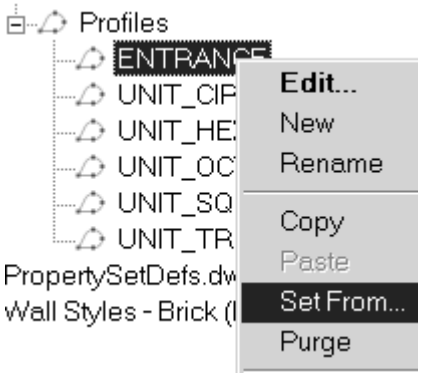
You see the Profiles that are included in the Aec Arch template used to start your drawing.

Press OK

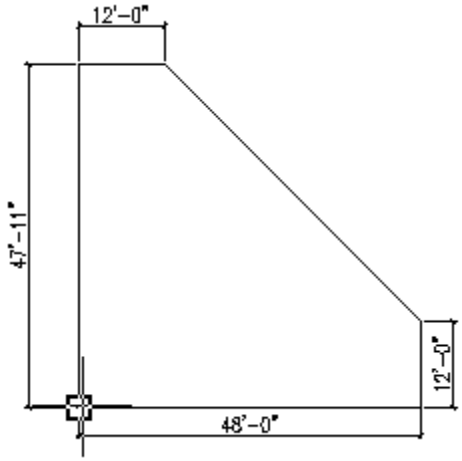
6. 

Highlight Profiles.
Right click and select **New**.

Rename the Profile **Entrance.**

7. 

Highlight **Entrance**.
Right click and select **Set From.**

8. 

Select the sketch to be used for the Profile.
You'll be asked if you want to 'Add Another Ring?' Enter N.
Next you'll be prompted for an insertion point, select the Endpoint located in the lower left corner of the figure.

Press **Apply** in the Style Manager.

In the Style Manager, we see the sketch as the profile for the entrance.

Check out the sketches for the other profiles.

Press **OK** to close the Style Manager.

9. Save the drawing as *ex2-7.dwg.*

Exercise 2-8

More Mass Elements

Drawing Name: Ex2-7.dwg
Estimated Time: 10 minutes

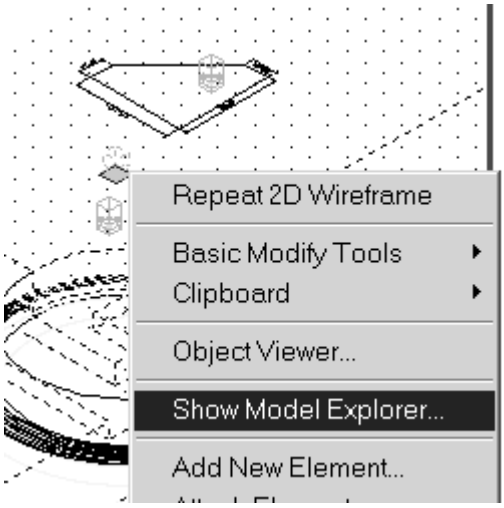
This exercise reinforces the following skills:

- Mass Groups
- Model Explorer
- Mass Elements

We are going to create an Atrium entrance that will be an alternative version of our building design.

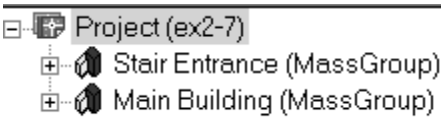
We can create Mass Elements inside the Model Explorer.

1. Open the Ex2-7.dwg.

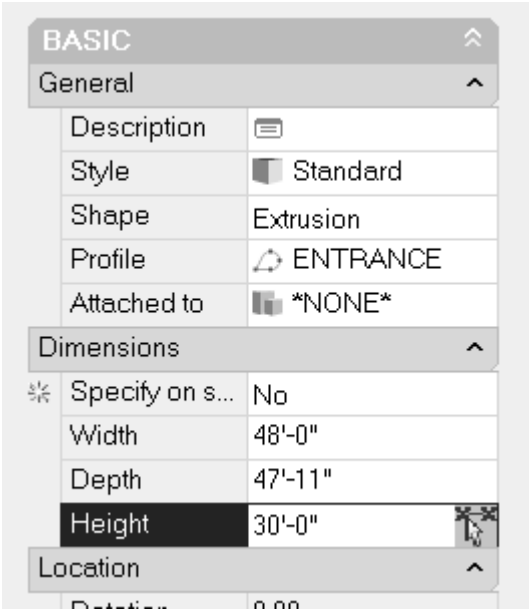
2. 

