

ME 113

ENGINEERING DRAWING I

CHAPTER 4

ORTHOGRAPHIC DRAWING

4

Introduction and Objectives

- ❑ This lecture introduces how to visualize an object from its orthographic views.
- ❑ To do so, methods, procedure and the meaning of basic features are explained in detail.
- ❑ Students are required to understand and practice to visualize an object using with given orthographic views and to gain an ability of reversal drawing of an object and drawing of missing views.

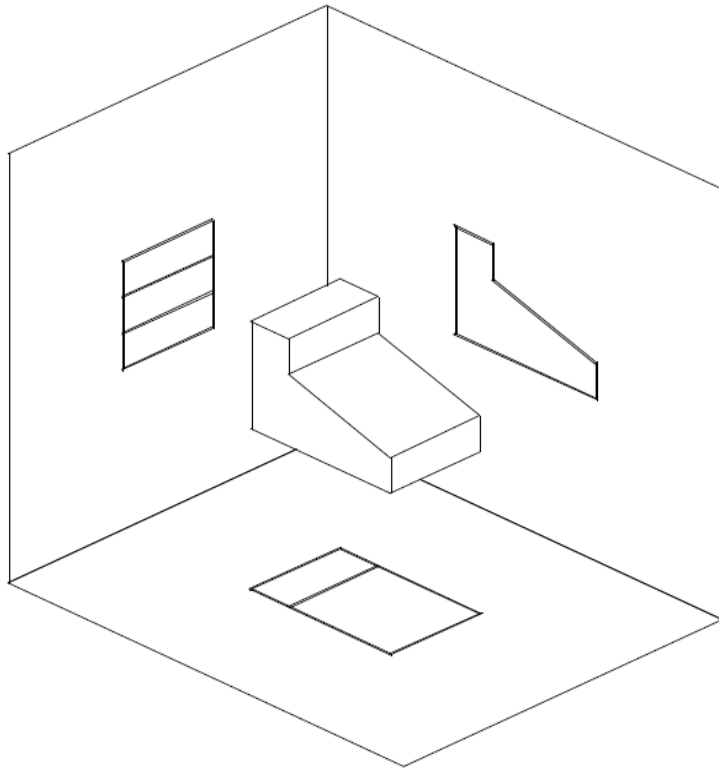
4.30.ORTHOGRAPHIC READING

- The engineer must be able to read and write the orthographic language. The necessity of learning to read is absolute because everyone connected with technical industry must be able to read a drawing without hesitation or concede technical illiteracy.
- Reading the orthographic language is a mental process, a drawing is not read aloud. To describe even a simple object with words is almost impossible. Reading proficiency develops with experience. Experienced readers read quickly because they can draw upon their knowledge and recognise familiar shapes and combination without hesitation. However, reading a drawing should always be done carefully and deliberately, as a whole drawing can not be read at a glance any more than a whole page of print.

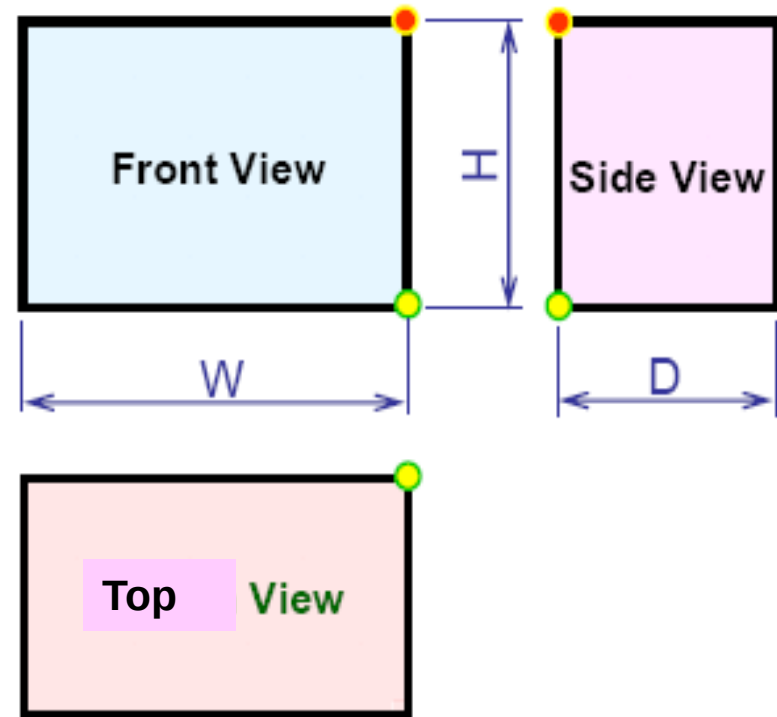
Orthographic Reading & Prerequisites of Reading

- ❑ Orthographic reading is a meaning of **understand the language of technical drawing**.
- ❑ Reading a drawing is the process of **recognizing and applying the principles of orthographic projection to interpret the shape** of an object from the orthographic views.
- ❑ Before reading a drawing, the one should familiar with the principles of orthographic projection:
 - ✓ Arrangement of views and their projection
 - ✓ The location of height, width and depth
 - ✓ What line, surface and plane represent etc.

Orthographic Reading & Prerequisites of Reading



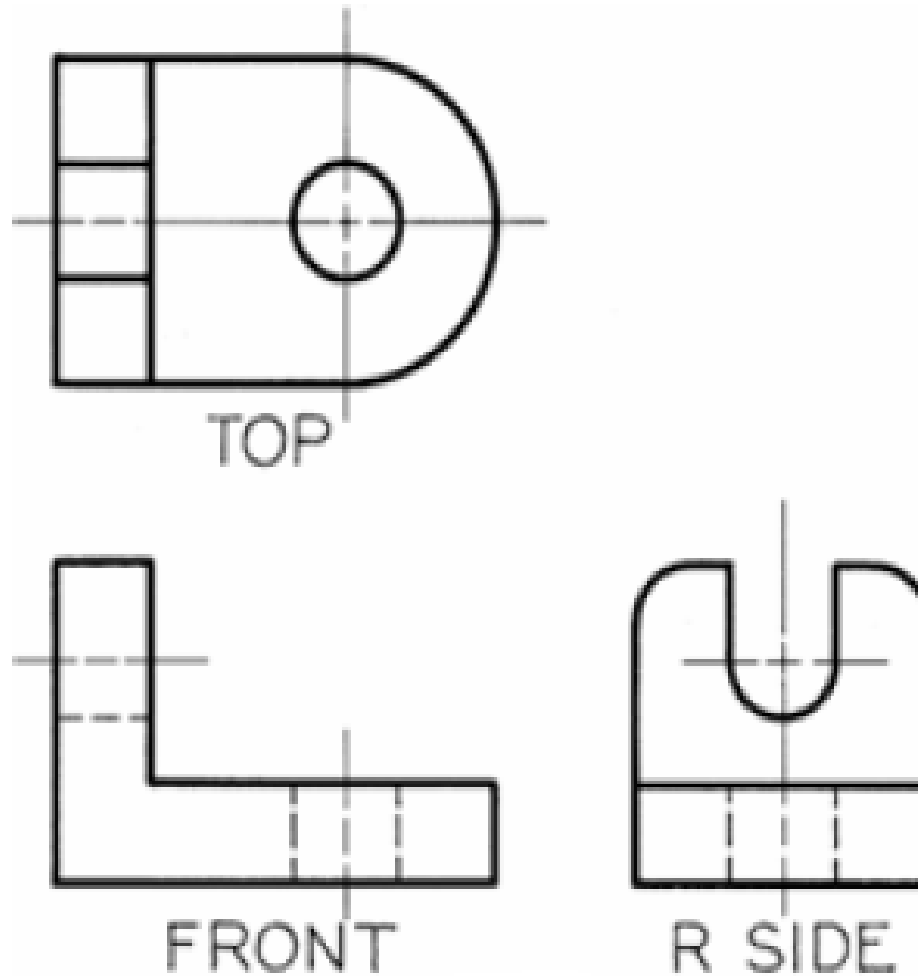
First-Angle
Projection



4.31.PREREQUISITES OF READING

- Reading a drawing is the process of recognizing and applying the principle of Orthographic Projection to interpret the shape of an object from the orthographic views.
- Before attempting to read a drawing, familiarize yourself with the, principles of orthographic projection as explained before. Keep in mind the arrangement of views and their projection, the space measurements of height, width and depth, what each line, plane represents etc.
- Visualization is the medium through which the shape information on a drawing is translated to give the reader an understanding of the object represented. The ability to visualize is not a “gift” that some people possess and others do not. Any person of reasonable intelligence having visual memory can do this process. The ability to visualize a shape shown on a drawing is almost completely governed by a person's knowledge of the principles of orthographic projection. The best way to learn to read a drawing is to learn how to make one.

