BLUEPRINT READING FOR WELDERS

A.E. BENNETT LOUIS J. SIY

Sheet 1 Front – Cable Drum Detail
Sheet 1 Back – Adjustable Bumper Hitch
Sheet 2 Front – Chassis for Utility Trailer
Sheet 2 Back – Hot Water Tank
Sheet 3 Front – Motor Support Frame
Sheet 3 Back – Engine Mount Rear
Sheet 4 Front – Comprehensive Review
Sheet 4 Back – Comprehensive Review

These drawings are printed on a perforated sheet, so that they can be separated for ease of handling.

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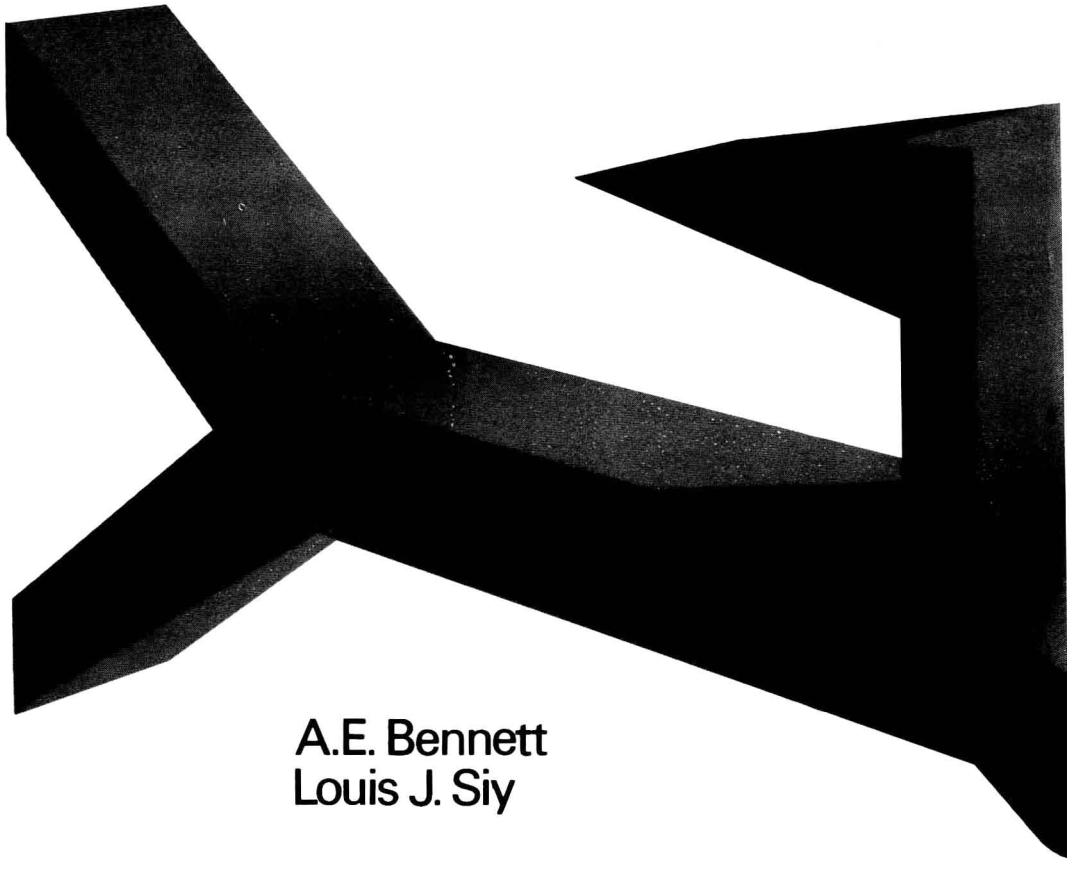