Activate the right viewport.
Select one of the mass group icons.
Right click and select
Show Model Explorer.

TIP: When we create new elements, we have to switch between the main graphics window and the Model Explorer.

3. 

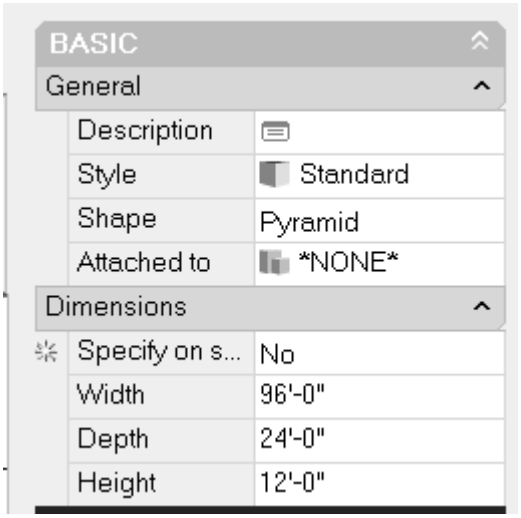
Highlight the Project at the top of the browser tree.
Select the **New Element** tool.

4. 

Under Shape, select **Extrusion**.
Under Profile, select **Entrance.**
For Width, enter **48′-0″**.
For Depth, enter **47′-11″**.
For Height, enter **30′-0″**.

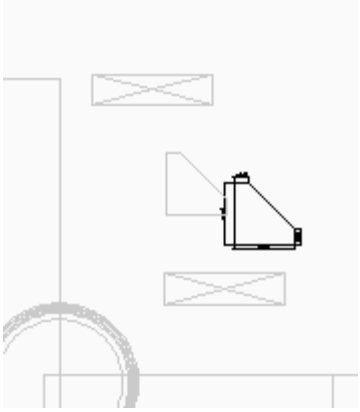
Switch to ADT graphics window.
Select anywhere away from your model as the insertion point for the first mass element of our atrium.

Press **ENTER** twice.

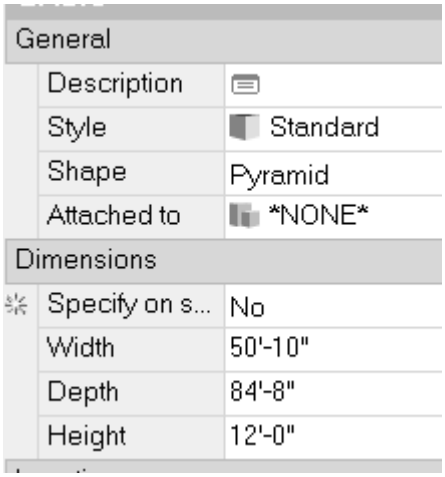
5. 

Select the **New Element** tool.

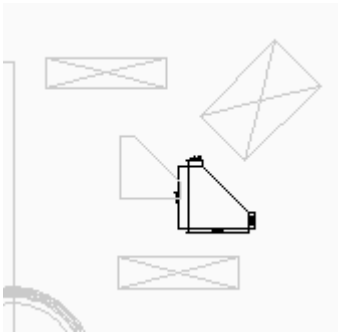
Next we place two pyramids that are 96′W × 24′D × 12′H.

6. 

Place the pyramids in the left viewport, so you can see them.

7. 