Procedure of Reading



4.32. METHOD OF READING

- Reading is primarily a reversal of the process of making drawings. A drawing is read by visualising units or details one at a time from the orthographic projection and mentally orienting and combining these details to interpret the whole object finally.
- Beginner can develop this ability as follows:
 - 1. He must have a reasonable knowledge of the principles of orthographic projection
 - 2. Beginner must acquire a complete understanding of the principles behind the meaning of lines, areas etc. and the mental process involved in interpreting them, as these principles are applied in reading.
- There is very little additional learning required. Careful study of all these items plus practice will develop the ability and confidence needed.

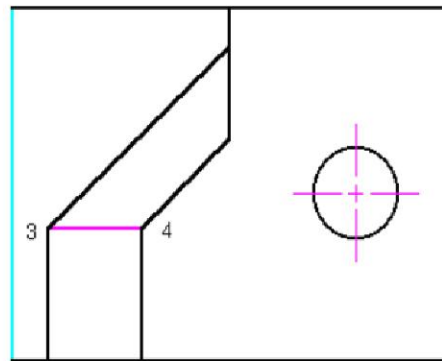
4.33.PROCEDURE FOR READING

- The reading steps are not always identical, because of the wide variety of drawing types. On the other hand, the following outline gives the basic procedure and will serve as a guide:
 1. Orient yourself with the given views.
 2. Obtain a general idea of the over-all shape of the object. Think each view as the object itself. Study the dominant features and their relations to one another.
 3. Start reading the simpler individual features. Look for familiar shapes or conditions that your memory retains from previous experience. Read all views of these familiar features to note the extent of holes, thickness of ribs and lugs etc.
 4. Read the unfamiliar or complicated features. Remember that every point, line, surface and solid appears in every view and that you must find the projection of every detail in the given views to learn the shape.
 5. As the reading proceeds, note the relationship between the various portions or elements of the object. Such items as the number and the spacing of holes, placement of ribs, tangency of surfaces, and the proportions of hubs etc. should be noted and remembered.
 6. Reread any detail or relationships not clear at the first reading.
- Do not forget that, shape of the object can not be assumed from one or two views, all the views must be read carefully.

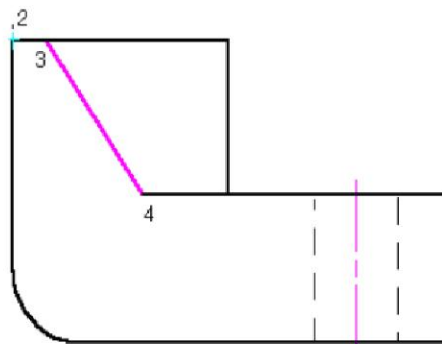
4.34. THE MEANING OF LINES

- As explained before, a line on a drawing indicates
 1. The edge view of a surface
 2. An intersection of two surfaces
 3. A surface limit.
- A line on a view may mean any one of these three conditions. The corresponding part of another view must be consulted to determine the meaning. See and study the figures (4.50.51).
- The several lines representing one feature must be read in all views. As an exercise in reading the lines on an orthographic drawing find all the lines representing the hole, prism slot, and cut of corner in (Fig.4.52).

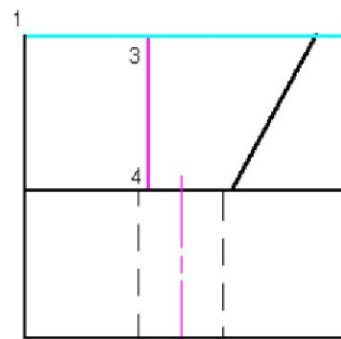
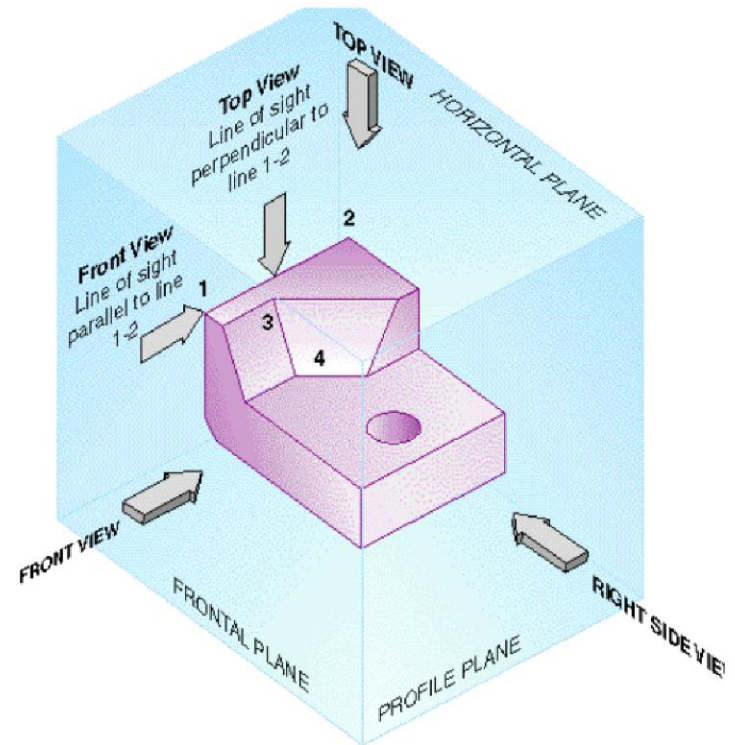
The Meaning of Lines



TOP



FRONT



RIGHT SIDE

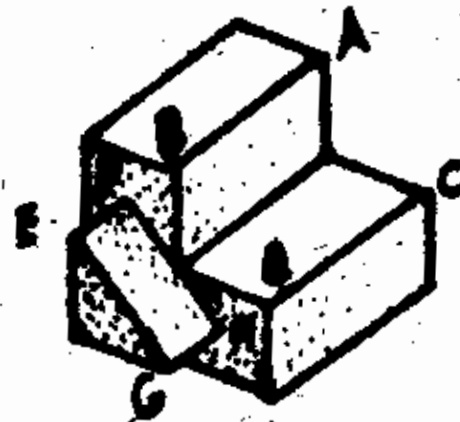
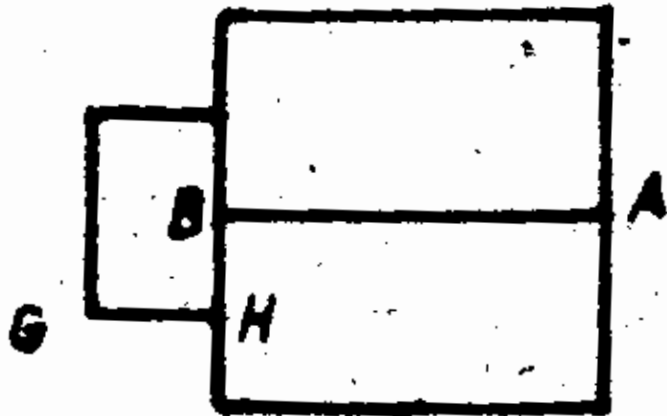
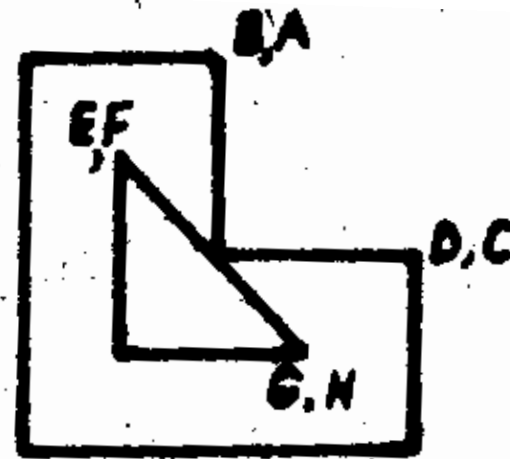
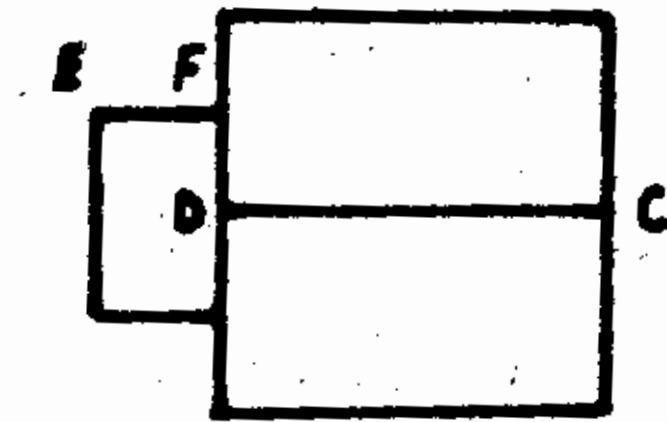


Fig.4.50. Meaning of lines. AB, CD and EF represent the edge view of surfaces. GH represents an edge.