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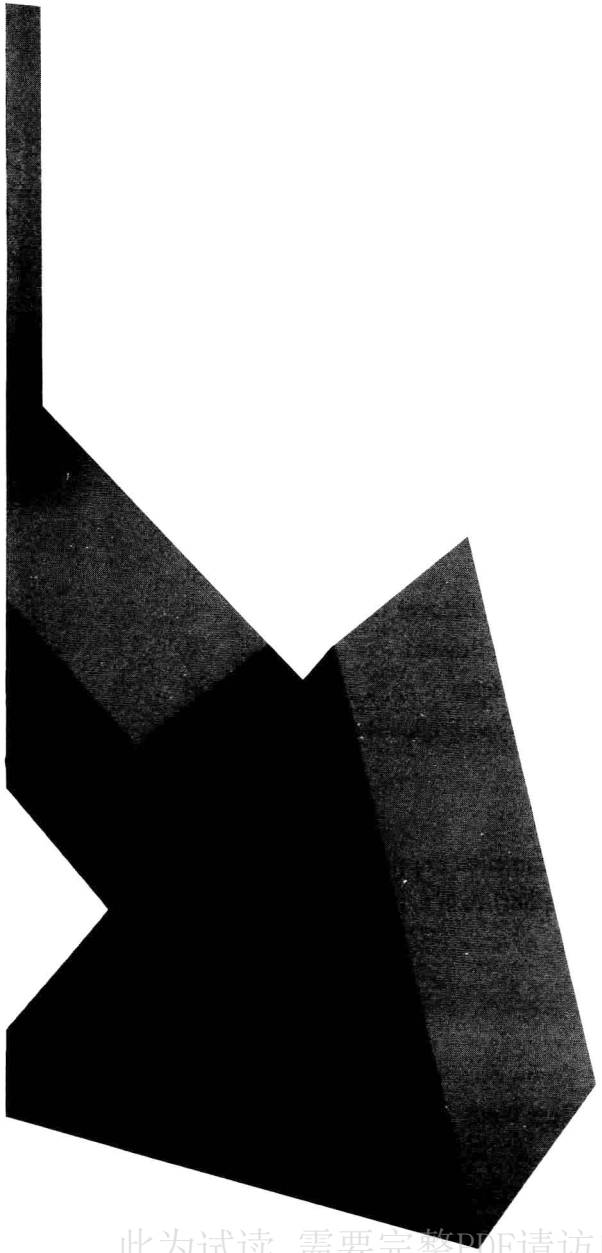

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PREFACE

It has long been recognized that skilled welders must not only be competent in the manipulative skills of the trade, but must be equally competent in their ability to interpret the trade drawings which describe the work they must do.

BLUEPRINT READING FOR WELDERS is concerned with the basic fundamentals of drawing interpretation as applied in the welding trade. Beyond the required core of blueprint reading skills, the welder must also be thoroughly familiar with welding symbols and their significance. These symbols are an integral part of the graphic language by which the engineer or designer communicates to the welder on the job. Thus, thorough coverage of welding symbols is considered an integral part of blueprint reading for the welder.