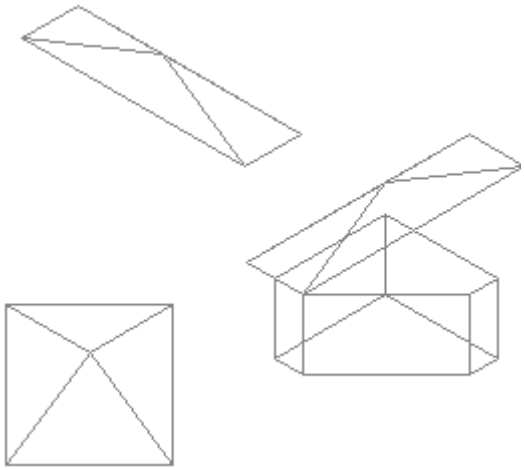
Place a third pyramid that is 50′-10″ W × 84′-8″ D × 12′H. Place and rotate 315 degrees.

8. 

Erase the profile outline as you don't need it anymore.

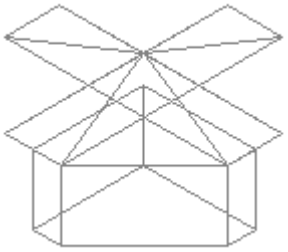
It will still be stored in your Style Manager.

9.



Move the first pyramid on top of the extrusion. Line up a corner of the pyramid with the corner of the extrusion.

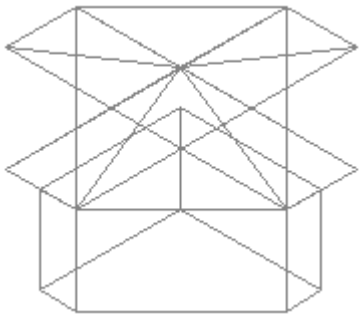
10.



Place the second pyramid on top of the extrusion.

In order to get your elements to look like the figure, you may need to rotate your view.
You also may need to rotate one of the pyramids.

11.



Place the third pyramid on top of the extrusion.

12. Save the file as *ex2-8.dwg*.

Exercise 2-9

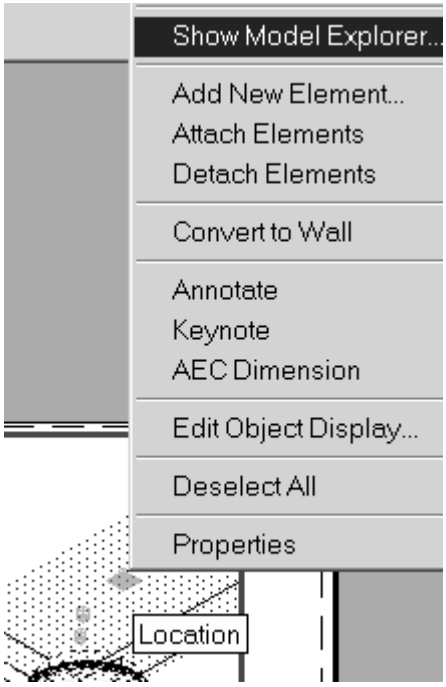
Using Model Explorer to Explore Alternate Designs

Drawing Name: Ex2-8.dwg
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- Mass Groups
- Model Explorer
- Mass Elements

1.  Open the Ex2-8.dwg.

2. 

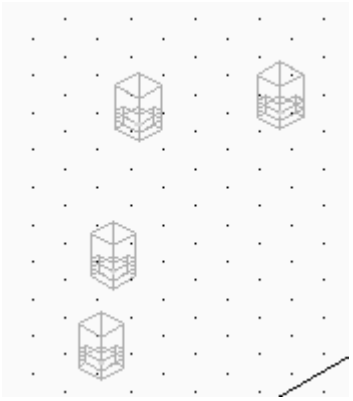
Activate the right viewport.
Select one of the mass group icons.
Right click and select
Show Model Explorer.

We see all our models, but we don't see our Atrium.

We need to create a group for the Atrium entrance.

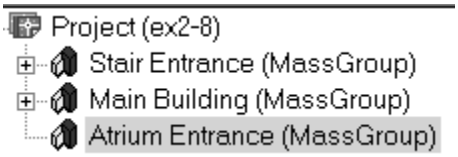
3. 