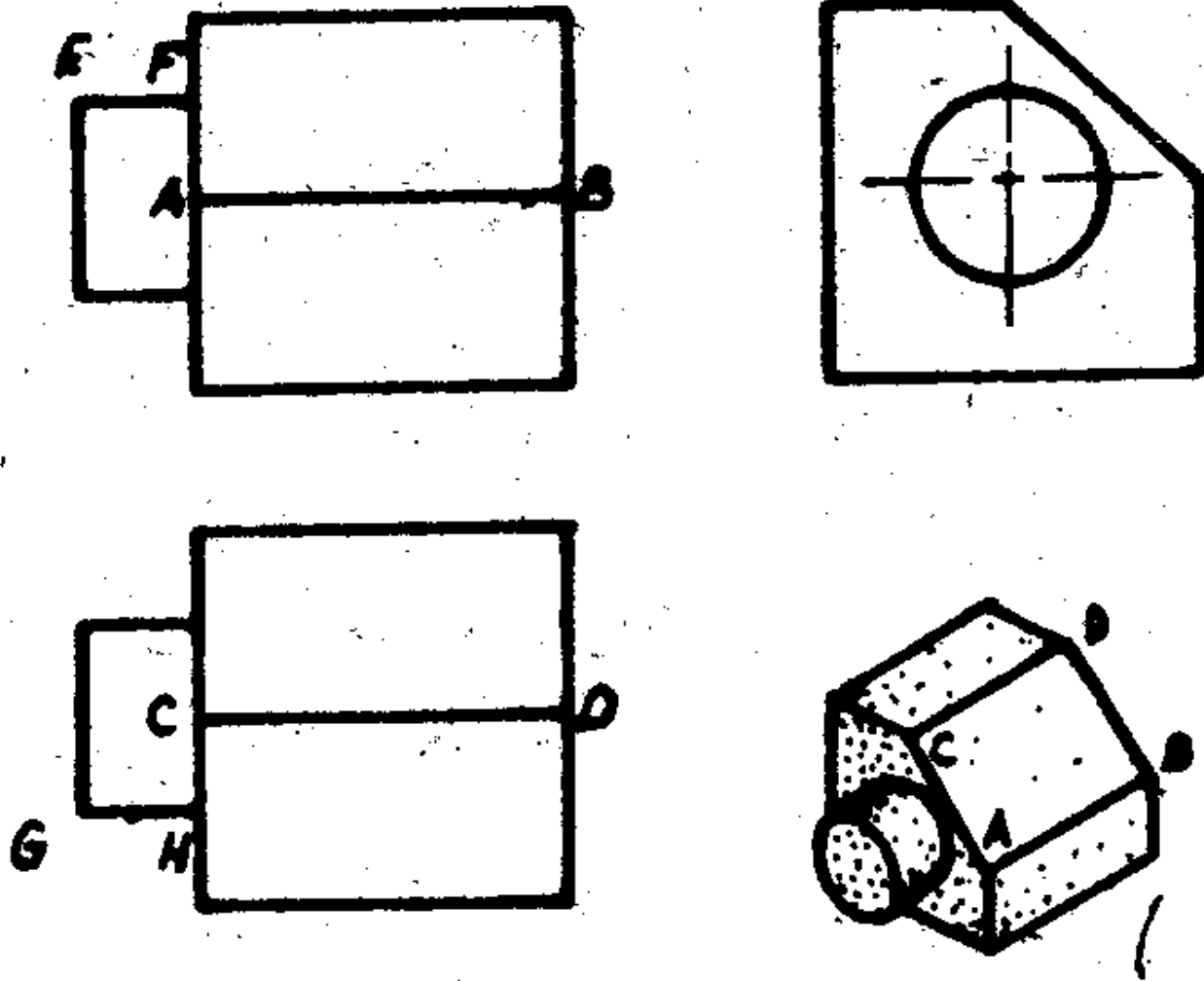


Fig.4.51. Meaning of lines. AB and CD represent the intersection of two surfaces. EF and GH represent a curved-surface limit. Compare this drawing with (Fig.4.50).

