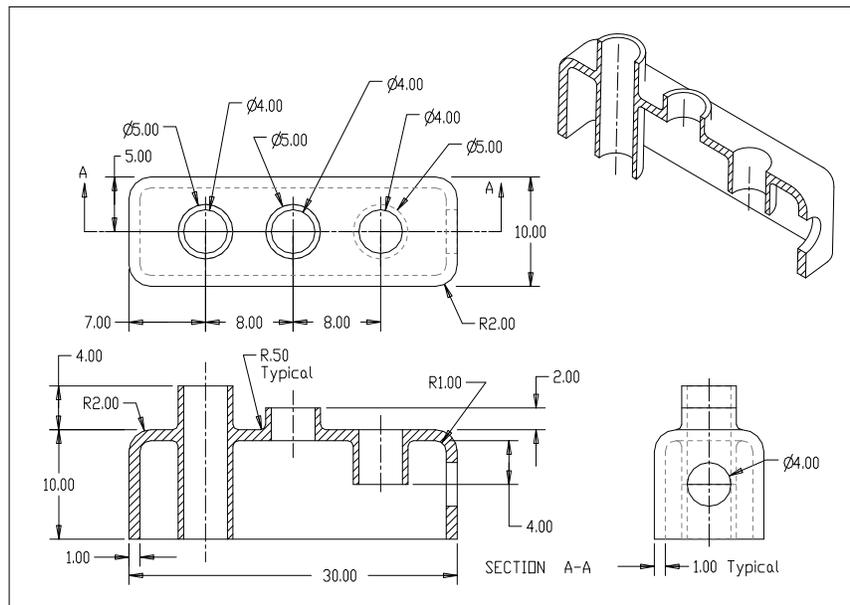


## Chapter 5 – Sectional Views

There are a number of different types of sectional views that can be drawn. A few of the more common ones are: full sections, half sections, broken sections, rotated or revolved sections, removed sections, offset sections, and assembly sections. These sectional views are very useful when there is geometry on the interior of a part that is difficult to understand from looking at typical orthographic views. They are also very useful in dimensioning the drawing. It is considered poor practice to dimension to a hidden line and sectional views allow us to dimension the interior of a part without dimensioning to hidden lines.

All of the various types of sectional views can be drawn with AutoCAD. A typical example is shown below. Here we are using a full section to dimension much of the object. Without this sectional view, we would be forced to dimension to hidden lines.

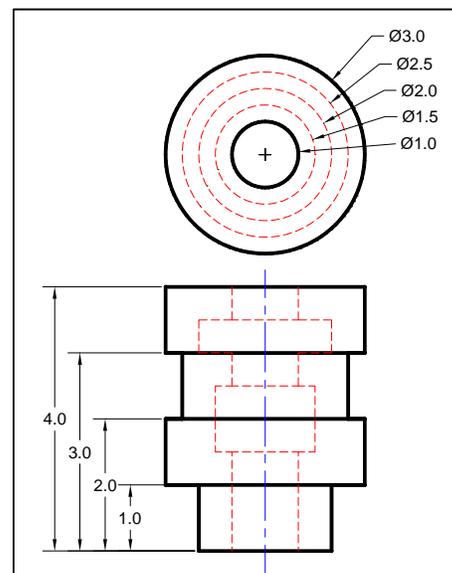


### Create Orthographic Drawing

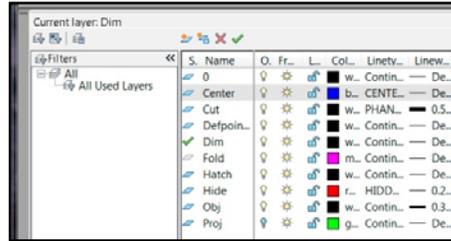
You start this tutorial by drawing the top and front third angle views of the object shown on the right. The process is exactly like the drawings we have done in the past so it will not be covered here. Be sure to dimension the views using the techniques we used in a previous assignment.

The required layers are listed below and shown in the figure at the top of the next page.

- **Center** – centerlines
- **Cut** – cutting plane
- **Dim** – dimensions
- **Fold** – folding lines
- **Hatch** – cross hatching