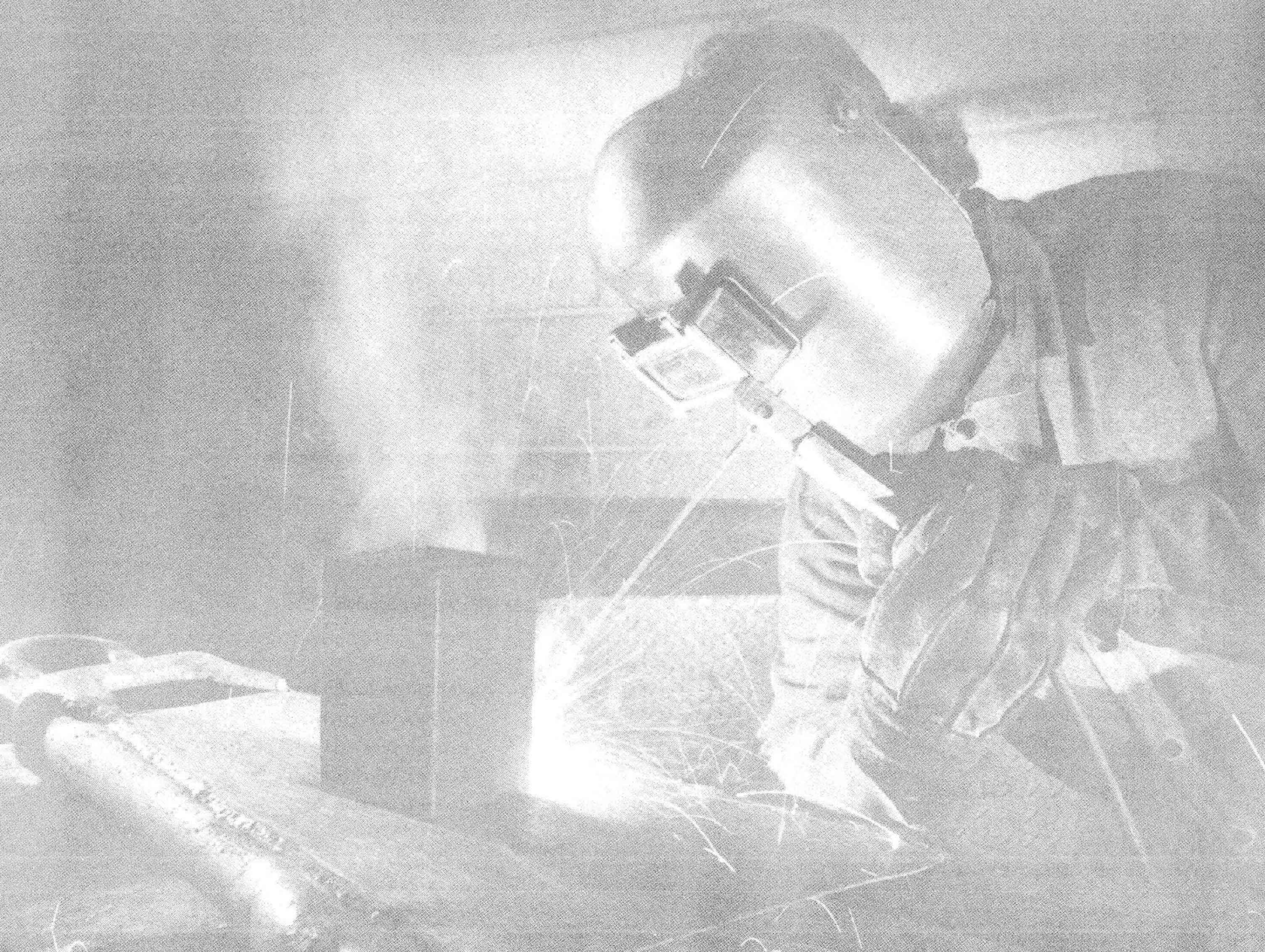
Each instructional unit represents a complete learning experience. The first nine units of the text deal with the fundamentals of blueprint reading and cover such topics as basic lines and views, dimensions, notes and specifications, structural shapes, sections, and detail and assembly drawings. The balance of the units cover welding symbols and their significance. To meet local needs, these units may be rearranged in sequence, and it is suggested that certain units dealing with welding symbols be introduced in the course prior to the completion of the instructional units on assembly drawings. In addition, it is suggested that available local prints be used to supplement this instructional material to lend added meaning to the necessity for developing these blueprint reading skills.

A new unit has been added to familiarize the student with the use of metrics as they relate to the interpretation of welding blueprints.

Instructional materials dealing with the development of welding skills are available in the publications listed below. In content, organization, and instructional format, they are correlated for use with this text in related blueprint reading.

WELDING PROCESSES – Griffin, Roden, Briggs
BASIC OXYACETYLENE WELDING – Griffin, Roden, Briggs
BASIC ARC WELDING – Griffin, Roden, Briggs
BASIC TIG AND MIG WELDING – Griffin, Roden, Briggs
PIPE WELDING TECHNIQUES – Griffin, Roden, Briggs
WELDING PROCEDURES: OXYACETYLENE – Schell
WELDING PROCEDURES: ELECTRIC ARC – Schell
WELDING PROCEDURES: MIG & TIG – Schell and Matlock