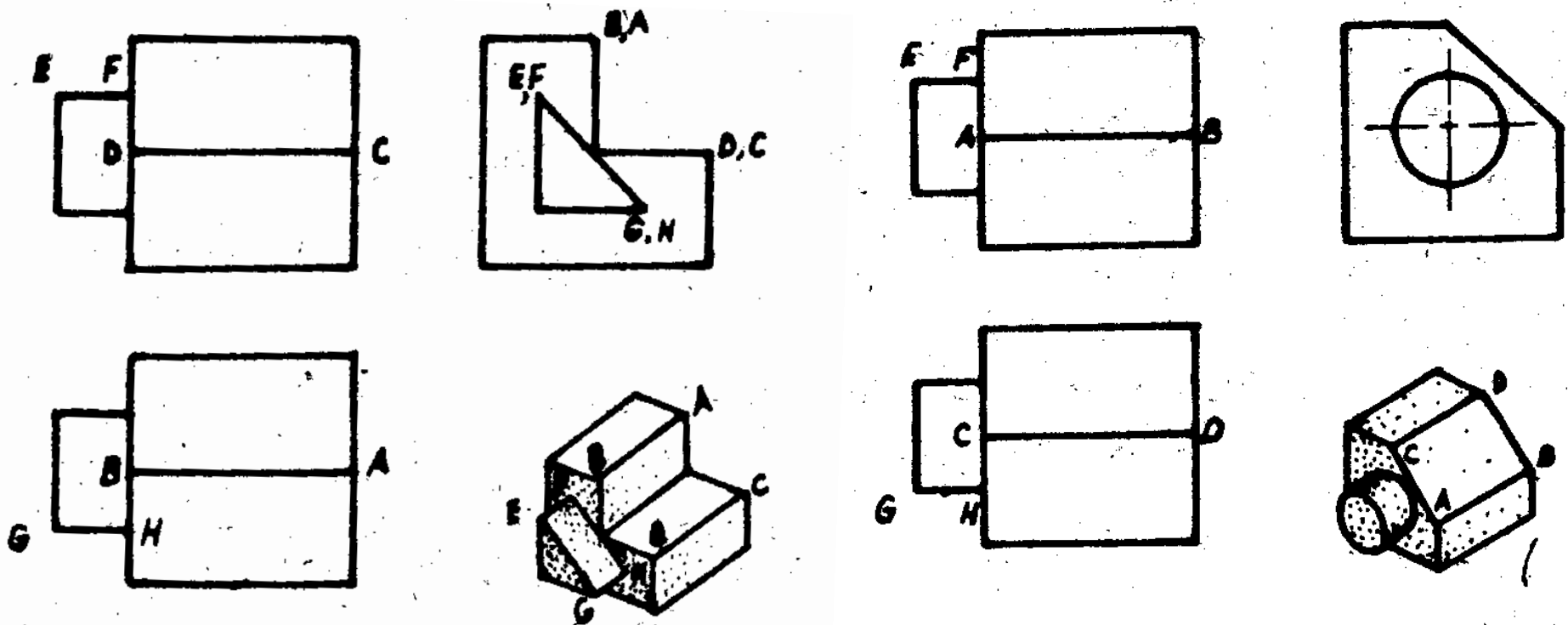


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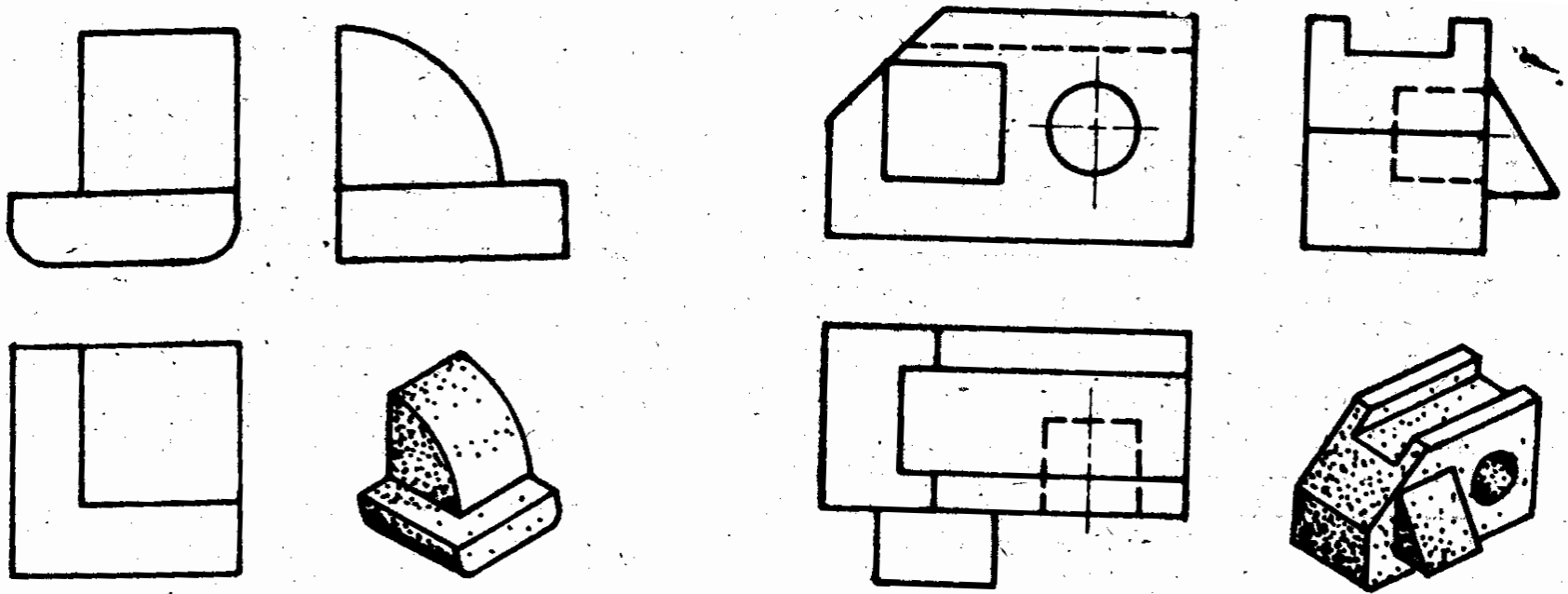


Fig.4.52.Read all views, features and lines. Read each feature by looking at all three views. Then school yourself to remember all features.

4.35 THE MEANING OF AREAS

The term "area" as used here means the contour limits of a surface or combination of tangent surfaces as seen in the different orthographic views. Study the (Fig.4.53).

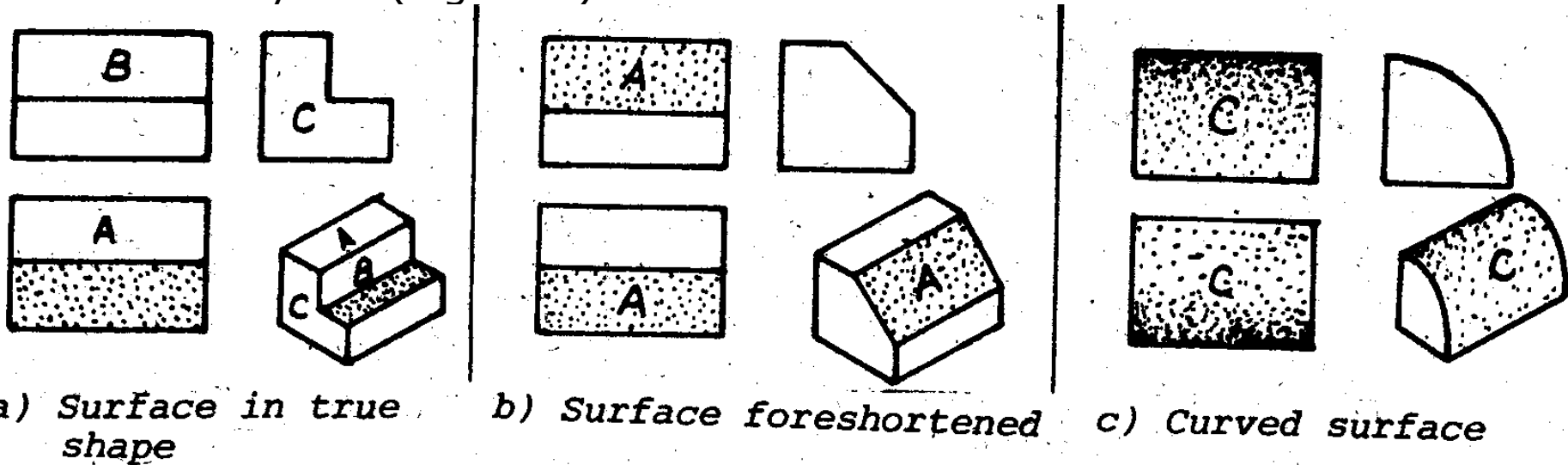


Fig. 4. 53 The meaning of areas. Two views must be read to determine what an area means.

After a short study of the surfaces we can form a rule that, a plane surface, whether it is positioned in a horizontal, frontal, profile or an inclined or skew position, will always appear in a principal orthographic views as a line or an area. Study (Fig.4.54).

