

FILLETS AND ROUNDS

CADD programs allow you to draw a fillet or round between any two lines or a line and an arc simply by picking the two lines and specifying the fillet radius. The AutoCAD command for this operation is called **FILLET**, but it draws any radius exterior or interior corner. If the lines intersect, they are automatically trimmed and the fillet is drawn. If the lines do not meet, they are automatically extended and the fillet is drawn. If all of the lines of an object are connected as one object (referred to as a polyline in AutoCAD), picking anywhere on the line automatically fillets all corners. Figure 7.37 shows some before and after examples of using the **FILLET** command.

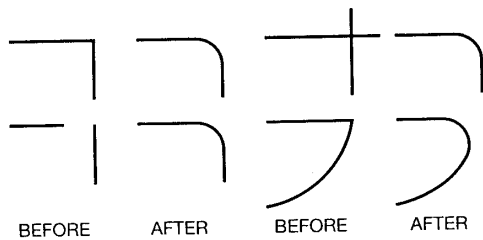


FIGURE 7.37 ■ Automatically drawing fillets and rounds using CADD.

Rounded Corners in Multiview

An outside or inside slightly rounded corner of an object is represented in multiview as a contour only. The extent of the round or fillet is not projected into the view as shown in Figure 7.38. Cylindrical shapes may be represented with a front and top view, where the front identifies the height and the top shows the diameter. Figure 7.39 shows how these cylindrical shapes should be represented in multiview. Figure 7.40 shows the representation of the contour of an object as typically displayed in multiview using phantom lines. This is done to clearly accent the rounded feature.

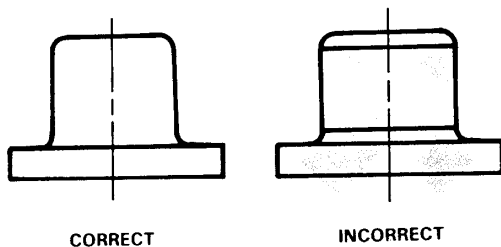


FIGURE 7.38 ■ Rounds and fillets in multiview.

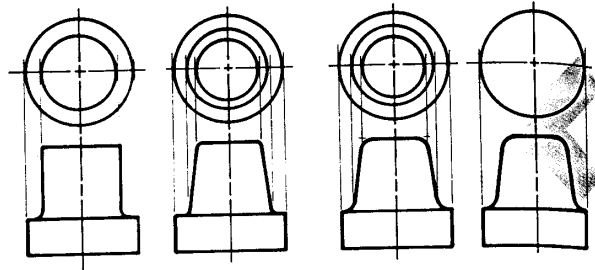


FIGURE 7.39 ■ Rounded curves and cylindrical shapes in multiview.

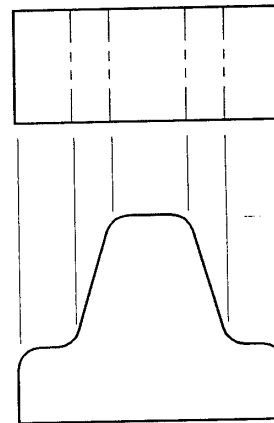


FIGURE 7.40 ■ Contour in multiview.

Runouts

The intersections of features with circular objects are projected in multiview to the extent where one shape runs into the other. The characteristics of the intersecting features are known as *runouts*. The runout of features intersecting cylindrical shapes is projected from the point of tangency of the intersecting feature, as shown in Figure 7.41. Notice also that the shape of the runout varies when drawn at the cylinder depending on the shape of the intersecting feature. Rectangular-shaped features have a fillet at the runout, while curved (elliptical or round) features contour toward the centerline at the runout. Runouts may also exist when a feature such as a web intersects another feature, as shown in Figure 7.42.

LINE PRECEDENCE

When drawing multiviews, it is common for one type of line to fall in line with a different line type. As a drafter, you need to decide which line to draw. This is known as *line precedence*. You draw the line that is most important based on these rules:

- Object lines take precedence over hidden lines and centerlines.
- Hidden lines take precedence over centerlines.

