❖ ENGINEERING DRAWING

A. CONVENTIONAL REPRESENTATION

- this section specifies, by means of examples, the rules for representation of threaded parts, springs, gears , rivets, bolts, bearings and common-features on technical drawings.

- CONVENTIONAL REPRESENTATION OF THREADED

PARTS –

the method of simplified representation of threaded parts is independent of type of screw thread applied. the type of screw thread and its dlmergons are to be indicated by means of standard designations.

***VISIBLE SCREW THREADS* -** for visible screw threads, the crests of threads should be defined by a continuous thick line (type a), and the roots of threads by a continuous thin line (type b) (see figure as shown below). it is recommended that the space between .lines representing the major and minor diameters of the thread be as close as possible to the correct depth of thread, but in all cases this spacing shall not be less than twice the thickness of the thick line or 0.7 mm whichever is larger.

Conventional representations of threads

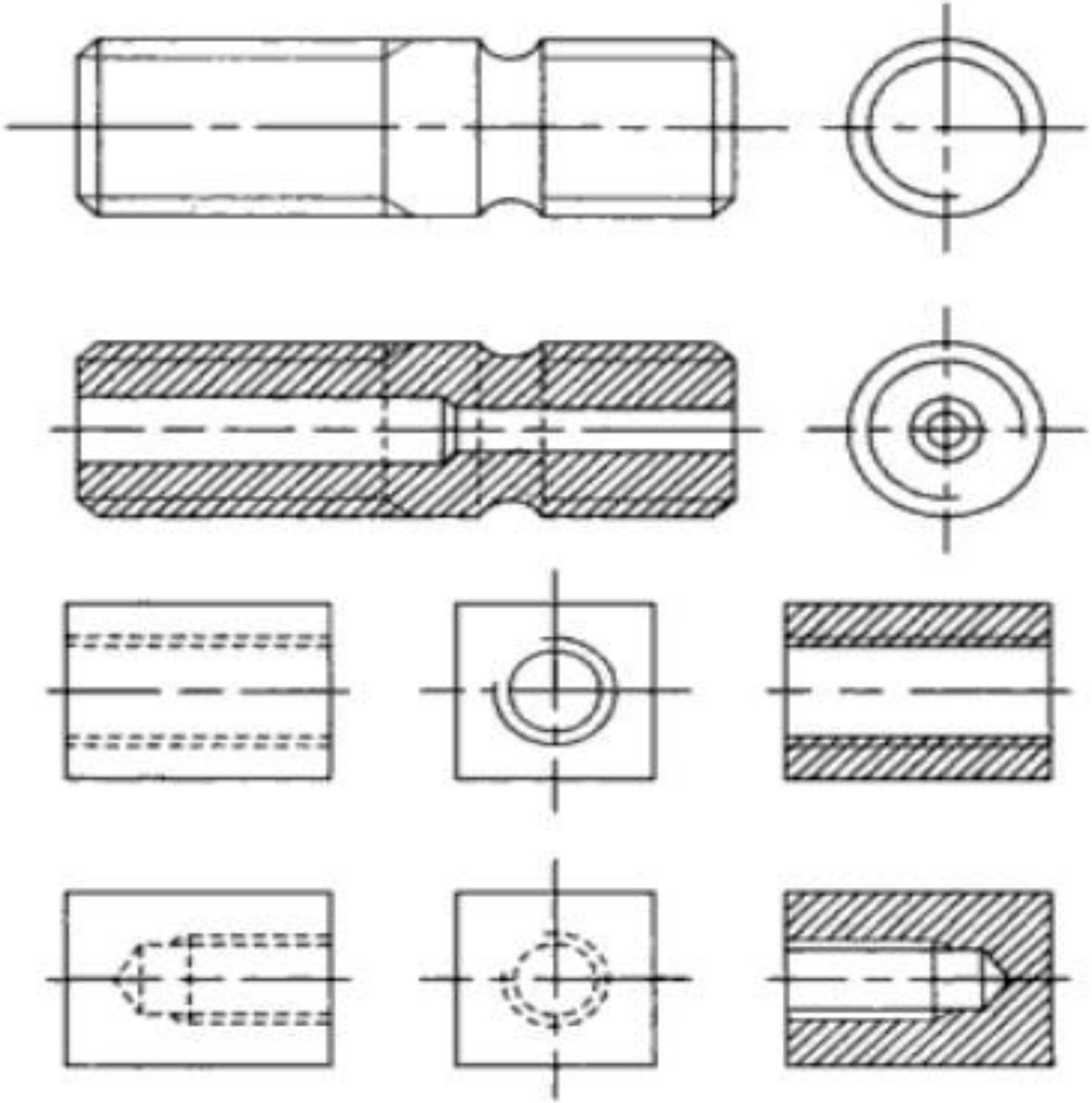


Fig. Conventional representation of threads

- ***HIDDEN SCREW THREADS***

- for hidden

screw threads, the crests and the roots should be defined by dashed lines (type e or i;, but one type only on the same drawing).