CONTENTS

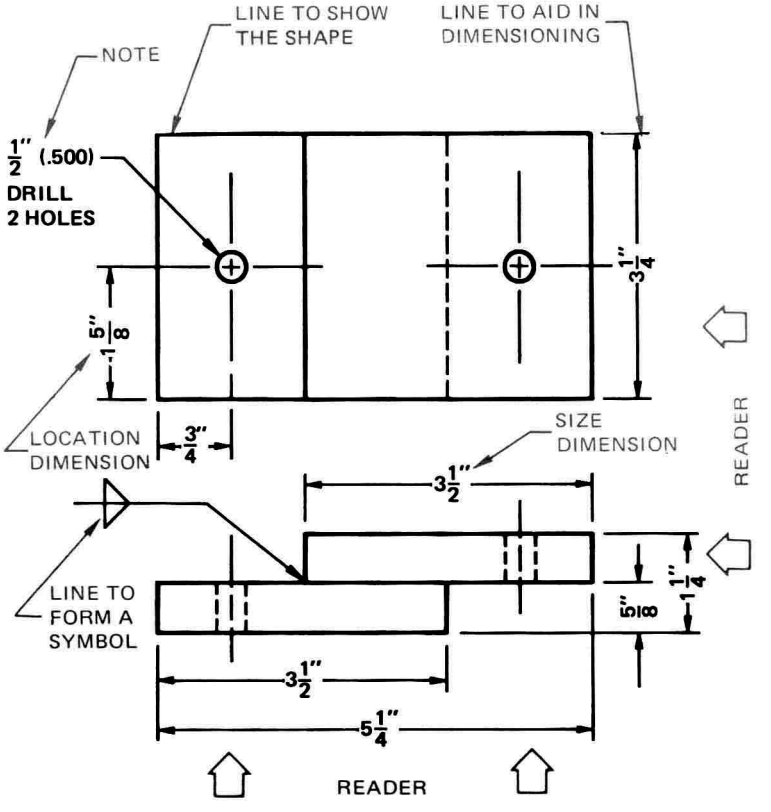


THE PURPOSE AND MAKEUP OF PRINTS

The calculations and ideas of the engineer must be transferred to the welder working in the shop. It is usually impractical for an engineer to be present while a weldment is being fabricated, therefore the needed information must be supplied by some method other than verbal communication. The most concise method for doing this is through the use of rough sketches or detailed drawings.

The single copy of a drawing provided by the engineer is usually insufficient for production purposes; therefore, one of several methods is used to provide the required number of copies. For the most part, a finished drawing is made from the original sketch or drawing and then traced. In many instances the finished drawing is made directly on the tracing material to eliminate one step in the reproduction process. Blueprints or whiteprints are made from the tracing with the use of strong, light-sensitized paper, and prepared chemicals. A print is simply a copy of a drawing or tracing.

There are three basic elements to be found on a print: lines, dimensions, and notes. Lines show the shape of the object, aid in dimensioning the object, and are used in the formation of symbols. Dimensions give sizes and locations. Notes, giving details of construction not shown by lines, may be in the form of symbols or abbreviations. A note which designates the kind of material, machining process, or standard to be used, is often referred to as a specification. Notes or specifications are found adjacent to a view, or in a ruled space provided on the print for this purpose. In addition to lines, dimensions, and notes, a print consists of one or more views, usually the top, front, and right side views of the object. Other views which may be used to describe the object completely are the left side, back, auxiliary, and bottom views. The number and type of views shown depend on the shape and complexity of the object. A concept of these views is presented in the units which follow.



NOTE: ALWAYS READ A PRINT FROM THE BOTTOM AND THE RIGHT SIDE

Unit 1 BASIC LINES

There are many different types of lines used on a print and each type has a different meaning. To understand the requirements of the job, the welder should be able to interpret these meanings. Although the welder may not be required to know every type of line firsthand, he should learn those which are most frequently used. Table 1 can be used as a reference for the common line types usually found on a print.

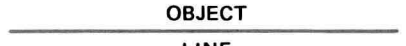
Type of Line	Description	Purpose
 OBJECT LINE	Thick solid line	To show the visible shape of a part
 HIDDEN LINE	Broken line of medium thickness	To show edges and outlines not visible to the eye
 CENTER LINE	Fine, broken line made up of a series of short and long dashes alternately spaced	To show the center of circles, arcs and symmetrical objects and to aid in dimensioning these parts
 EXTENSION AND DIMENSION LINES	Extension lines are fine lines which extend from the object with a slight break between. Dimension lines are fine lines with arrowheads, unbroken except where the dimension is placed.	Extension lines show dimensioning points. Dimension lines touch the extension lines and show distance given by the dimensions.

Table 1 Common types of lines used on a print

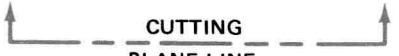
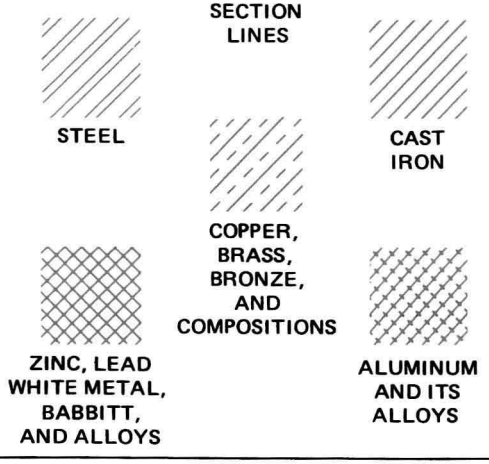
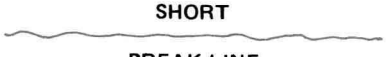
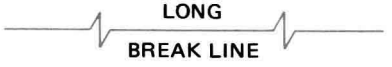
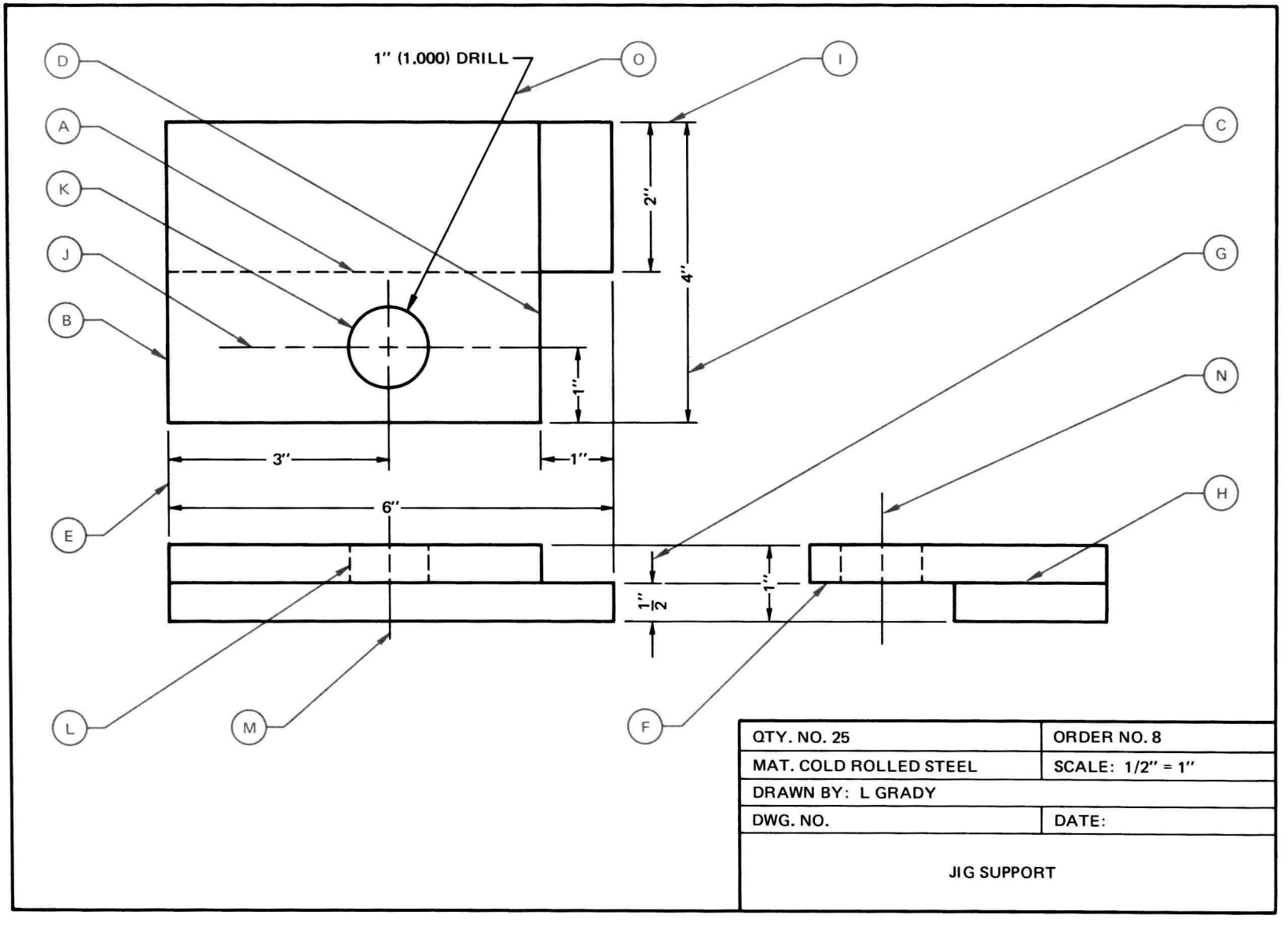
Type of Line	Description	Purpose
 LEADER	Fine, straight line with an arrowhead at one end. It is usually drawn at an angle.	Points directly to a surface for the purpose of dimensioning or adding a note
 CUTTING PLANE LINE	Heavy, broken line made up of a series of one long and two short dashes alternately spaced. Arrowheads are placed at the ends as shown.	To indicate where an imaginary cut is made through the object. The arrow points in the direction in which the section should be viewed.
 SECTION LINES STEEL CAST IRON COPPER, BRASS, BRONZE, AND COMPOSITIONS ZINC, LEAD WHITE METAL, BABBITT, AND ALLOYS ALUMINUM AND ITS ALLOYS	Series of fine lines – solid or solid and broken – arranged in specific patterns. They may be shown either straight or curved. When shown straight, they are usually drawn at a 45° angle. However, this angle will vary when applied to adjacent parts.	To indicate the imaginary cut surface referred to by the cutting plane line. To represent various kinds of materials
 SHORT BREAK LINE	Heavy, irregular line drawn freehand	To show a short break (to conserve space on a drawing). To show a partial section
 LONG BREAK LINE	Ruled, light line with freehand zigzags	To show a long break (to conserve space on a drawing)