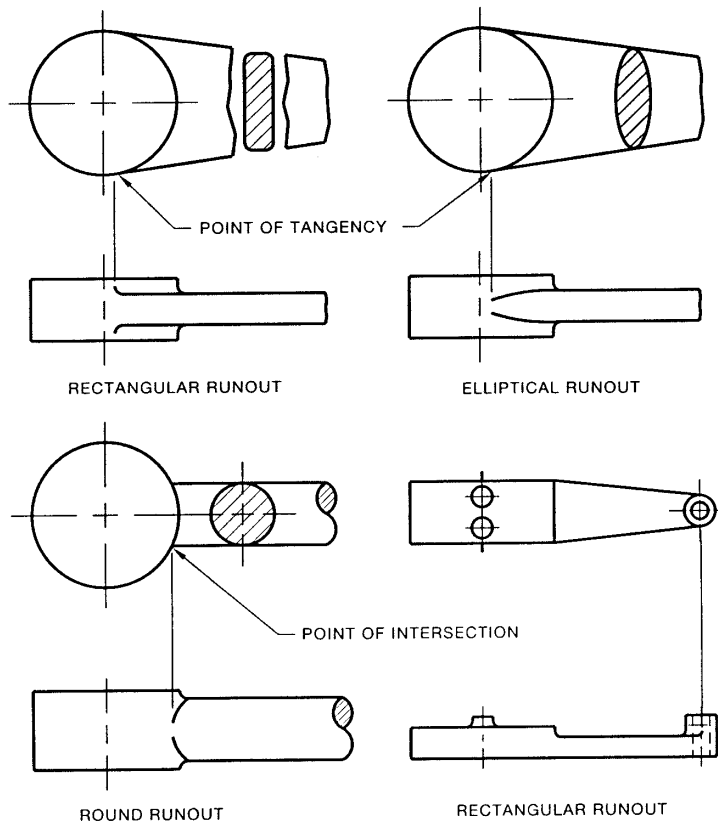


FIGURE 7.41 ■ Runouts.

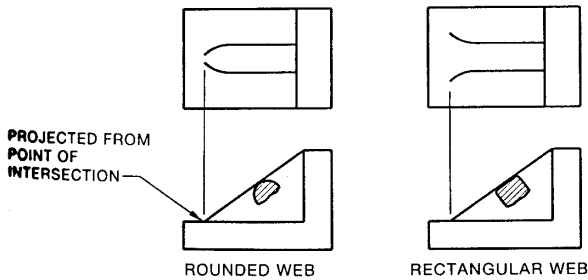


FIGURE 7.42 ■ Other types of runouts.

■ In sectioning (covered in Chapter 14), cutting plane lines take precedence over centerlines.

When an object line is drawn over a centerline, the ends or tails of the centerline may be drawn slightly beyond the outside of the view. Figure 7.43 shows examples of line precedence.

THIRD-ANGLE PROJECTION

The method of multiview projection described in this chapter is also known as *third-angle projection*. This is the method of view

arrangement that is commonly used in the United States. In the previous discussion on multiview projection, the object was placed in a glass box so the sides of the glass box were parallel to the major surfaces of the object. Next, the object surfaces were projected onto the adjacent surfaces of the glass box. This achieved the same effect as if the viewer's line of sight were perpendicular to the surface of the box and looking directly at the object, as shown in Figure 7.44. With the multiview concept in mind, assume an area of space is divided into four quadrants, as shown in Figure 7.45.

If the object were placed in any of these quadrants, the surfaces of the object would be projected onto the adjacent planes. When placed in the first quadrant, the method of projection is known as first-angle projection. Projections in the other quadrants are termed second-, third-, and fourth-angle projections. Second- and fourth-angle projections are not used, though first- and third-angle projections are very common.