- ***SECTIONS, OF THREADED PARTS* -** for

threaded parts shown in section, hatching should be extended to the line defining the crest of the thread.

- ***END VIEW OF SCREW THREADS* -** on an

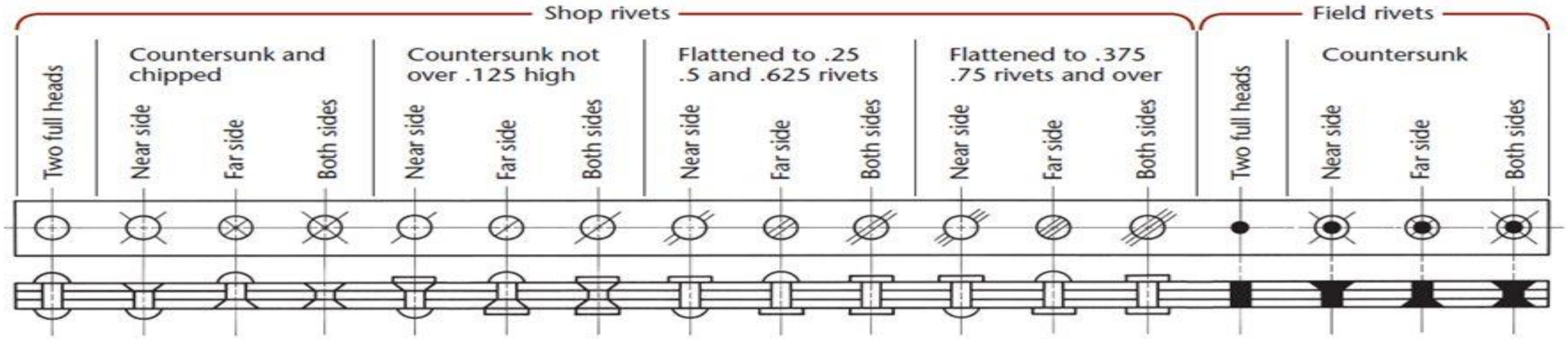
end view of a visible screw thread, the thread roots should be represented by a portion of a circle, drawn with a continuous thin line (type b), of length approximately three-quarters of the circumference on an end view of a hidden screw thread, the thread roots should be represented by a portion of a circle, drawn with a dashed line (type e or f, but same as that used for the crests and one type only on the same drawing);of thellengtbapproximately threequarters ofme circumference.

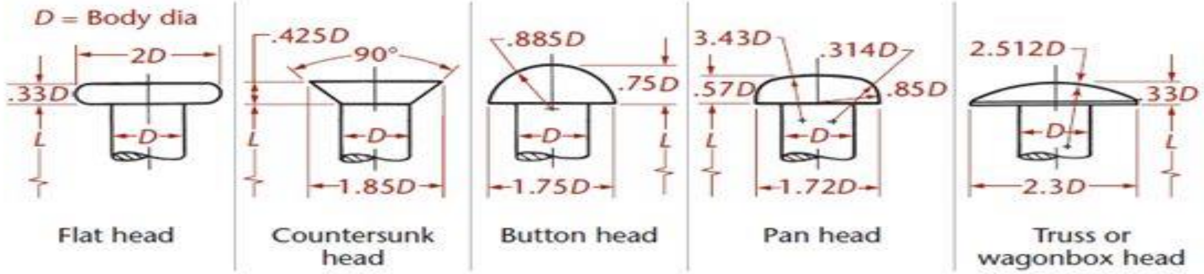
- ***LIMITS OF USEFUL LENGTH OF SCREW THREADS -*** the limit of useful length of a screw thread should be shown by a continuous thick line (type a) or a dashed line (type e or f, but one type on the same drawing) according to whether this limit is visible or hidden. this line should terminate at the line defining the major diameter of the thread.

- COVENTIONAL REPRESENTATION OF RIVET AND BOLT

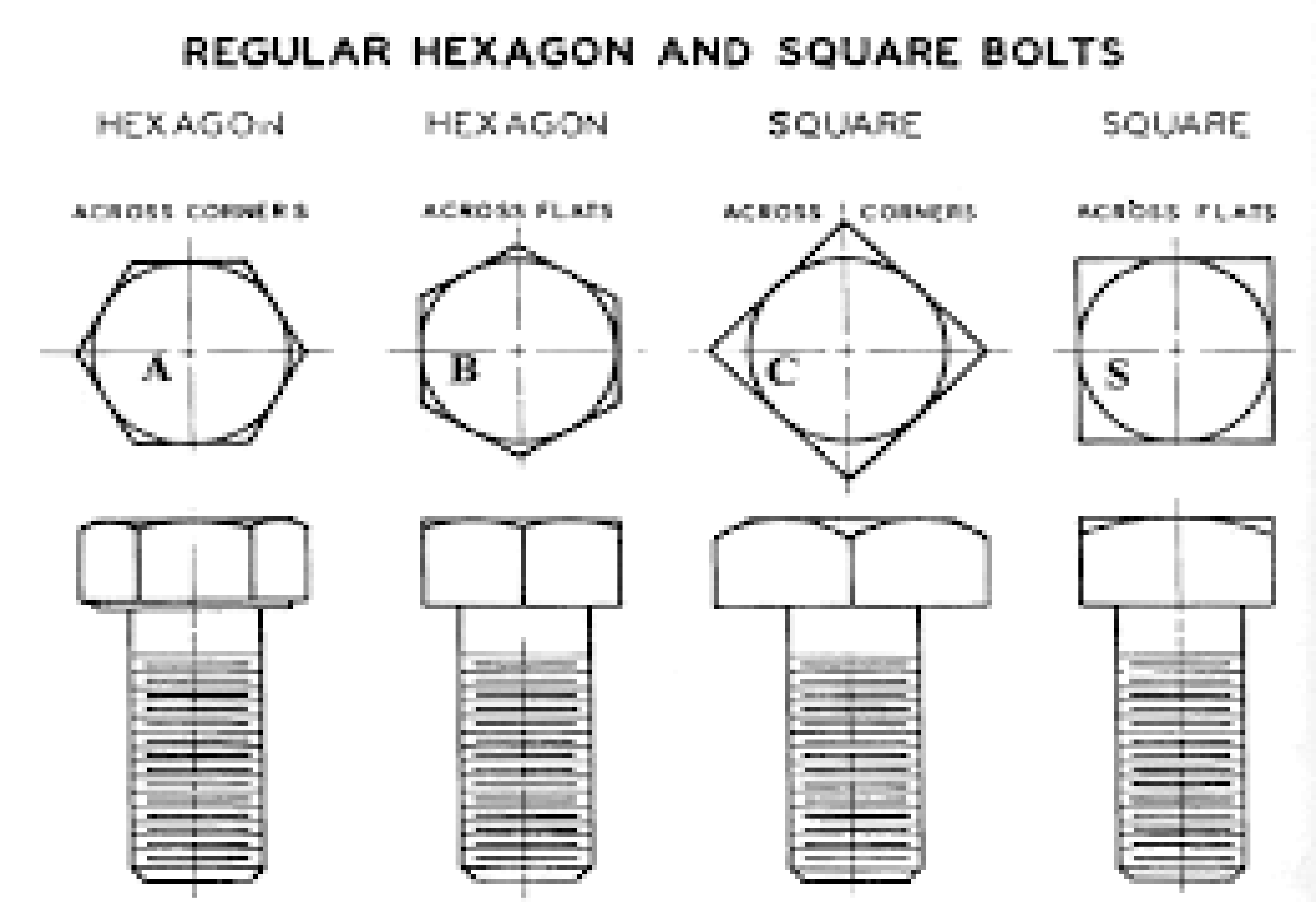
Rivet Symbols

Because many engineering structures are too large to be built in the shop, they are built in the largest units possible and then are transported to the desired location. Trusses are common examples. The rivets driven in the shop are called *shop rivets, and those driven on the job are* called *field rivets*.

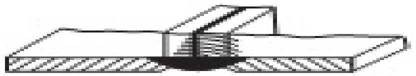
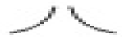
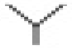
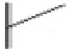
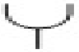
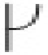
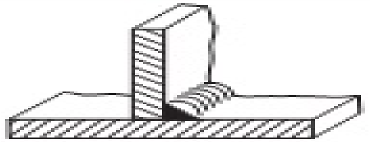
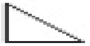
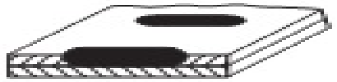
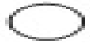
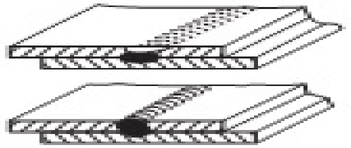




Technical Drawing with Engineering Graphics, 14/e
Giesecke, Hill, Spencer, Dygdon, Novak, Lockhart, Goodman

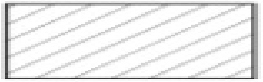
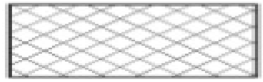
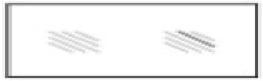
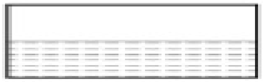
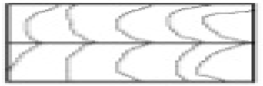
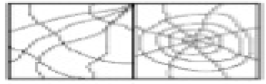
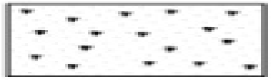

REGULAR HEXAGON AND SQUARE BOLTS
HEXAGON
HEXAGON
SQUARE
SQUARE
ACROSS CORNERS
ACROSS FLATS
ACROSS CORNERS
ACROSS FLATS
A
B
C
S

- CONVENTIONAL REPRESENTATION OF WELDING

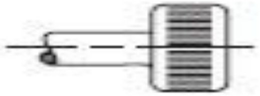
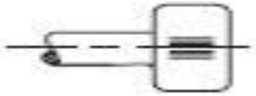
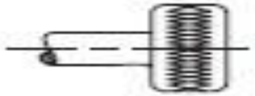
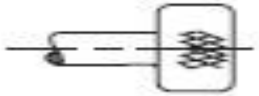
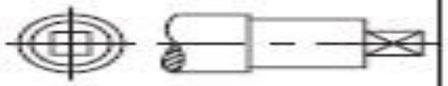
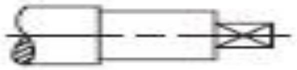
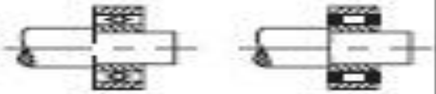
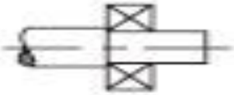
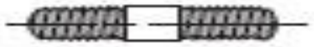
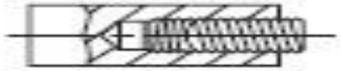
No.	*Designation*	*Illustration*	*Symbol*
1.	Butt weld between plates with raised edges (the raised edges being melted down completely)		
2.	Square butt weld		
3.	Single-V butt weld		
4.	Single-bevel butt weld		
5.	Single-V butt weld with broad root face		
6.	Single-bevel butt weld with broad root face		
7.	Single-U butt weld (parallel or sloping sides)		
8.	Single-U butt weld		
9.	Backing run; back or backing weld		
10.	Fillet weld		
11.	Plug weld; plug or slot weld		
12.	Spot weld		
13.	Seam weld		

- CONVENTIONAL REPRESENTATION OF MATERIALS

7) *Draw the conventional representation of materials*

Sl. No	Type of section lines	Materials
1		Cast iron, steel, copper and its alloys (brass, bronze, etc.), aluminium and its alloys.
2		Lead, zinc, tin, white metal
3		Glass
4		Marble, porcelain, stoneware, slate
5		Rubber, asbestos, leather, paper, linoleum, cork, felt, fibre, wax
6		Liquid, such as water, kerosene, petrol, oil
7		Wood, plywood (along grain)
8		Wood, plywood (across grain)
9		Concrete

- CONVENTIONAL REPRESENTATION OF OTHER TECHNICAL FEATURES

Title	Subject	Convention
Straight knurling		
Diamond knurling		
Square on shaft		
Holes on circular pitch		
Bearings		
External screw threads (Detail)		
Internal screw threads (Detail)		
Screw threads (Assembly)		

B. GOMETRICAL CONSTRUCTIONS

- In this chapter, we shall deal with problems on geometrical construction which are mostly based on plane geometry and which are very essential in the preparation of engineering drawings.

Bisecting a line:

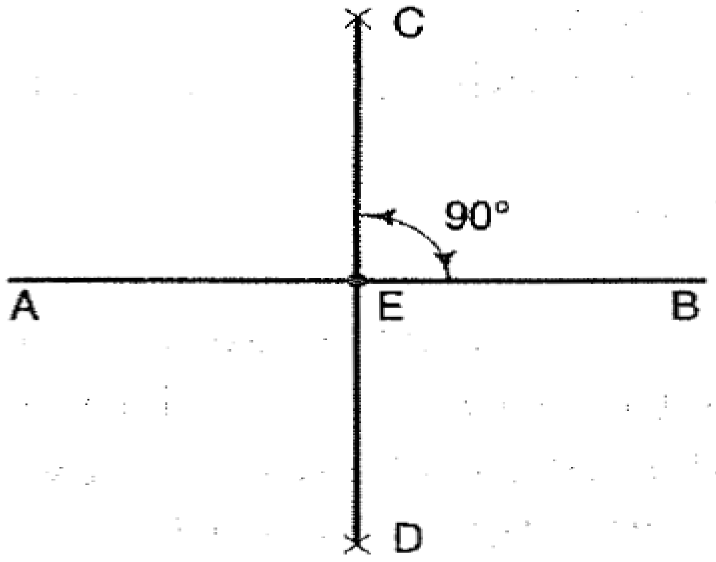


FIG. 5-1

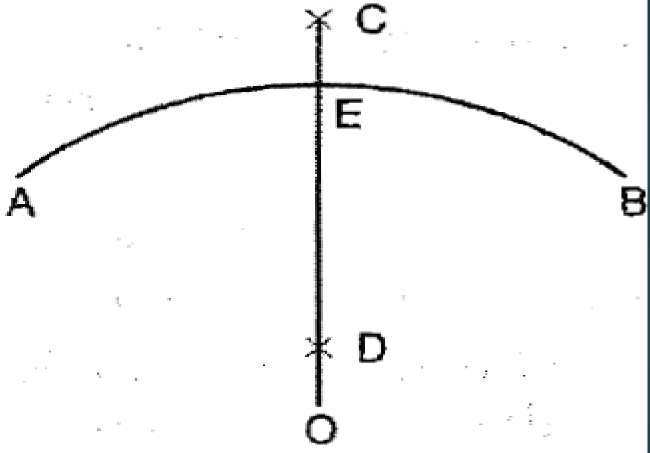


FIG. 5-2

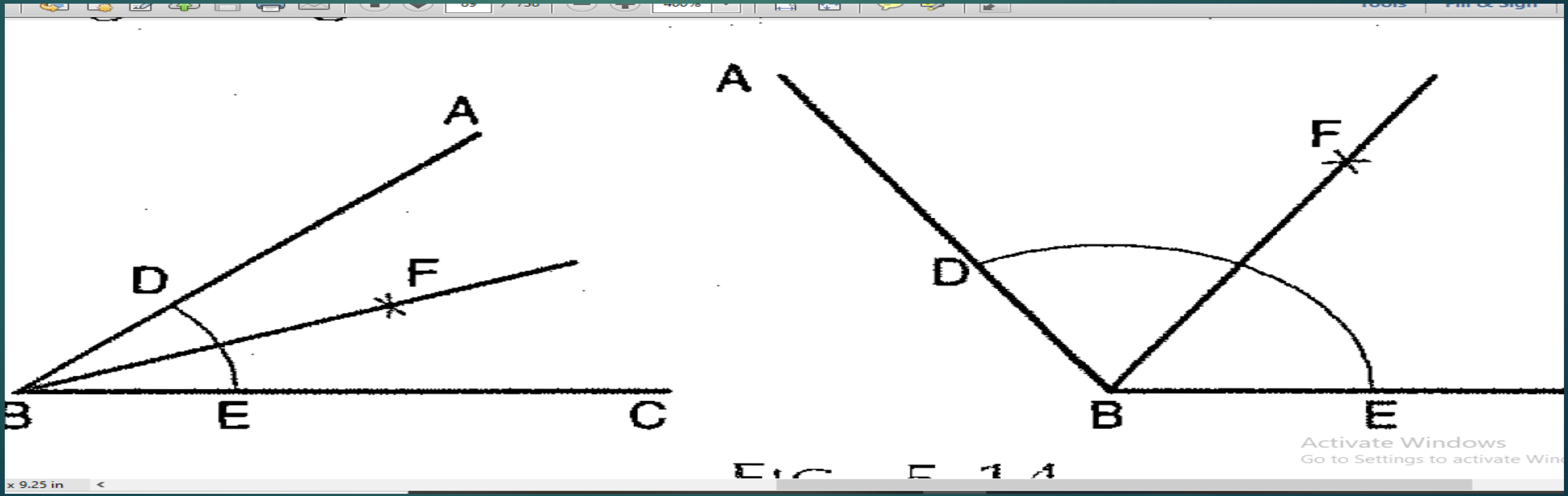
- Let *AB* be the given line. With centre *A* and radius greater than half *AB*, draw arcs on both sides of *AB*.
- With centre *B* and the same radius, draw arcs intersecting the previous arcs

at C and *D*.

- Draw a line joining C and *D* and cutting *AB* at *E*.
- Then *AE* = *EB* = 2 *AB*.
- Further, *CD* bisects *AB* at right angles.

▶Bisect an angle :

- Let *ABC* be the given angle.
- With *B* as centre and any radius, draw an arc cutting *AB* at *D* and *BC* at E
- With centres *D* and *E* and the same or any convenient
- radius, draw arcs intersecting each other at F.
- Draw a line joining *B* and *F*. *BF* bisects the angle *ABC*, ..e. *L ABF* = *L FBC*.



- To construct squares:

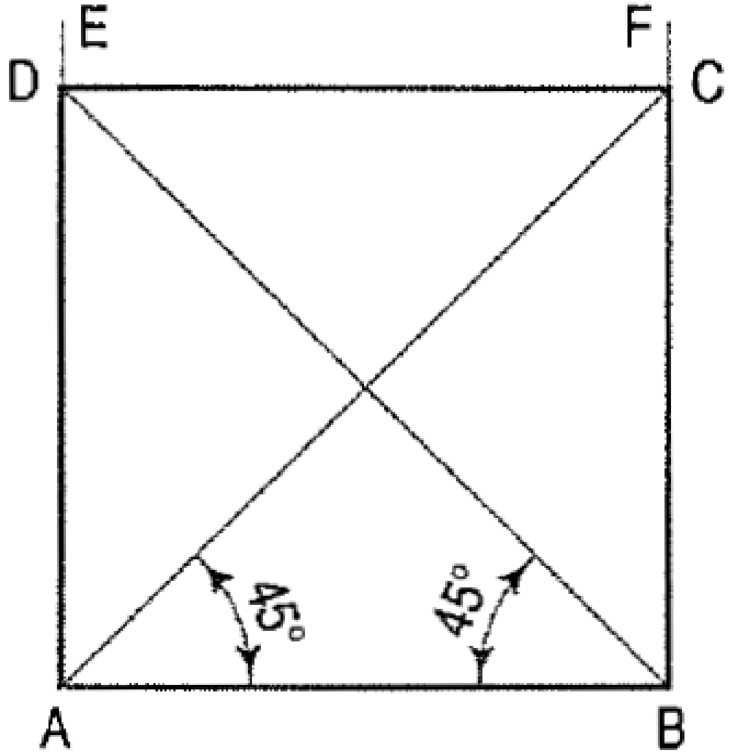


FIG. 5-34

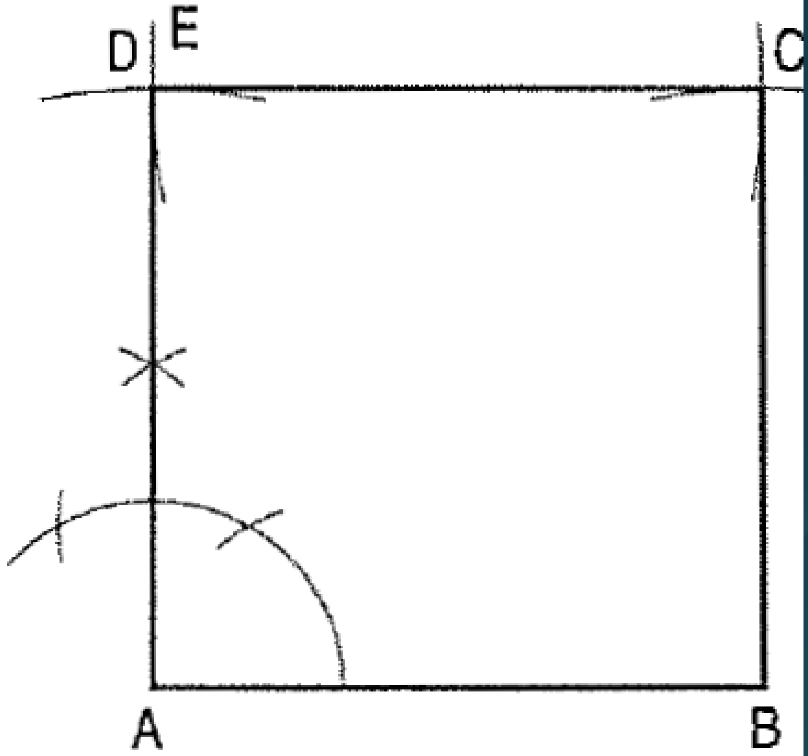


FIG. 5-35

- *With T-square and set-square only* as shown in above figure.
- **With the T-square**, draw a line *AB* equal to the given length.
- At *A* and *B,* draw verticals *AE* and *BF.*
- From point *A* draw a line inclined at 45° to *AB,* cutting *BF* at C.
- From point *B* draw a line inclined at 45° to *AB,* cutting *AE* at *D.*
- Draw a line joining C with *D.*
- Then *ABCD* is the required square.
- ***With the aid of a compass*** :
- (i) Draw a line *AB* equal to the given length.
- (ii) At *A,* draw a line *AE* perpendicular to *AB.*
- (iii) With centre *A* and radius *AB,* draw an arc cutting *AE* at *D.*
- (iv) With centres *B* and *D* and the same radius, draw arcs intersecting at C.
- (v) Draw lines joining C with *B* and *D.*
- Then *ABCD* is the required square.

C. SCALES

- Drawings of small objects can be prepared of the same size as the objects they represent. A 150 mm long pencil may be shown by a drawing of 150 mm length.
- Drawings drawn of the same size as the objects, are called full-size drawings. The ordinary full-size scales are used for such drawings.
- *A scale is defined as the ratio of the linear dimensions of element of the object as represented in a drawing to the actual dimensions of the same element of the object itself.*

- **Representative fraction**: The ratio of the length of the object represented on drawing to the actual length of the object represented is called the Representative Fraction (i.e. R.F.).
- **R.F.** = Length of the drawing/Actual length of object.

- **TYPES OF SCALES :**
- The scales used in practice are classified as under:

(1) Plain scales (4) Vernier scales

(2) Diagonal scales (5) Scale of chords.

(3) Comparative scales.

- **(1) Plain scale**:
- A plain scale consists of a line divided into suitable number of equal parts or units, the first of which is sub-divided into smaller parts. Plain scales represent either two units or a unit and its sub-division.

- In every scale,
- (i) The zero should be placed at the end of the first main division, i.e. between the unit and its sub-divisions.
- (ii) From the zero mark, the units should be numbered to the right and its sub-divisions to the left.
- (iii) The names of the units and the sub-divisions should be stated clearly below or at the respective ends.
- (iv) The name of the scale (e.g. scale, 1 : 10) or its R.F. should be mentioned below the scale.

- **(2) Diagonal scales**: A diagonal scale is used when very minute distances such as 0.1 mm etc. are to be accurately measured or when measurements are required in three units; for example, dm, cm and mm, or yard, foot and inch.

- **(3) Comparative scales**: Scales having same representative fraction but graduated to read different units are called *comparative scales.* A drawing drawn with a scale reading inch units can be read in metric units by means of a metric comparative scale, constructed with the same representative fraction. Comparative scales may be plain scales or diagonal scales and may be constructed separately or one above the other.

- **(4) Vernier scales**: Vernier scales, like diagonal scales, are used to read to a very small unit with great accuracy. A vernier scale consists of two parts - a primary scale and a vernier. The primary scale is a plain scale fully divided into minor divisions.
- As it would be difficult to sub-divide the minor divisions in the ordinary way, it is done with the help of the vernier. The graduations on the vernier are derived from those on the primary scale.

- **(5) Scale of chords**: The scale of chords is used to set out or measure angles when a protractor is not available. It is based on the lengths of chords of different angles measured on the same arc and is constructed.