Under File, select **New Grouping**.

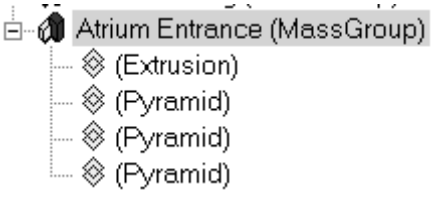
4. 

Switch to ADT's graphic window and place the Mass Group icon.

Switch back to the Model Explorer.

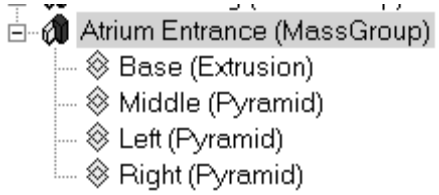
5. 

Highlight the new (MassGroup).
Right click and select **Rename**.
Rename to **Atrium Entrance**.

6. 

 Select the **Attach Items** tool.

Window around the atrium mass elements to select them.

7. 

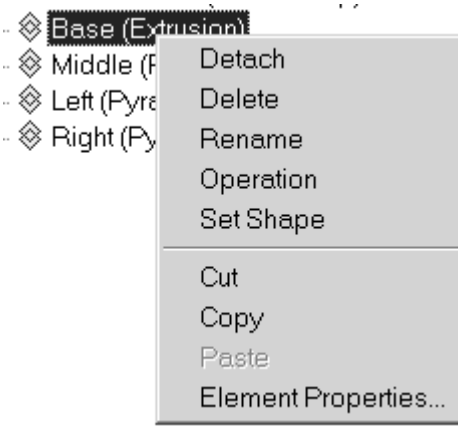
To make it easier to identify each element, we can use the Rename option.

Rename the pyramids to **Left, Right,** and **Middle.**

Rename the extrusion **Base**.

To rename, highlight the element, right click and select **Rename**.

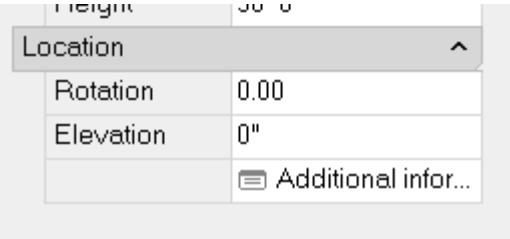
8. We need to move the Atrium Entrance elements to act as an entrance to the building.



Highlight each element in the Atrium Entrance group.

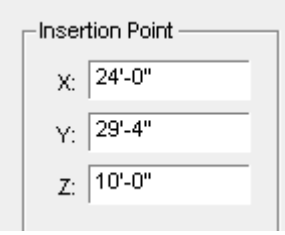
Right click and select **Element Properties.**

9.



Select **Additional information** in the Location area.

10.

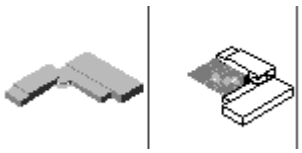


Assign the values in the table.

Base	24′, 29′-4″, 10′
Left Pyramid	0′, 5′-4-1/2″, 22′
Right Pyramid	0′, 5′-3-1/2″, 22′
Middle Pyramid	10-1/2″, 5′-6-15/16″, 22′

Press **OK.**

11.

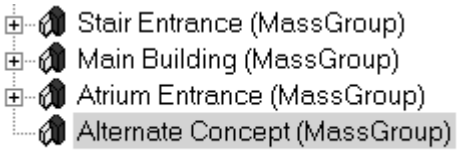


If you switch to the main ADT graphics window, you should see the atrium group moved to the entrance point of the building.
Switch back to the Model Explorer.

12.

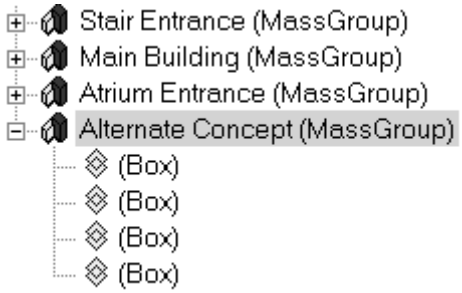
Select the **New Grouping** tool.
Place the mass group tool in the right viewport.