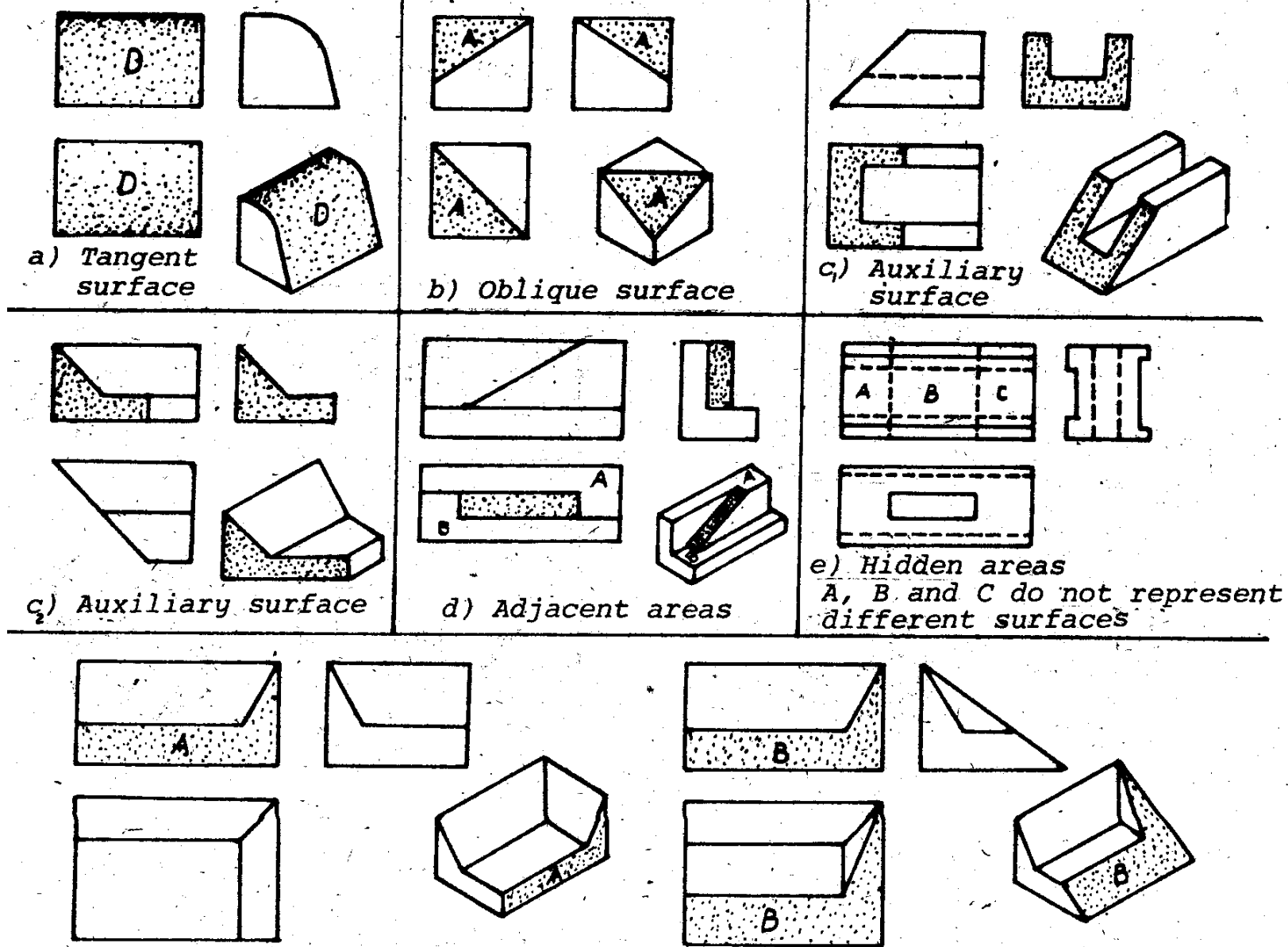
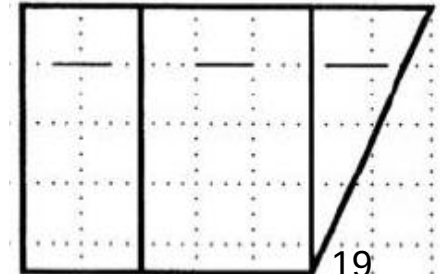
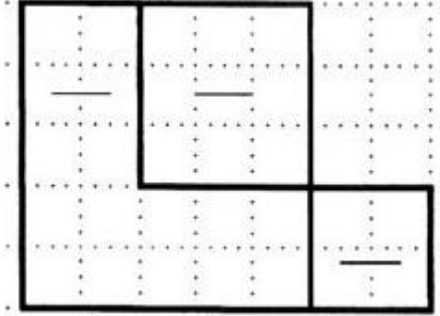
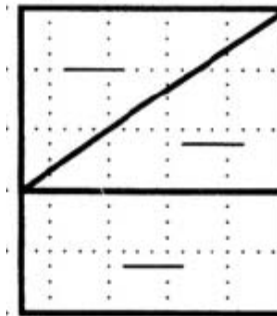
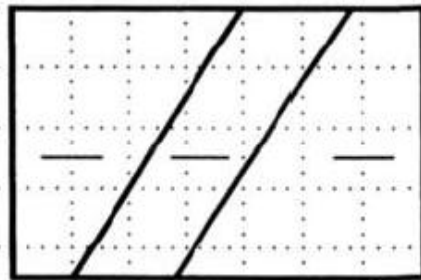
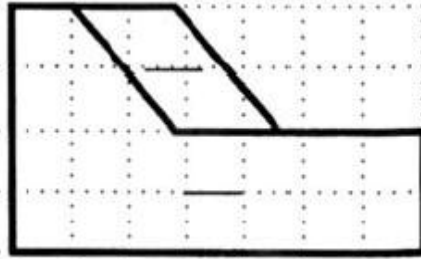
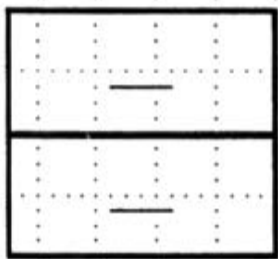
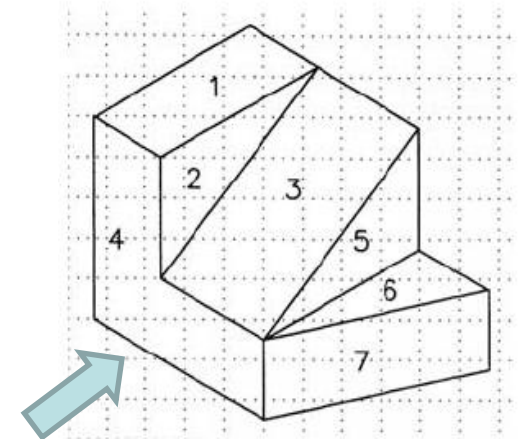
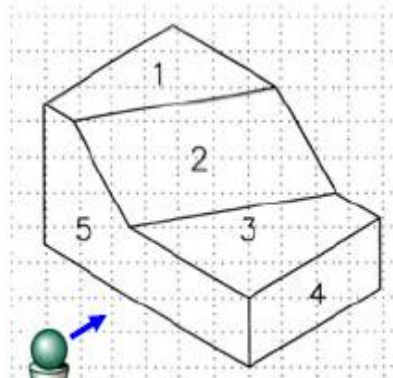


Fig.4.54. The meanings of areas in projection. Compare them.

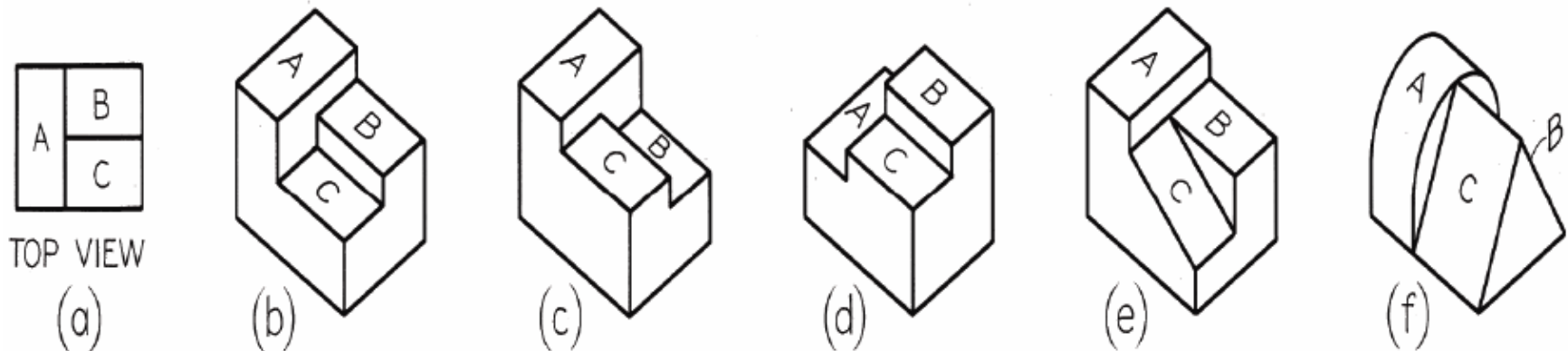
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The meaning of areas



The meaning of areas

- In the figure lines divide the view into three areas. Each area must represent a surface at a different level
- Surface A may be high, and surfaces B & C lower (b), or B may be lower than C (c)
- Or B may be highest, with C and A each lower (d), or one or more surfaces may be inclined (e), or one or more surfaces may be cylindrical (f)...and so on
- No two adjacent areas can lie on the same plane
- Since an area (surface) in a view may be interrupted in several different ways, other views must be observed to determine which interpretation is correct



4.36. READING CORNERS AND EDGES

The corners and edges of areas may be numbered or lettered to identify them in making additional views or as an aid in reading some complicated shape. If there are no coincident conditions, the corners and the edges are easily named by projection (Fig.4.55). An experienced reader can get the shape without marking the points, but a beginner can in many cases gain much valuable experience by making corners and edges, especially if the object, he is studying, has an unusual combination of surfaces.