Third-angle projection, as commonly used in the United States, is achieved when you take the glass box from Figure 7.44 and place it in quadrant three from Figure 7.45. Figure 7.46 shows the relationship of the glass box to the projection planes in the third-angle projection. In this quadrant, the projection plane is between the viewer's line of sight and the object. When the glass box in the third-angle projection quadrant is unfolded, the

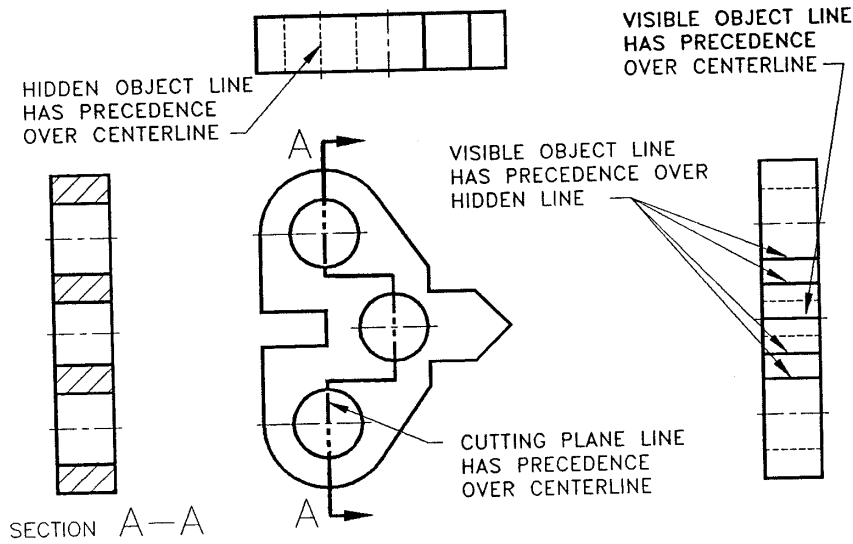


FIGURE 7.43 ■ Line precedence.

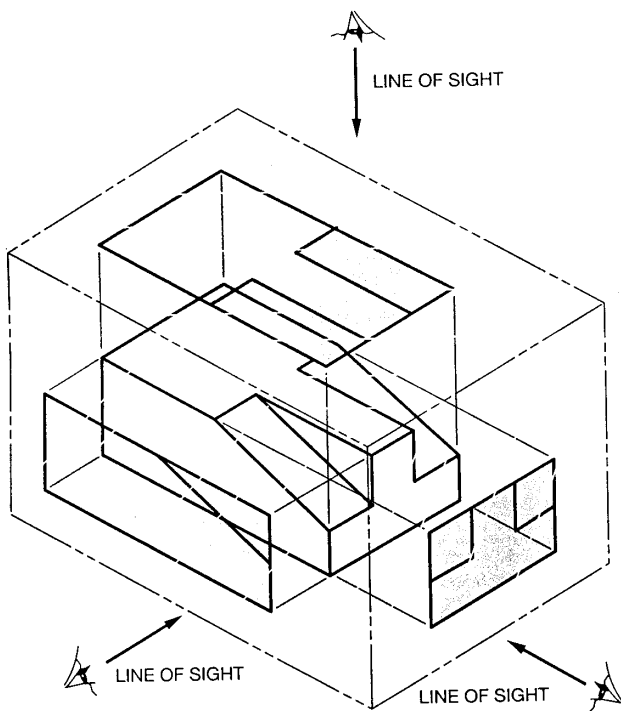


FIGURE 7.44 ■ Glass box in third-angle projection.

result is the multiview arrangement previously discussed and shown in Figure 7.47.

A third-angle projection drawing may be accompanied by a symbol on or next to the drawing title block. The standard third-angle projection symbol is shown in Figure 7.48.

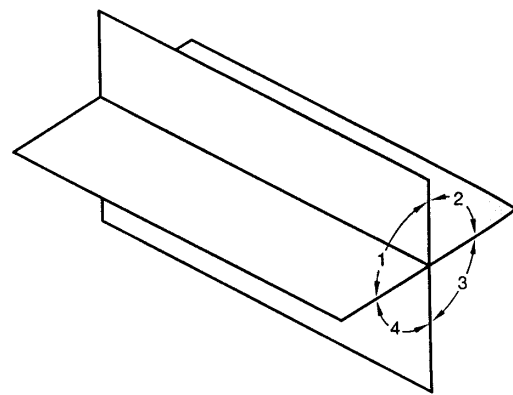


FIGURE 7.45 ■ Quadrants of spatial visualization.

FIRST-ANGLE PROJECTION

First-angle projection is commonly used in Europe and other countries of the world. This method of projection places the glass box in the first quadrant. Views are established by projecting surfaces of the object onto the surface of the glass box. In this projection arrangement, however, the object is between the viewer's line of sight and the projection plane, as you can see in Figure 7.49. When the glass box in the first-angle projection quadrant is unfolded, the result is the multiview arrangement shown in Figure 7.50.

A first-angle projection drawing may be accompanied by a symbol on or adjacent to the drawing title block. The standard first-angle projection symbol is shown in Figure 7.51. Figure 7.52 shows a comparison of the same object in first- and third-angle projections.

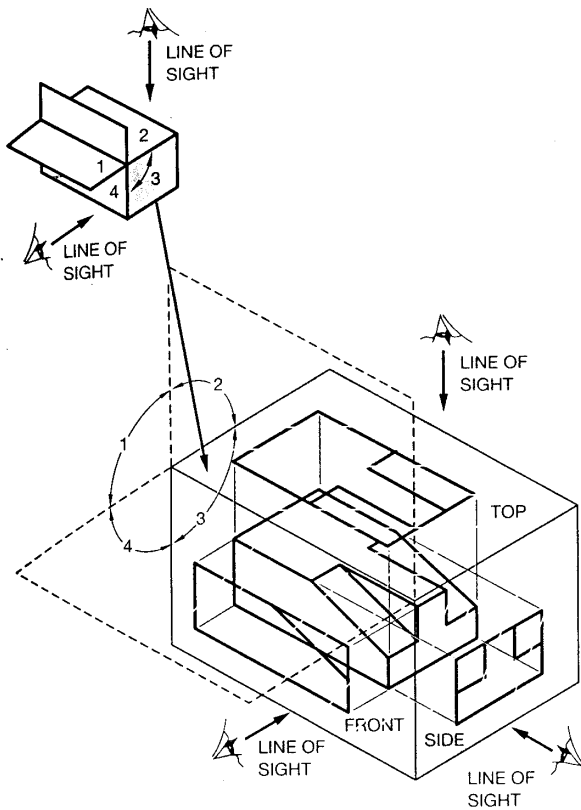


FIGURE 7.46 ■ Glass box placed in the third-quadrant for third-angle projection.

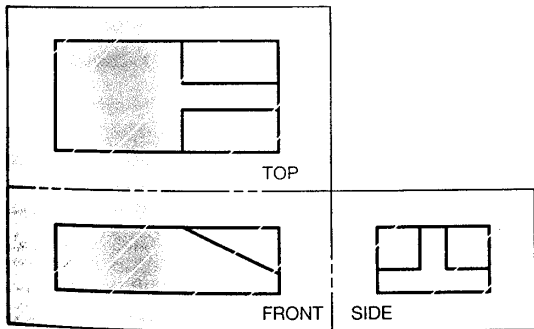


FIGURE 7.47 ■ Third-angle projection.

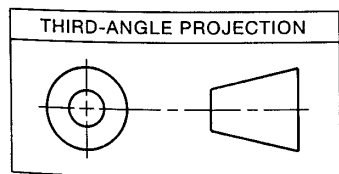


FIGURE 7.48 ■ Third-angle projection symbol.

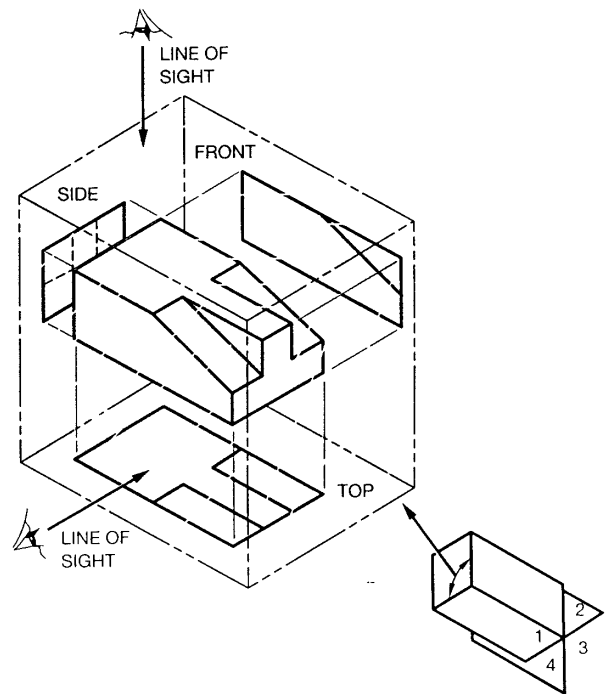


FIGURE 7.49 ■ Glass box in first-angle projection.

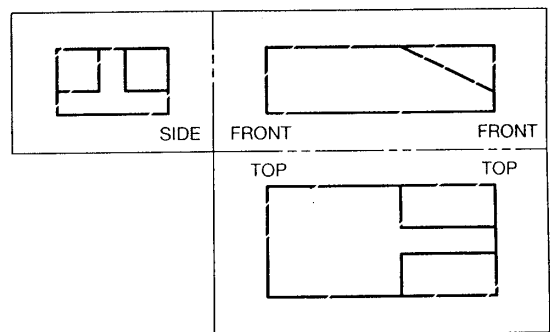


FIGURE 7.50 ■ First-angle projection.

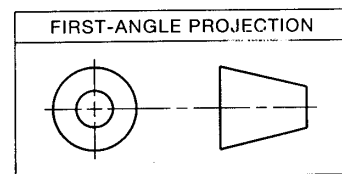


FIGURE 7.51 ■ First-angle projection symbol.

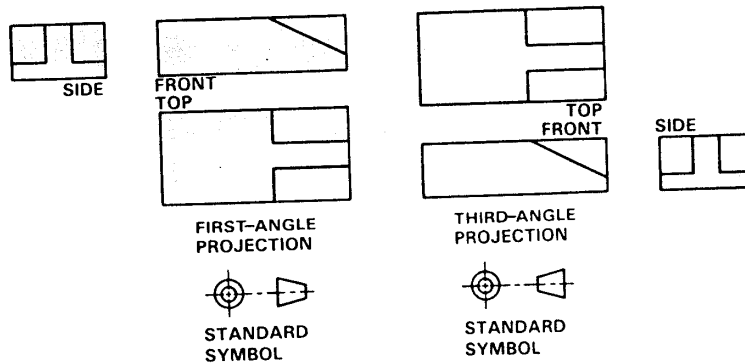


FIGURE 7.52 ■ First-angle and third-angle projection.

RECOMMENDED REVIEW

It is recommended that you review the following parts of Chapter 2 before you begin working on multiview drawings. This will refresh your memory about how related lines are properly drawn:

- Object Lines.
- Viewing- and Cutting-Planes.
- Hidden Lines.
- Break Lines.
- Centerlines.
- Phantom Lines.

LAYOUT

Many factors influence the drawing layout. Your prime goal should be a clear and easy-to-read interpretation of selected views with related information. Although this chapter deals with multiview presentation, it is not totally realistic to consider view layout without thinking about the effects of dimension placement on the total drawing. Chapter 12 correlates the multiview drawings of *shape description* with dimensioning, known as *size description*.

The initial steps in view layout should be performed using rough sketches. By using rough sketches, you can analyze which views you need before you begin formal drafting. Sketches do not have to be perfect. Try to sketch as fast as you can to save time.

Sketching the Layout

Consider the engineering sketch in Figure 7.53 as you evaluate the proper view layout.

- Step 1. Select the front view using the rules discussed in this chapter. Sketch the front view that you have picked. Try to keep your sketch proportional to the actual object, as in Figure 7.54. However, keep in mind that a sketch does not have to be perfect. It should be done quickly to save time, while helping you lay out the drawing.

- Step 2. Select the other views needed to completely describe the shape of the V-BLOCK MOUNT, as shown in Figure 7.55.

The front, top, and left-side views clearly define the shape of the V-BLOCK MOUNT. Now lay out the formal drawing using the

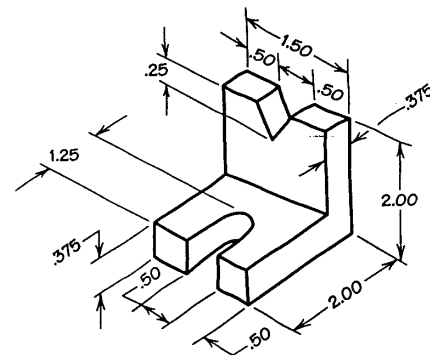


FIGURE 7.53 ■ Engineering sketch.

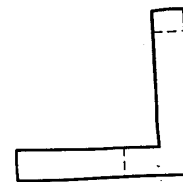


FIGURE 7.54 ■ Sketch the front view.

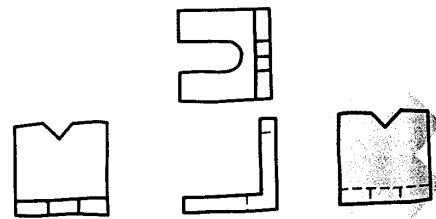


FIGURE 7.55 ■ Sketch the required views.

sketch as a guide. Several factors must be considered before you begin:

1. Size of drawing sheet.
2. Scale of the drawing.
3. Number and size of views.

4. Amount of blank space required for future revisions.
5. Dimensions and notes (not drawn at this time).

Drawing the Layout

Step 1. Use an A3-size (297 × 420 mm) or B-size (11 × 17 in.) drawing sheet. The recommended working area is shown in Figure 7.56. The amount of blank area on a drawing depends on company standards. Some companies want the drawing to be easy to read with no crowding; others may want as much information as possible on a sheet. Generally, .50 in. (12.7 mm) should be the minimum space between the drawing and border line. More space is preferred. An area for future revision generally (but not always) should be left between the title block and upper right corner. An area for general notes should be available

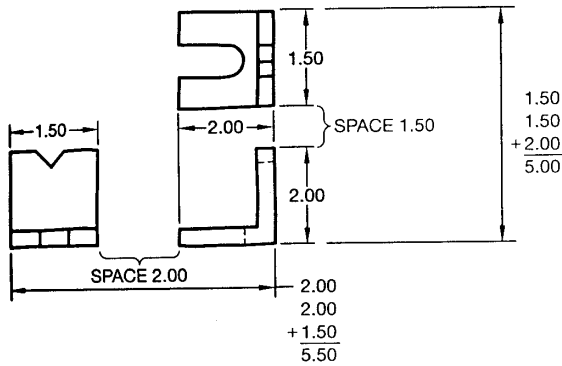


FIGURE 7.56 ■ Rough sketch with overall dimensions and selected space between views.

to the left of the title block for ASME/ANSI standard layout or in the upper left corner for Military standard layout. The remaining area is the space available for drawing. On Figure 7.56, this area is about 10 × 6 in. (250 × 15 mm).

Step 2. After determining the approximate working area, use your rough sketch as a guide to establish the actual size of the drawing by adding the overall dimensions and the space between views. (See Figure 7.56.) The amount of space selected will not crowd the views. The amount to select is an arbitrary decision and one where the drafter must use good judgment. Keep in mind that, for now, you will not consider dimensions when evaluating space requirements. The effect of dimensions on drawing layouts is discussed in Chapter 14.

Step 3. Now, in each direction subtract the total drawing size from the total space available and divide by two. This gives you the boundaries of the drawing area. Use construction lines to block out the total drawing areas that you have selected. (See Figure 7.57.)

Calculations:

Total space height	6.00
Total drawing height	<u>-5.00</u>
	1.00 ÷ 2 = .50
Total space width	10.00
Total drawing width	<u>-5.50</u>
	4.50 ÷ 2 = 2.25

Step 4. Within the area established, use construction lines to block out the views that you selected in the rough sketch. Use multiview projection as discussed in this chapter, beginning with the front view. (See Figure 7.58.)