13.



Rename the new mass group to **Alternate Concept**.

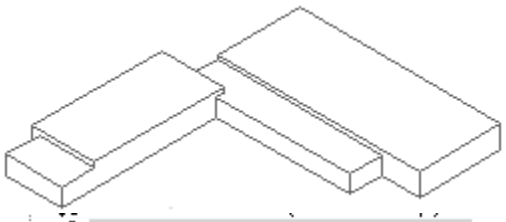
14.



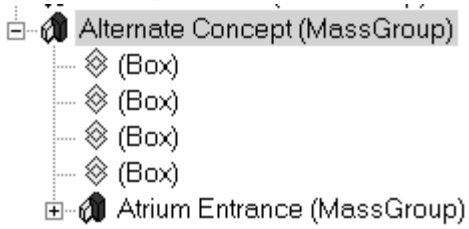
Copy the four boxes in the Main Building Mass Group and Paste them into the Alternate Concept group.

To Paste, highlight the Alternate Concept and select the Paste tool or right click and select Paste.

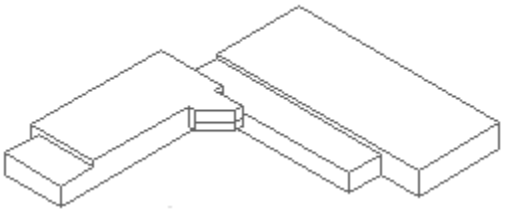
You have to select each element individually to copy and paste. If you had assigned the boxes to their own group, you would have been able to copy and paste the box group.

15. 

When we highlight the Alternate Concept group, we see the four boxes.

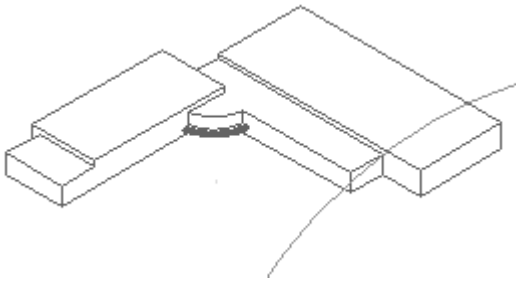
16. 

Drag and drop the Atrium Entrance group into the Alternate Concept group.

17. 

Highlight the Alternate Concept Mass Group.

We can see the conceptual idea of the building with an atrium entrance.

18. 

Highlight the Main Building Mass Group.

We see the conceptual idea of the building with the circular entry.

19. We see that using the Model Explorer allows us to explore different conceptual designs.

Save the file as Ex2-9.dwg.

TIP:

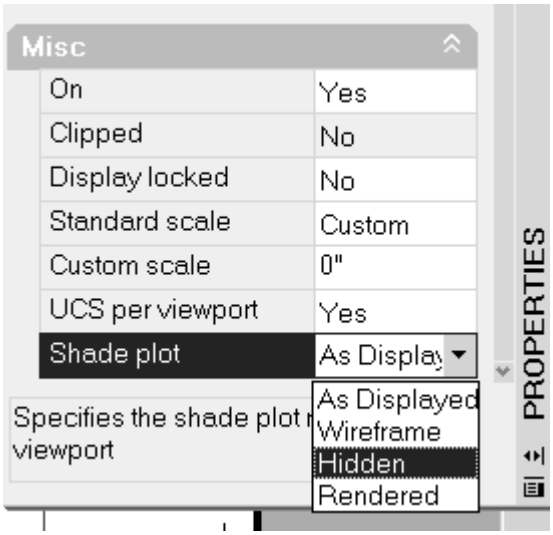
You can plot shaded or hidden mode from a viewport in 2004.

Select a layout tab.

Verify that you are in paper space mode.

Double-click the border of the viewport you want to plot.

In the Properties palette, under Misc., select Shade Plot, and then select an option for plotting.



NOTES: