3 UNIT

Lines and Symbols

Various lines on a drawing have different meanings. They may appear solid, broken, thick, or thin. Each is designed to help the blueprint reader make an interpretation. The standards for these lines were developed by the American National Standards Institute (ANSI). These lines are now known as the alphabet of lines, Figure 3.1. Knowledge of these lines helps one visualize the part. Some lines show shape, size, centers of holes, or the inside of a part. Others show dimensions, positions of parts, or simply aid the drafter in placing the various views on the drawing.

This unit describes the most basic lines. The identification of other types of lines will be described in following units.

OBJECT LINES

Object lines are heavy, solid lines also known as *visible edge lines,* Figure 3.2. They generally show the outline of the part.

HIDDEN LINES

Some objects have one or more hidden surfaces that cannot be seen in the given view. These hidden surfaces, or invisible edges, are represented on a drawing by a series of short dashes called hidden lines, Figure 3.3.

EXTENSION LINES

Extension lines are thin, solid lines that extend surfaces, Figure 3.4. Extension lines extend away from a surface without touching the object. Dimensions are usually placed between the extension lines.

DIMENSION LINES

Dimension lines are thin, solid lines that show the distance being measured, see Figure 3.4. At the end of each dimension line is an *arrowhead.* The points of the arrows touch each extension line. The space being dimensioned extends to the tip of each arrow.

Arrowheads may be open or solid and can vary in size. The size depends mostly on the dimension line weight and blueprint size.

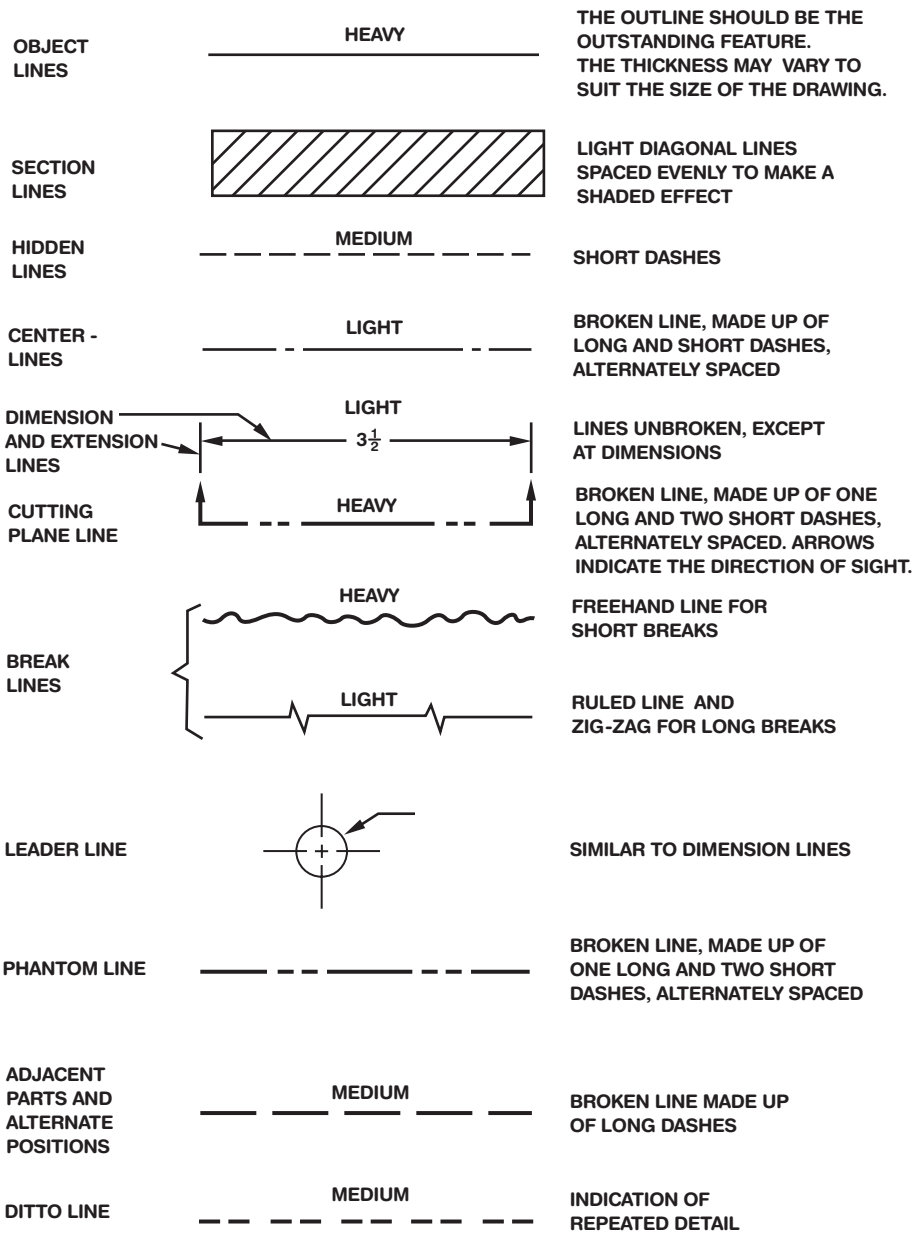


FIGURE 3.1 ■ Alphabet of lines

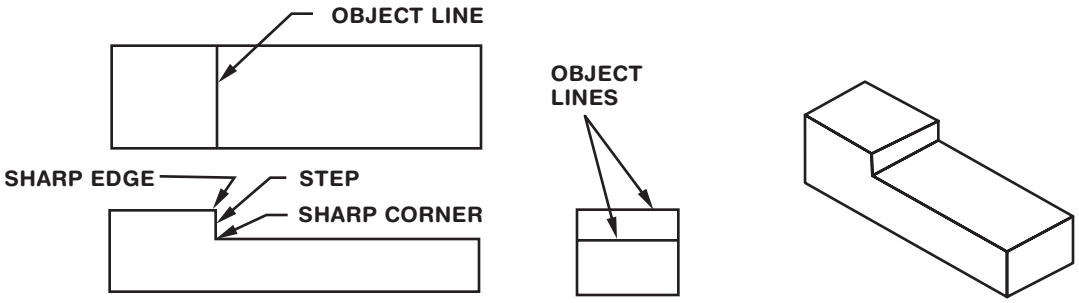


FIGURE 3.2 ■ Object or visible edge lines

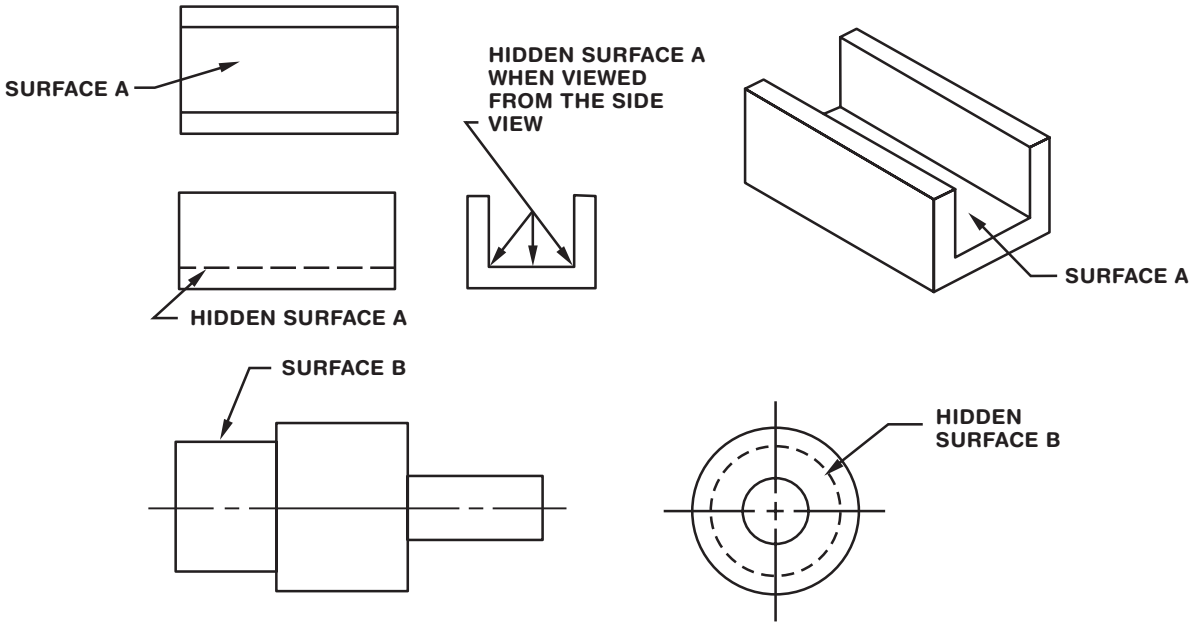


FIGURE 3.3 ■ Hidden surfaces

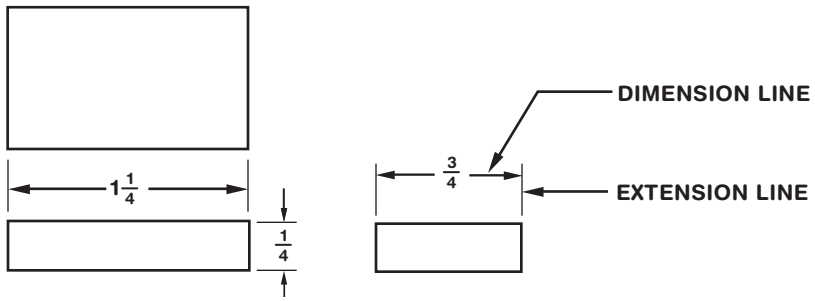


FIGURE 3.4 ■ Extension and dimension lines

CENTERLINES

Centerlines are thin lines with alternate long and short dashes. They do not form part of the object, but are used to show a location. As the name implies, centerlines indicate centers. They are used to show centers of circles, arcs, or symmetrical parts, Figure 3.5.

LEADER LINES

Leader lines are similar in appearance to dimension lines. They consist of an inclined line with an arrow at the end where the dimension or surface is being called out. The inclined line is attached to a horizontal leg at the end of which a dimension or note is provided, Figure 3.6.

APPLICATION OF SYMBOLS

Revised drawing standards developed by the American National Standards Institute (ANSI) and the American Society of Mechanical Engineers (ASME) are being applied to most modern drawings. These standards encourage the use of symbols to replace words or notes on drawings. This practice reduces drafting time, reduces the amount of written information on the drawing, and helps overcome language barriers. Figure 3.7 shows some common symbols applied to prints. The application of most of these symbols is explained in the appropriate units that follow.

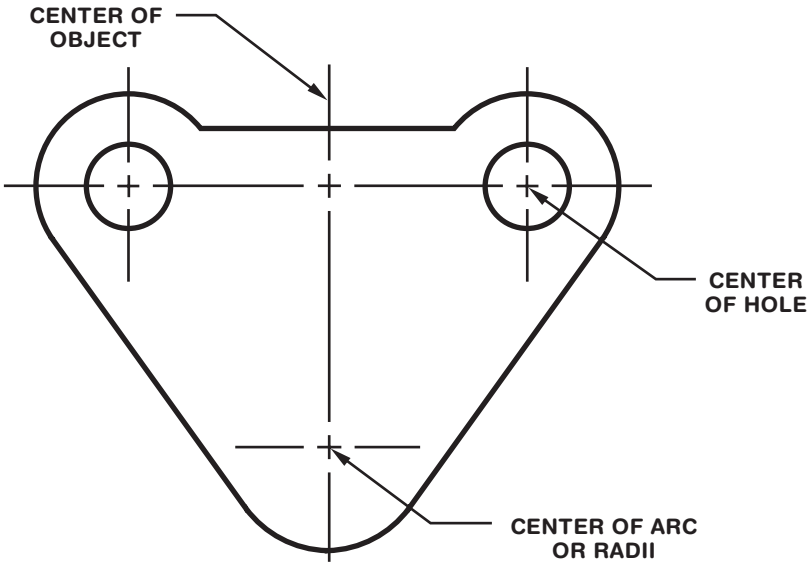


FIGURE 3.5 ■ Centerlines

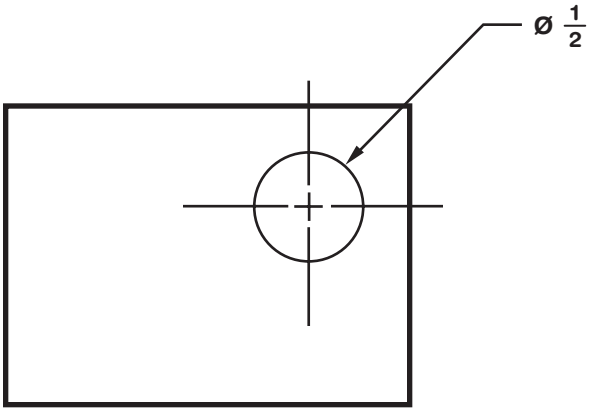


FIGURE 3.6 ■ Leader lines

DIAMETER SYMBOLS

The former practice was to specify holes or diameters by calling out the hole size, using an abbreviation or letter for the diameter, DIA or D, and a note for the process, Figure 3.8.