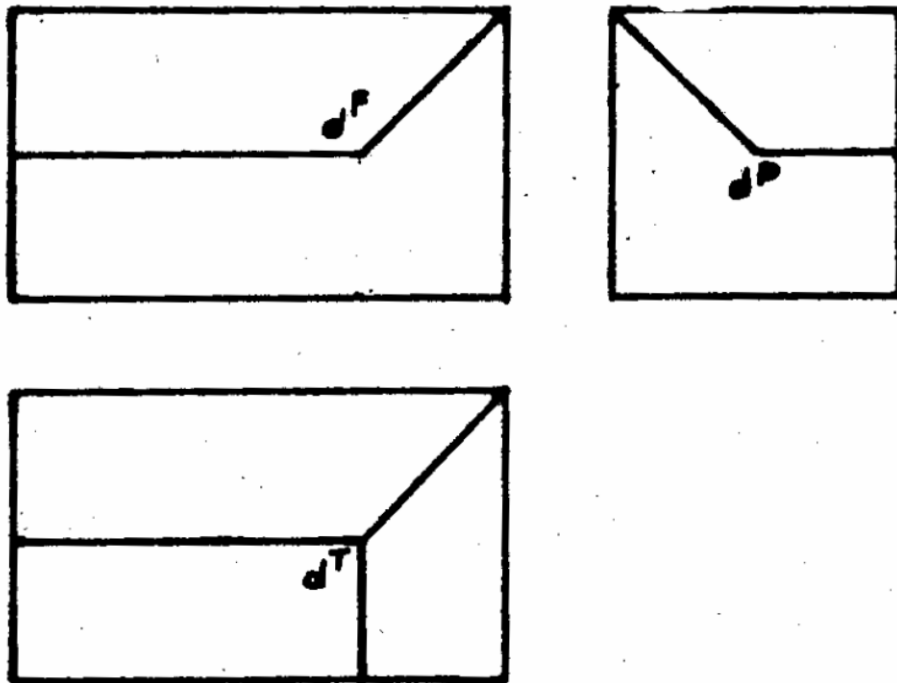
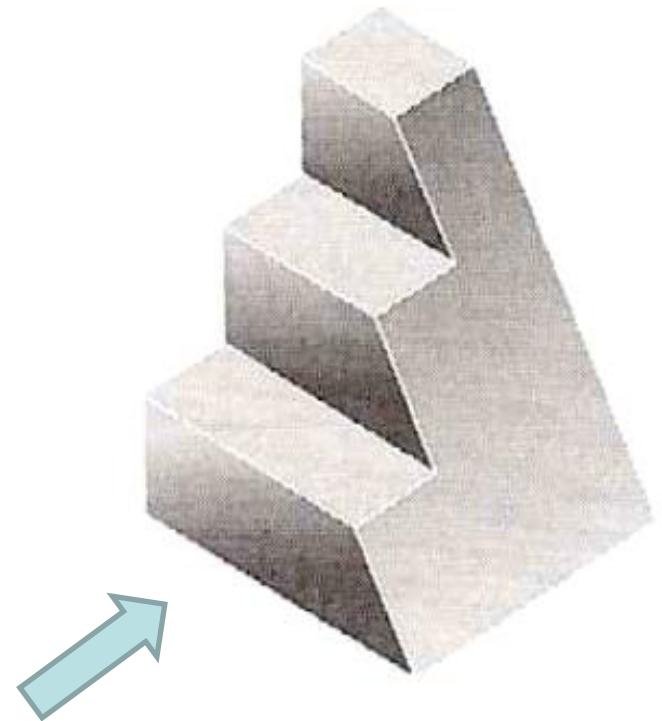
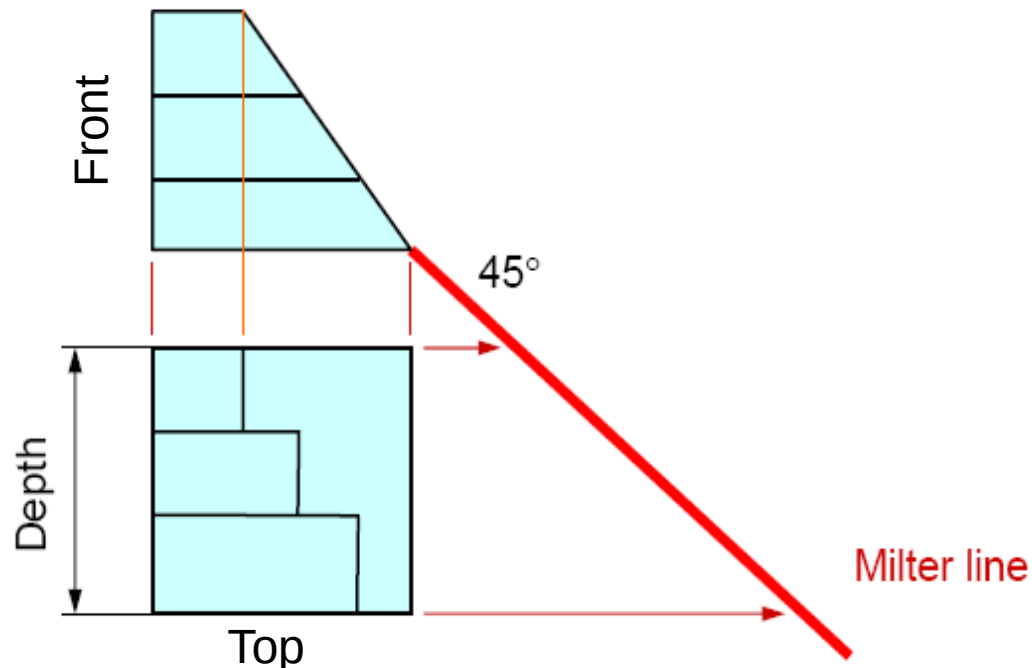


Fig. 4. 55 Identification of corners. This helps to determine meeting lines and areas in the views.

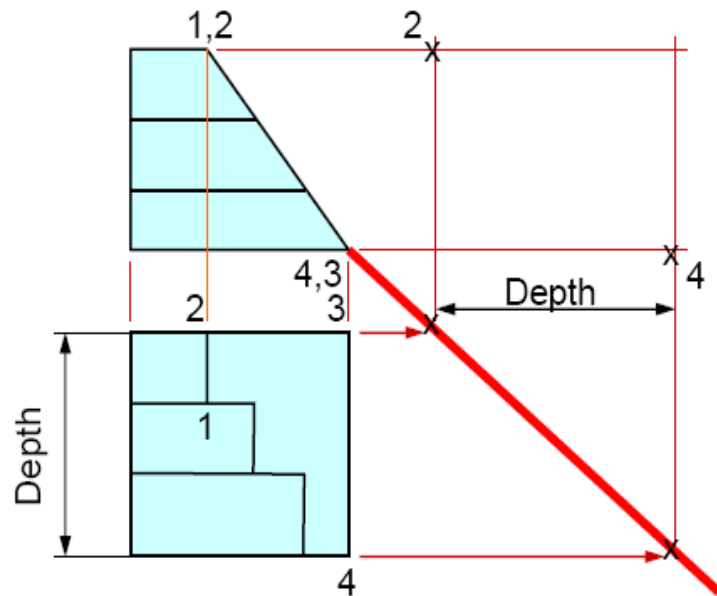
Reading corners and edges

- Draw a miter line at 45° at a convenient distance to produce the view.
- Sketch light lines projecting depth locations from points to miter line and then down into the side view as shown.

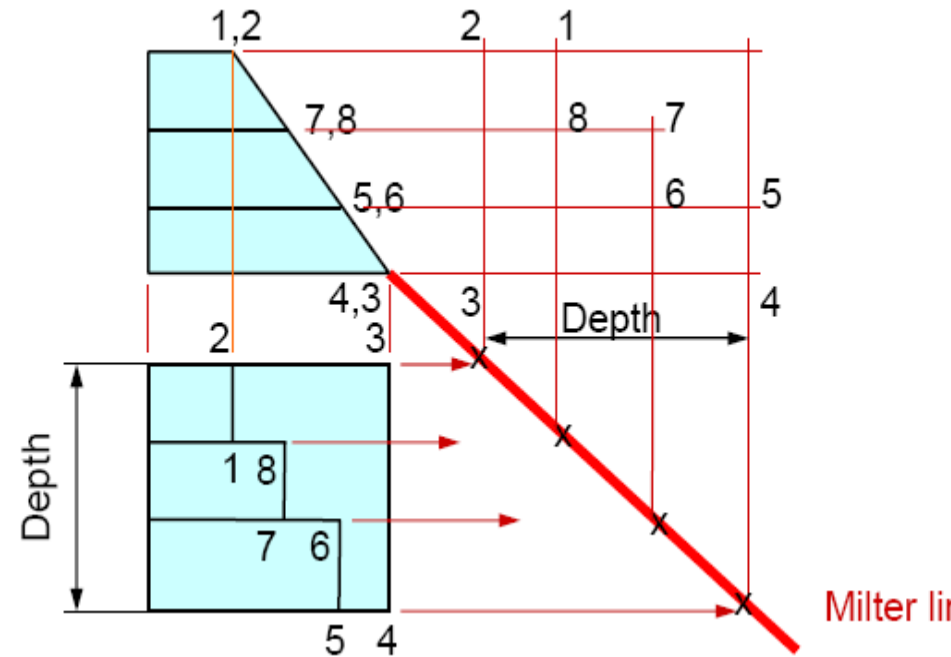


Reading corners and edges

- Project additional points surface by surface.
- Draw the view locating each vertex on the surface on the projection and miter line

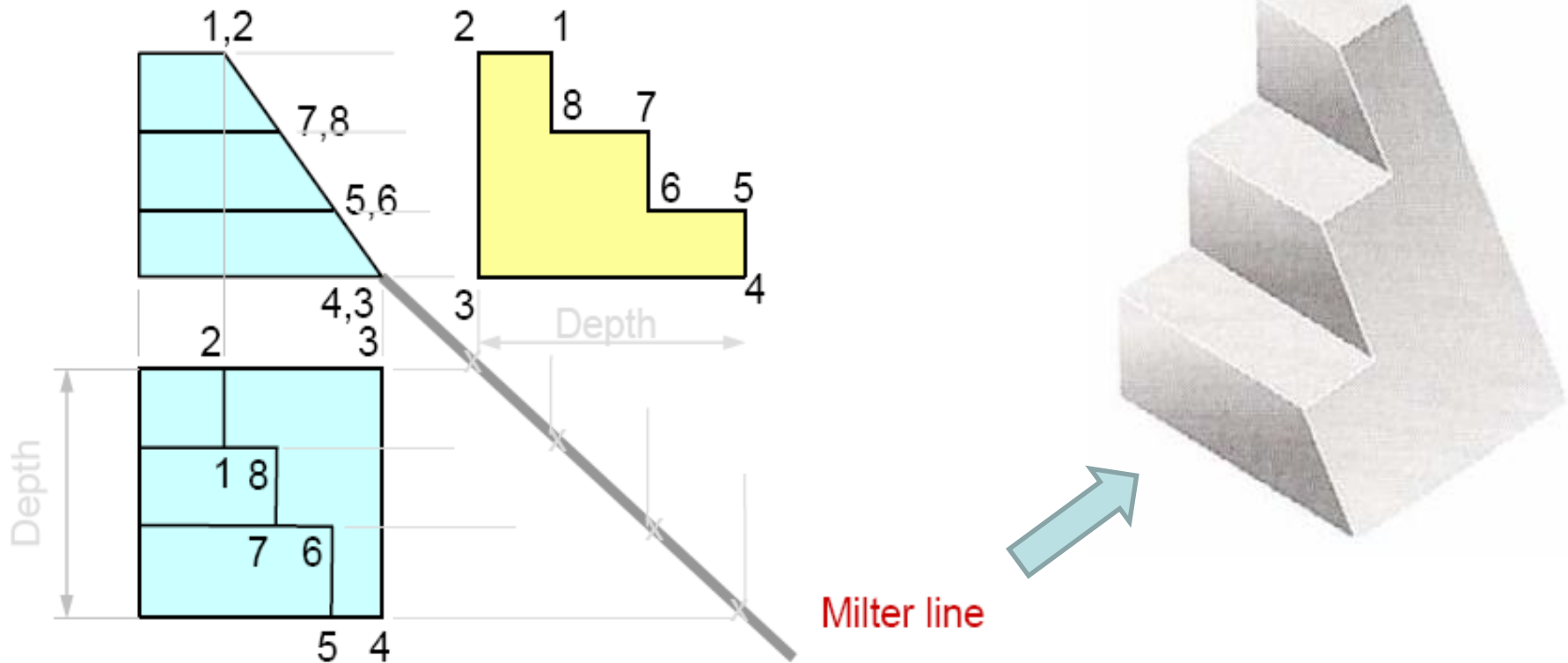


Miter line



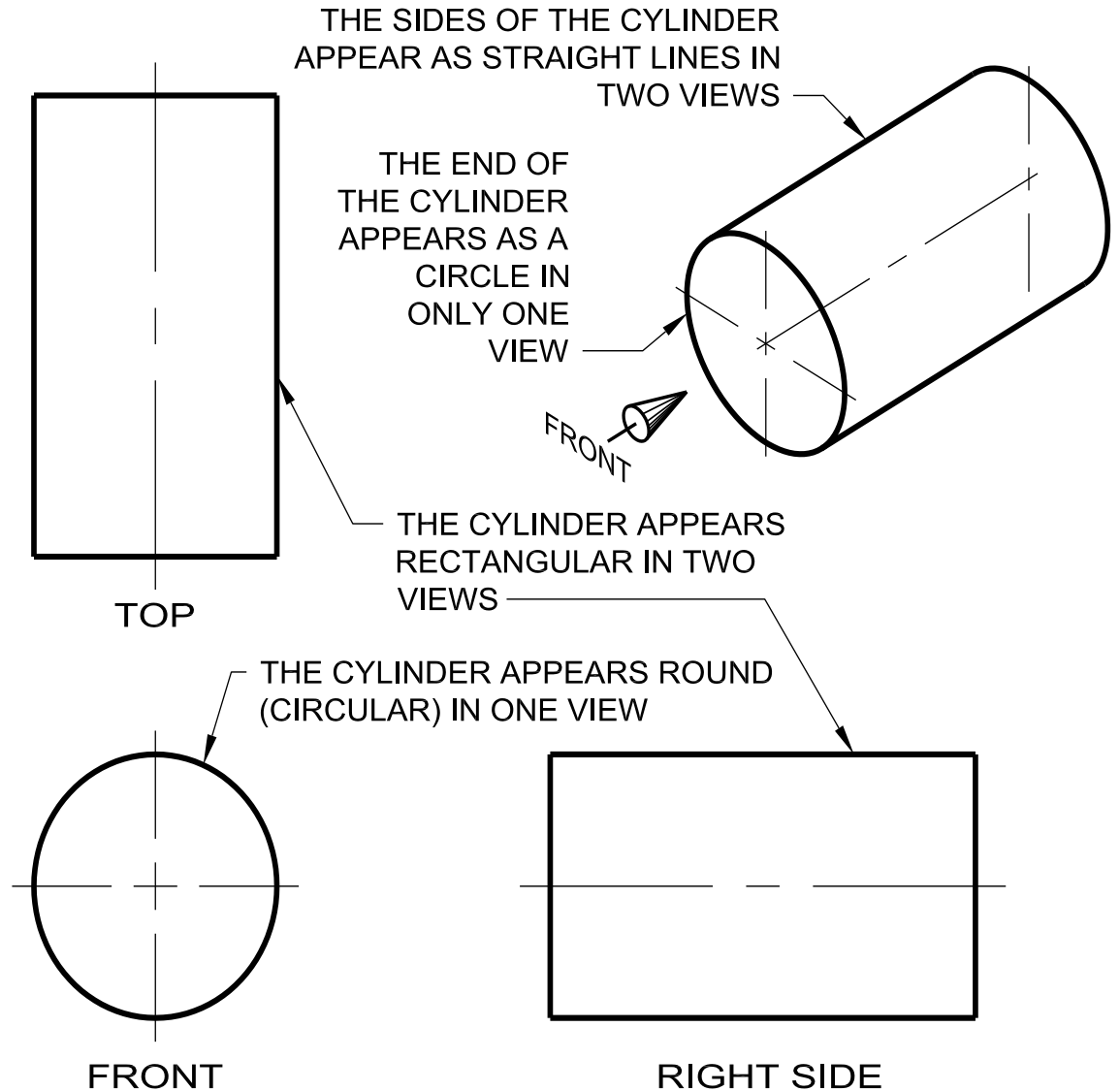
Miter line

Reading corners and edges



Reading corners and edges

A cylinder will appear as a circle in one view and a rectangular shape the other two views.