- **Hide** – hidden lines
- **Obj** – object lines
- **Proj** – projection lines

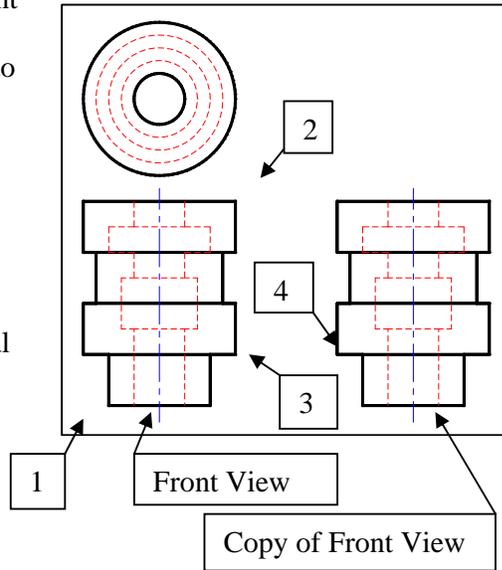


The exterior features of the object are dimensioned in the front view but the interior details are not. Dimensioning the interior features would require dimensioning to hidden lines which is poor practice. The problem is eliminated by creating a sectional view which shows the interior details. Once this view has been created, you can dimension the interior details in the sectional view to complete the drawing.

### Copy View to Be Cross Sectioned

Start the process by copying the front view (third angle projection) of the object. We will transform the copied front view into the sectional view.

Before you start the COPY process, make sure you have drawn the hidden and center lines. Turn off the dimension layer because you do not want to copy the dimensions along with the front view. The center and hidden lines must be visible because they must be copied to the sectional view we are creating.



#### COPY

Select objects: **W**

Specify first corner:

Specify opposite corner:

Select objects:

Specify base point

Specify second point

*{create a rectangular window around the front view to select the entire view}*

*{1 - Click at a location to the left of and below the entire view}*

*{2 - Click at a location to the right of and above the entire view}*

*{Press Enter to end the selection process}*

*{3 - Click on a point on the front view. This is where you will grab the copy}*

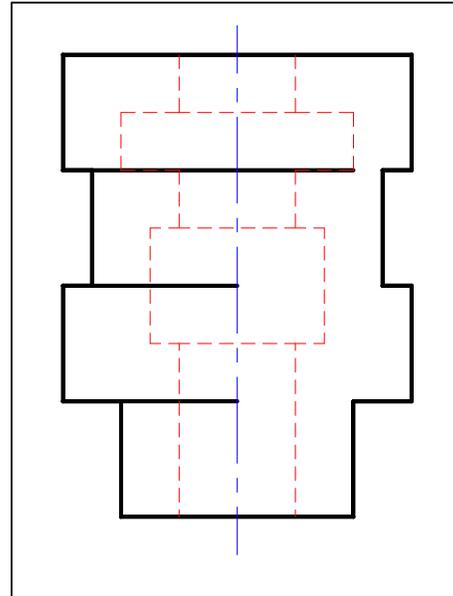
*{4 - Drag the view to where you want it. If ORTHO is on the view can only be moved horizontally or vertically}*

After copying the front view, turn dimension layer back on so the dimensions will show in the front view.

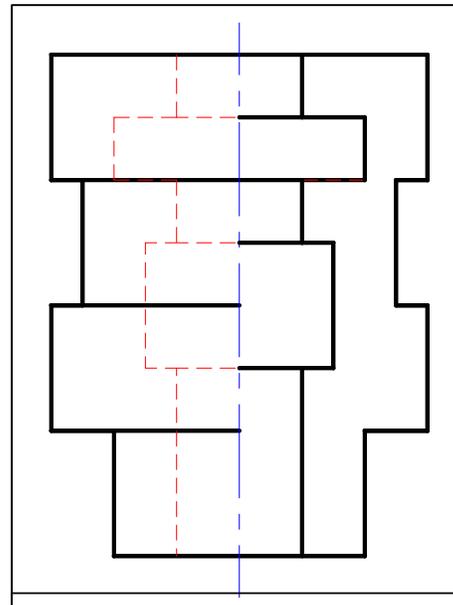
## Modify Copy to Create Sectional View

We can now alter the copied front view to create a half sectional view. We are creating a half sectional view because the object is symmetrical about the vertical axis which makes it ideal for a half section. The half section will show the left side of the object as a normal orthographic view and the right side as a sectional view.

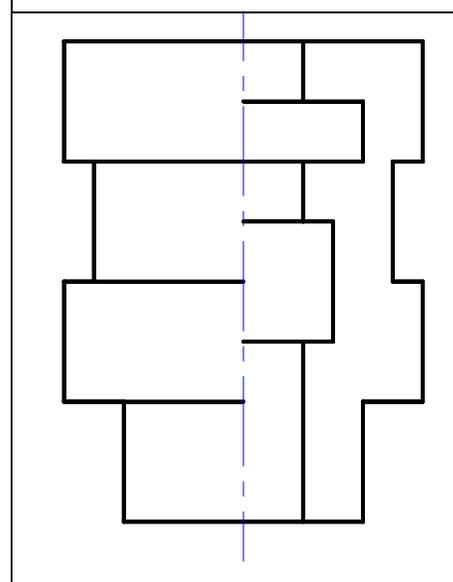
First, use the TRIM command to eliminate the interior lines that are not needed. Use the centerline, hidden lines, and selected object lines as the cutting planes to trim away some of the interior lines. When you have finished, your drawing should look like the one on the right



Next, switch the current layer to the object layer and draw over the hidden lines to complete the outline of the sectional view.