The new standard for diameter uses the symbol ∅ in front of the dimension indicating a diameter and the reference to a machining process is not given, Figure 3.9.

However, industrial use of the latest standards varies. Many drawings still reflect the older methods of dimensioning.

Ø	Diameter
2X	Repetitive Feature
R	Radius
↧	Depth
⌴	Countersink or Counterbore
(.XXX)	Reference Dimension
.XXX	Dimension Not to Scale
.XX	Basic Dimension
□	Square

FIGURE 3.7 ■ Standard feature symbols

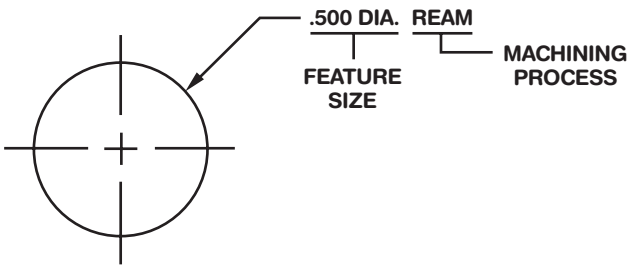


FIGURE 3.8 ■ Old method of specifying a diameter and process

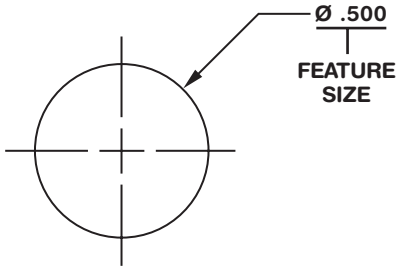


FIGURE 3.9 ■ New method of specifying a diameter

SQUARE SYMBOL

A square symbol is often used to show that a single dimension applies to a square shape. The use of a square symbol preceding a dimension indicates that the feature being called out is square, Figure 3.10.

SPECIFYING REPETITIVE FEATURES

Repetitive features or dimensions are often specified in more than one place on a drawing. To eliminate the need of dimensioning each individual feature, notes or symbols may be added to show that a process or dimension is repeated.

Holes of equal size may be called out by specifying the number of features required by an X. A small space is left between the X and the feature size dimension that follows, Figure 3.11.

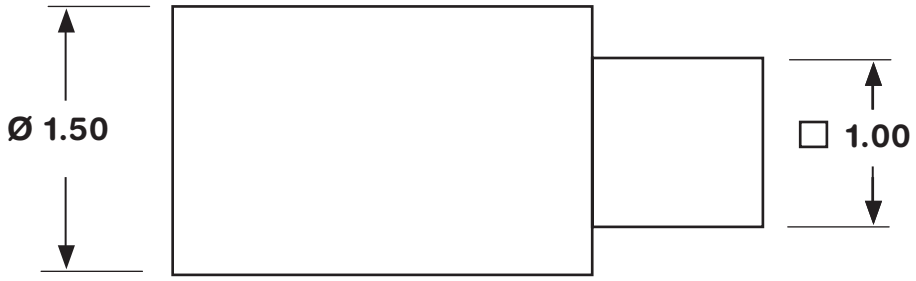


FIGURE 3.10 ■ Application of a square symbol to represent a feature

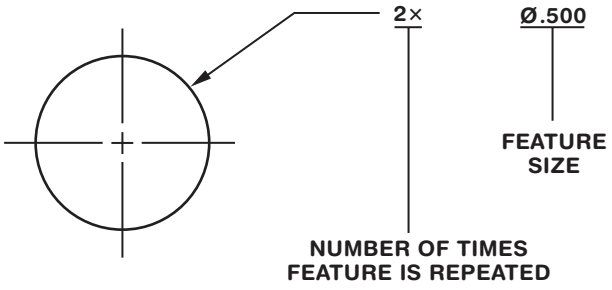
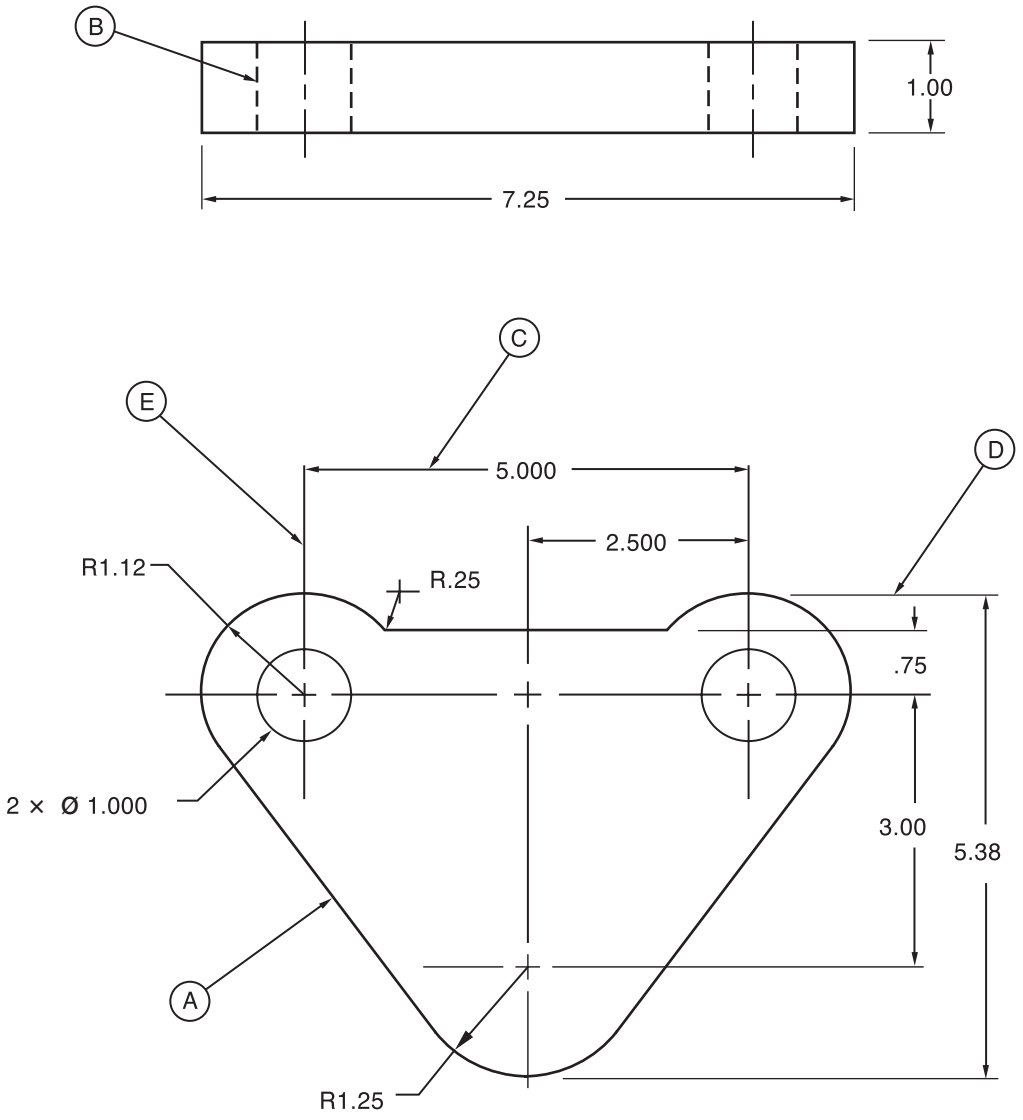


FIGURE 3.11 ■ New method of representing repetitive features

ASSIGNMENT D-2: TOP PLATE

1. What is the name of the part? _____
2. What is the part number? _____
3. Of what material is the part made? _____
4. How thick is the part? _____
5. What kind of line is Ⓐ? _____
6. What radius forms the front of the plate? _____
7. How many holes are there? _____
8. What kind of line is Ⓑ? _____
9. How far are the centers of the two holes from the vertical centerline of the piece? _____
10. How far apart are the centers of the two holes? _____
11. What radius is used to form the two large diameters around the 1.000 holes? _____
12. What kind of line is Ⓒ? _____
13. What diameter are the two holes? _____
14. What does the symbol 2X mean? _____
15. What kind of line is Ⓓ? _____
16. What kind of line is Ⓔ? _____
17. What is the overall distance from left to right of the top plate? _____
18. What kind of a line is drawn through the center of a hole? _____
19. What is the scale of the drawing? _____
20. What special finish is required on the part? _____



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				10/12/95	FRP	KLB	DLE
				SCALE:		MATERIAL:	
REV.	DESCRIPTION	DATE	BY	HALF		MST	

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

FRACTIONAL +_ 1/64 2 PLC. DECIMAL ± .01
3 PLC. DECIMAL ± .005 4 PLC. DECIMAL ± .0005
LIMITS ON ANGULAR DIMENSIONS ± 1/2°

FINISH: BREAK ALL SHARP CORNERS

PART NAME: NO. 202 TOP PLATE

PART NUMBER: A02056535

D-2