4.37. LEARNING TO READ BY SKETCHING AND MODELING

- A drawing is interpreted by mentally understanding the shape of the object represented. You can prove that you have read and understood a drawing by making the object in wood or metal, by modeling it in clay or by making a pictorial sketch (Fig.4.56.)

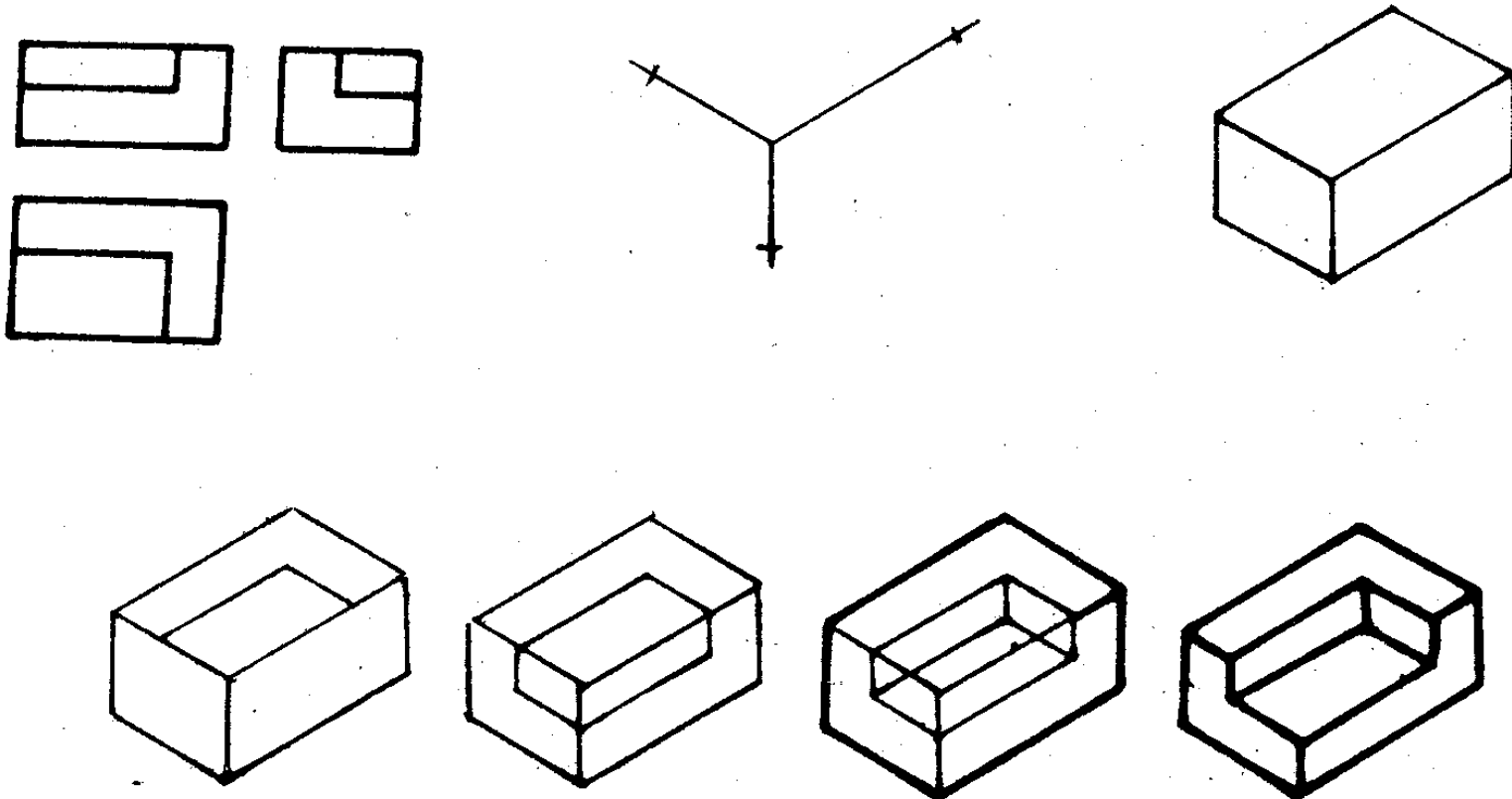


Fig.4.56. (A) Stages in making a pictorial sketch.

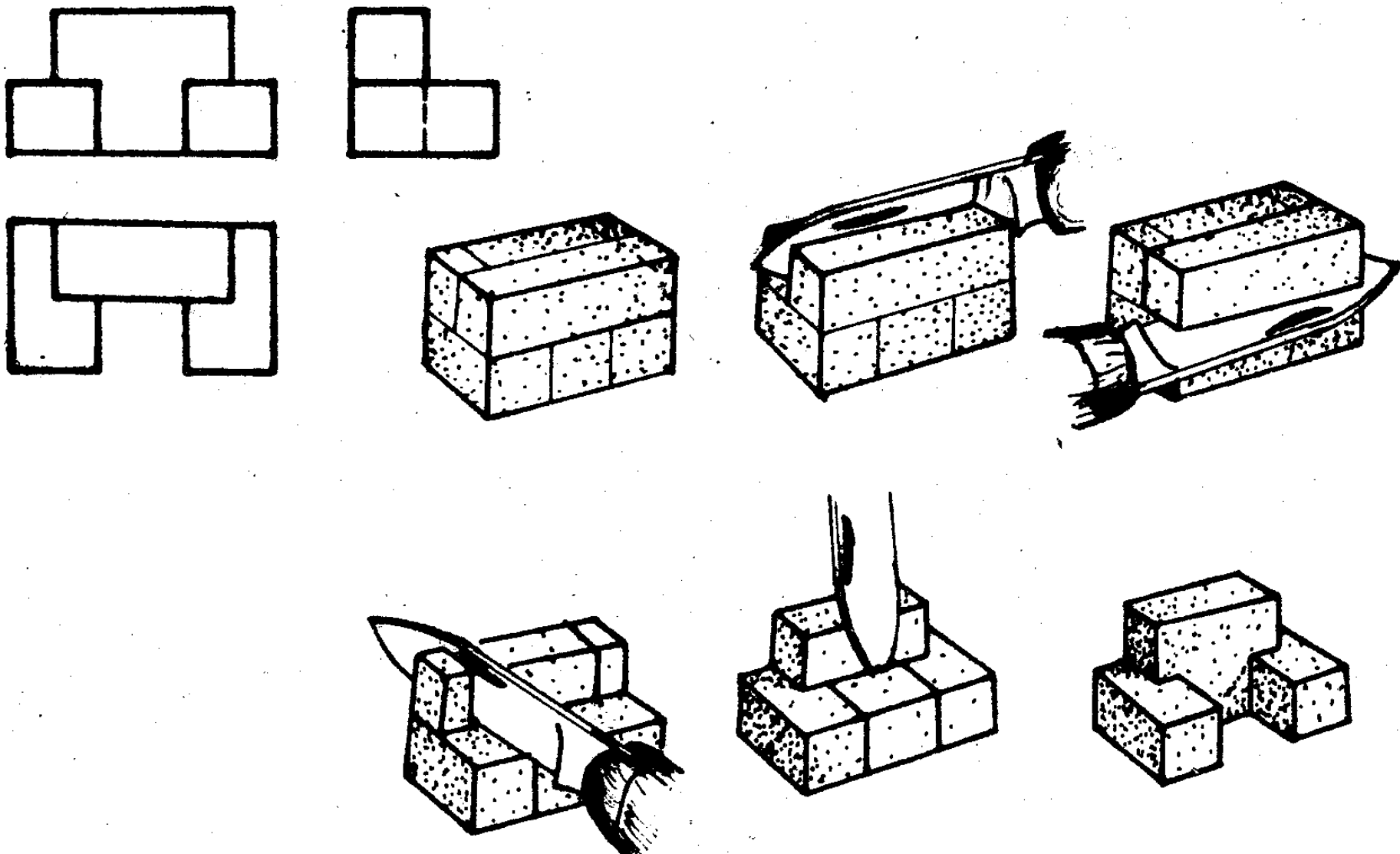


Fig.4.56. (B) Stages in modeling