We continue to work on this view by deleting all of the hidden lines in the view because we do not show hidden lines in sectional views. This is easily done by turning off all of the layers except for the hidden lines then using the ERASE command to delete all of the hidden lines belonging to this view. When you have finished, turn the layers back on. You should have a drawing similar to the one on the right.



## Cross Hatching Sectional View

Now we can cross hatch the cut surfaces. This is a very simple process. Switch the current layer to the Hatch layer and enter:

### HATCH

This command brings up the ribbon shown below.



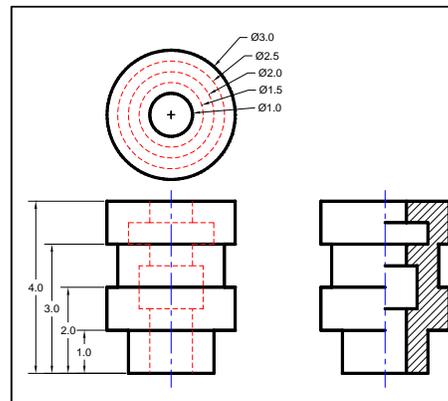
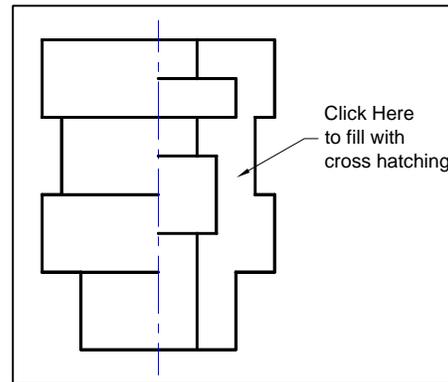
2. Select Pick Points

1. Select ANSI 31

AutoCAD can draw many different types of cross hatching. The different types can be used to indicate the material from which the part is made. It is especially useful in assembly sectional views where different parts are made from different materials.

We have only one type of material so we will just use a simple 45° cross hatch. Click on the ANSYS31 icon. This is the cross hatch scheme we want to use. Next, click on the Pick Points icon on the extreme left of the ribbon. After you have clicked on the “Pick Points” icon, click in the area of the drawing where you want the cross hatching to appear.

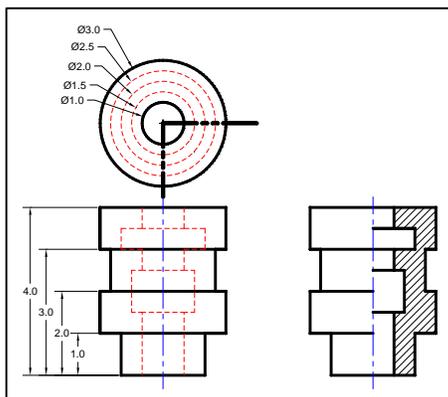
AutoCAD can automatically cross hatch any closed area. When you have finished, the entire drawing should look like the one on the right. All that remains is to draw the cutting plane on the top view.



### Drawing the Cutting Plane Lines

Switch to the “Cut” layer to draw the cutting plane. The lines in this layer should be a little wider than the object lines and the linetype should be “Phantom”. A line width of 0.5 mm seems to work well for many drawings.

Start by drawing lines from the center of the part to a point beyond the right side, and a line from the center to a point below the outer circle in the top view. The exact length of the lines is not important. Turn OSNAP and ORTHO on then draw the lines with the mouse. Note that the dimensions in the top



view had to be relocated to accommodate the cutting plane. The results are shown at the right.

## Cutting Plane Arrowheads

Now we can add the arrowhead to the end of the cutting plane. Surprisingly enough, AutoCAD does not provide an automatic facility for doing this. We will use the multileader facility to draw the arrowheads.

These arrowheads should be a little larger than the ones used for dimensioning and we will make them twice as large. Start by entering the command:

**mleaderstyle**

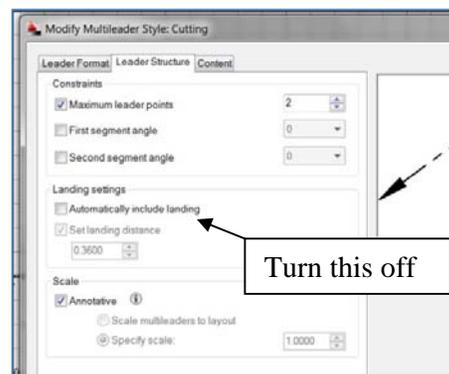
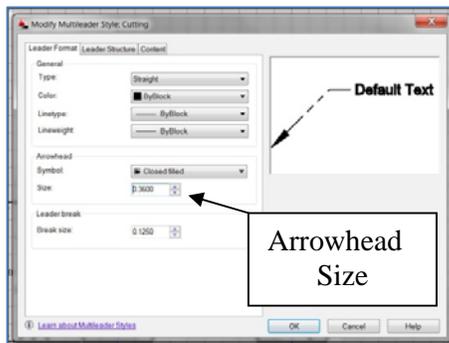
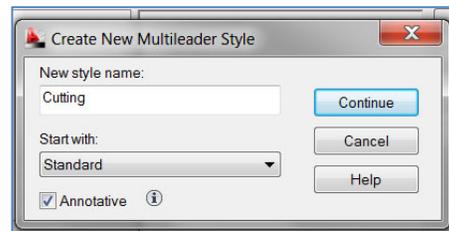
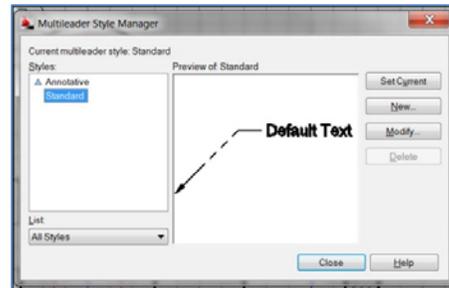
This will produce the dialog box shown on the right. This dialog box is used to define leader styles. We will use it to define a new style so that we can produce the arrowheads we need.

Click on the “New” button to create a new multileader style. This opens the dialog box shown on the right.

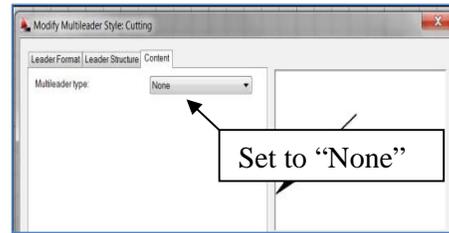
Enter “Cutting” for the new style name and start with “Standard” which is the current multileader style. Be sure to mark the “Annotative” box at the bottom of the *dialog* box. When you have finished, click on the “Continue” button.

The program displays the dialog box used to modify the style. Click on the “Leader Format” tab then change the arrowhead size to 0.36. This is twice the size of the arrowheads used for the dimensioning.

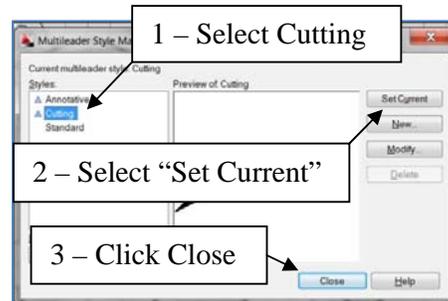
Next, click on the “Leader Structure” tab to produce the dialog box shown on the right. In this dialog box, make sure the “Automatically include landing” box is **not** marked. The landing is a small horizontal line that is automatically drawn at the end of the leader line. We do not want or need this line.



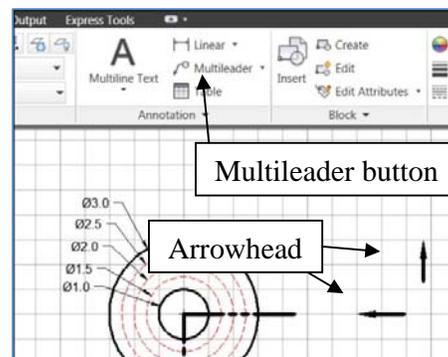
Click on the “Content” tab and set the “Multileader type” to **None**. Normally, the program would allow text to be typed at the end of the leader. In this case, we just want the arrowhead without any text, so we set this field to none. After you have completed these changes, click on the OK button at the bottom of the dialog box.



The program returns to the Multileader Style Manager dialog box. Make sure that “Cutting” is selected in the left window then click on the “Set Current” button. This makes the new multileader style that we have created, the current style that will be used. When you have finished, click on the “Close” button at the bottom of the screen. We are now ready to draw the arrowheads.



Two arrowheads are required. One is horizontal pointing to the left and the other is vertical pointing up. Click on the “Multileader” button in the “Home” ribbon and draw horizontal and vertical leaders. These can be drawn with the mouse if ORTHO is on. See the figure on the right.



Next, use the MOVE command to move the arrowheads to the ends of the cutting plane lines. If OSNAP is on, you can easily do this with the mouse.

We can now complete the drawing by using the DTEXT command to write an A at the end of each of these arrowheads then write “Section A-A” below the sectional view we have created. Next we add dimensions to the sectional view showing the location of interior features. The completed drawing is shown below.