Table 1 Common types of lines used on a print (continued)



QTY. NO. 25	ORDER NO. 8
MAT. COLD ROLLED STEEL	SCALE: 1/2" = 1"
DRAWN BY: L GRADY	
DWG. NO.	DATE:
JIG SUPPORT	

Refer to the drawing, **Jig Support**, page 10.

1. Identify the following types of lines.

(A) _____

(B) _____

(C) _____

(D) _____

(E) _____

(F) _____

(G) _____

(H) _____

(I) _____

(J) _____

(K) _____

(L) _____

(M) _____

(N) _____

(O) _____

2. Give the function or functions of the following lines.

(A) _____

(B) _____

(C) _____

(E) _____

(J) _____

3. Describe the following lines.

(E) _____

_____

(H) _____

_____

(C) _____

_____

(L) _____

_____

(M) _____

_____

Unit 2 BASIC VIEWS

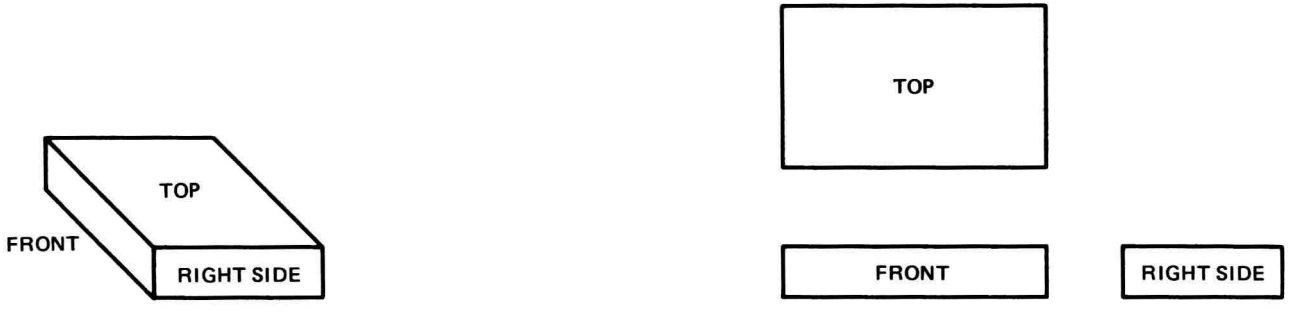
Drawings should be made to describe the object in sufficient detail to permit fabrication. Orthographic projection is the method employed to do this. That is, the exact form of the object is shown by various views of the object arranged in a particular order. The selection and arrangement of these views is shown in figure 2-1. Note the relationship in the placement of the views in the figures.

Figure 2-1(a) is a drawing of a three-dimensional block and figure 2-1(b) shows three two-dimensional views of the block. By examining each of the three views in figure 2-1(b), an accurate picture of the shape of each face can be formed. In this case, three views are used to describe the object. Note that the views have a definite arrangement. The top view is placed directly above and in line with the front view; the right side view is placed to the right of and in line with the front view.

There is no formal limitation on the number of views which may be used to describe an object; however, three properly selected views are usually sufficient. In cases where more views are needed to illustrate the shape clearly and to make dimensioning easier, the bottom, left side, or back views can be used. Simple parts can be completely described with only two views.

It should be noted that the front view usually gives the best indication of the shape of the object. This does not mean that the front view necessarily shows the front of the object. For example, if a welder's torch is represented on a print, the front of the torch is not shown as the front view since it does not show the true shape of the torch. Therefore, in general, to simplify the reading of the print, the front view should give the most accurate representation of the object.

All views have a particular position with respect to each other, and have either a horizontal or vertical alignment. These positions, illustrated in figure 2-2, should be learned.



(a) PICTORIAL (OBLIQUE)

(b) ORTHOGRAPHIC PROJECTION (IN THREE VIEWS)

Fig. 2-1 Methods of representing an object

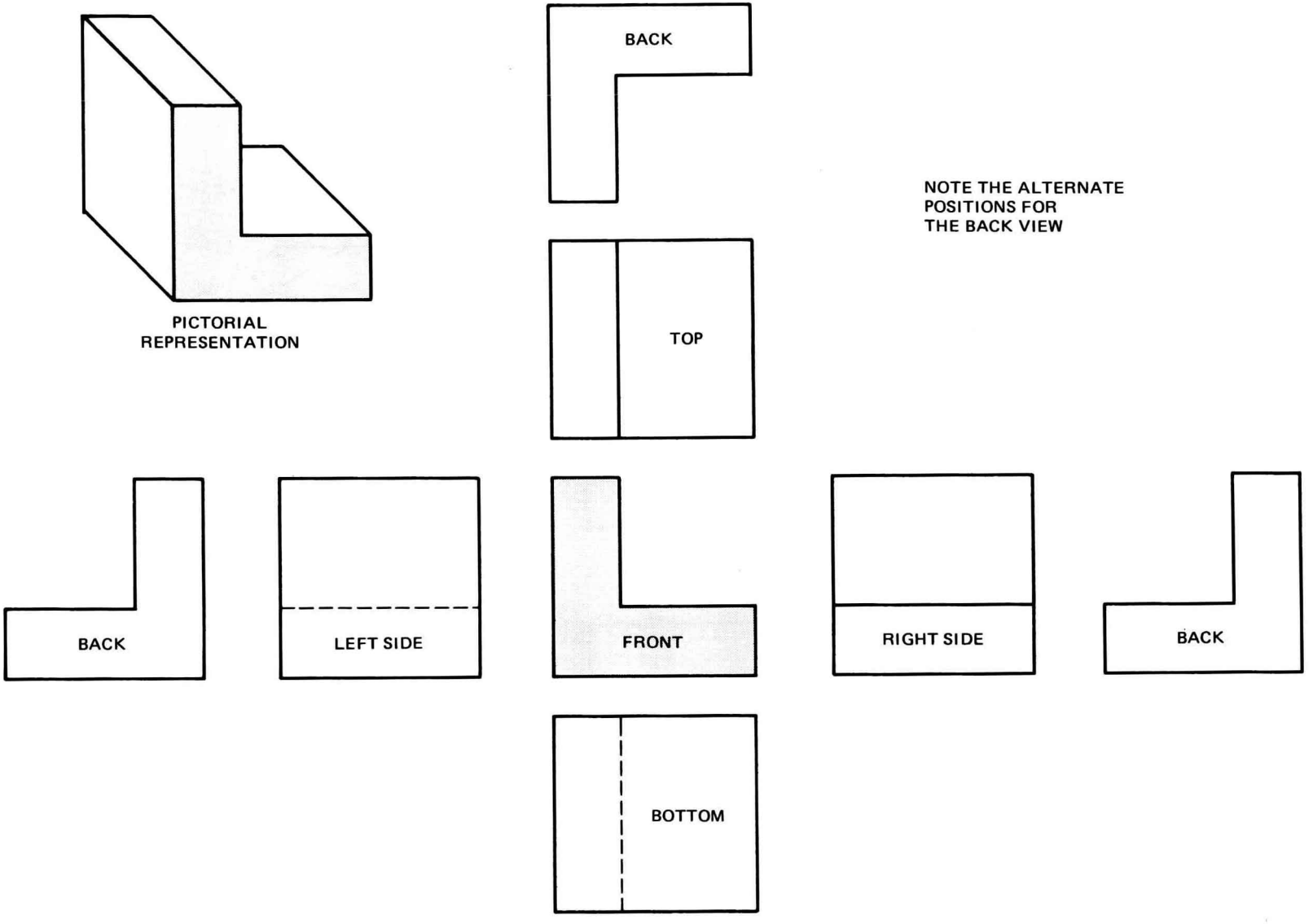
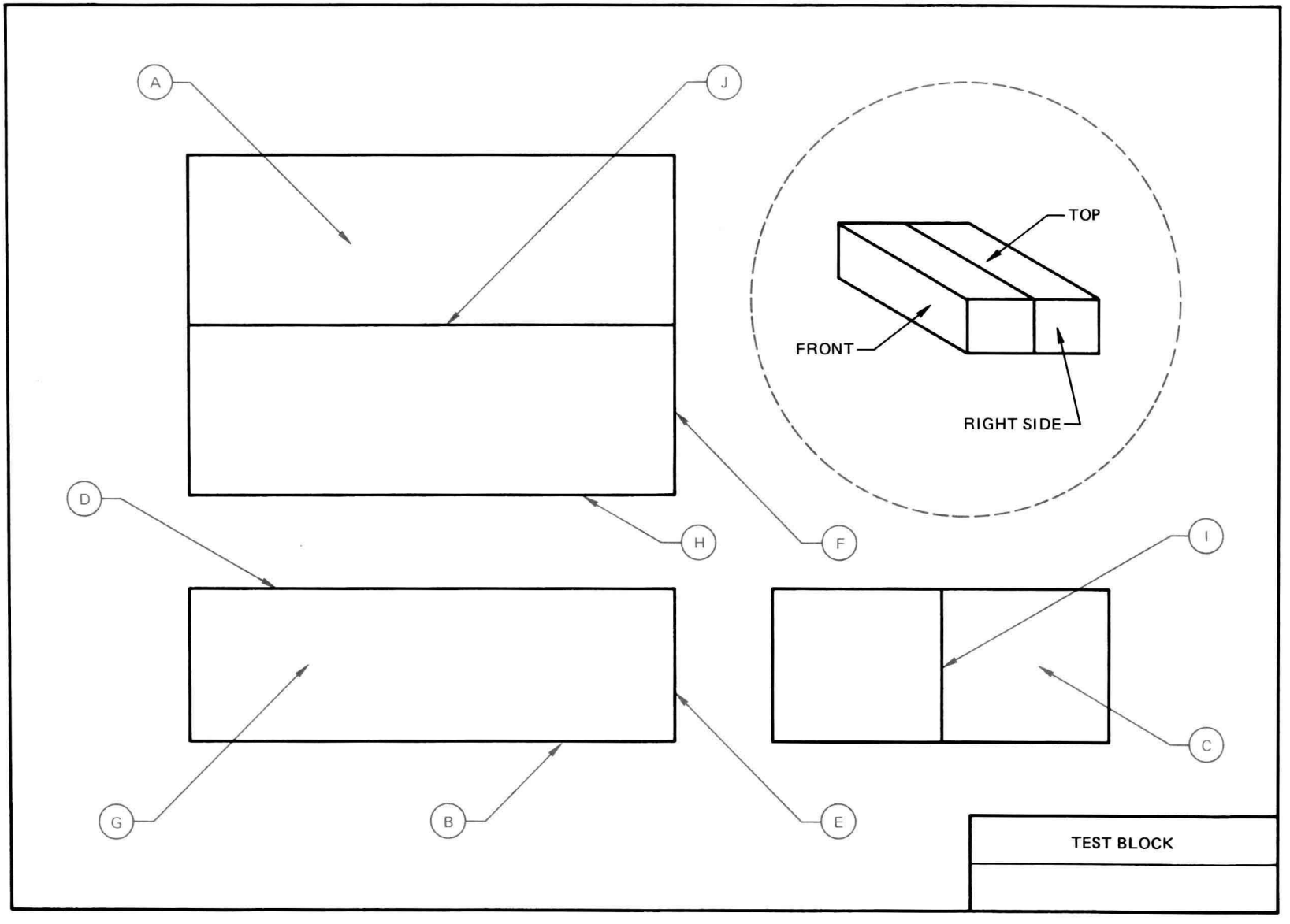


Fig. 2-2 Relationships of possible views for describing an object.


A
J
TOP
FRONT
RIGHT SIDE
D
H
F
I
G
B
E
C
TEST BLOCK

Refer to the drawing, **Test Block**, page 14.

1. Why are three views used to show the object?

2. Name each of the views shown.

3. In which two views is the length of the object the same?

4. In which two views is the width of the object the same?

5. In which views is the thickness of the object the same?

6. What line represents surface (A) in the front view?

7. What line represents surface (C) in the front view?

8. What line represents surface (C) in the top view?

9. What line in the top view represents surface (G) in the front view?

10. Is surface (B) shown in the top view?

11. What is the relationship of the top view to the front view?

12. What is the relationship of the front view to the side view?

13. What common characteristic do the top and side views have with respect to the front view?