Screw threads are of prime importance in machine drawing. It is a functional element used as temporary fasteners such as bolt, stud, nut and screw etc. These are constructed on the principle of helix.

**Helix**: Helix is a curve (cut) generated by a pointed tool on the circumference of a cylinder when it is rotated at a constant speed and the tool moves with a simultaneous of advance parallel to the axis of the cylinder as shown in Fig. 17.1.

**Screw threads**: The helical grooves cut on the circumference of a cylindrical piece are called screw threads. These are used for fastening parts or for transmission of power.
Terms and Nomenclature of Screw Threads (refer Fig. 17.2)

1. **Pitch:** The distance measured parallel to the axis from a point on a screw thread to a corresponding point on the next thread is called pitch or in other words the distance from crest to crest or root to root is called pitch of the thread.

2. **Lead:** The distance moved by a nut or a bolt in axial direction in one complete revolutions called lead.

3. **Crest:** The outer-most part of the thread is called crest.

4. **Root:** The inner most part of the thread is called root.

5. **Flank:** The surface between the crest and the root is known as flank of the thread.

6. **Angle of thread:** The angle between the flanks measured on an axial plane is called angle of thread.

7. **Depth:** It is the distance between crest and root measured at right angle to the axis.

8. **Nominal diameter:** The diameter of the cylindrical piece on which threads are cut is called nominal diameter.

9. **Major diameter:** Diameter at the crest of the thread measured at right angle to the axis is called major diameter and is also known as outside diameter.

10. **Minor diameter:** The diameter at the core or root of the thread is called minor diameter. It is also called as core diameter.

**External threads:** The threads on the outside surface of the bolt, stud and screw etc., are called external threads [Fig. 17.3 (i)].
Internal threads: The threads on the inside surface of the hole or a nut are called internal threads [Fig. 17.3 (ii)].

Types of Threads

(i) British Standard Whitworth (B.S.W.) thread: It is a symmetrical ‘V’—thread in which the angle between flanks is $55^\circ$. These threads are generally used on bolts, nuts and studs etc. (Fig. 17.4).

(ii) British Association (B.A.) thread: It is a symmetrical ‘V’—thread in which angle between flanks is $47\frac{1}{2}^\circ$. These threads are used on screws for precision work (Fig. 17.5).
(iii) **Sellers thread:** This thread is also called as American national thread. It is also a ‘V’— thread in which angle between flanks is 60°. These are used for general purpose as on bolts, nuts, studs and screws etc. (Fig. 17.6).

Theoretical depth, \( D = 0.866 P \),
Actual depth, \( d = \frac{3}{4} D = 0.649 P \).

![Fig. 17.6 Sellers threads](image)

(iv) **Unified threads:** Also called as International organisation threads. India, United Kingdom, U.S.A. and Canada are the members of the International Organisation for Standardization (I.S.O.) and are agreed to have a common form of threads (Fig. 17.7).

![Fig. 17.7 Unified screw threads](image)

(v) **Metric thread:** These are the threads based on metric system and the Bureau of Indian Standard has recommended to adopt the unified threads on metric system (Fig. 17.8).

![Fig. 17.8 Metric threads](image)
(vi) **Square threads**: The sides of the flanks of square threads are normal to the axis and hence parallel to each other. The pitch of the threads is often taken as twice that of B.S.W. threads of the same diameter. These are used for power transmission (Fig. 17.9).

![Square threads](image1)

Fig. 17.9 Square threads

(vii) **Acme threads**: These are modified form of square threads and are much stronger than square threads. The threads angle is 29°. These are used for the process of engagement and disengagement of threads e.g., lead screw of lathe, cocks and bench vives etc. (Fig. 17.10).

![Acme threads](image2)

Fig. 17.10 Acme threads

(viii) **Knuckle threads**: Knuckle threads are the modified form of square threads. These are semicircular at the crest and root. The radius of the semicircle is 0.25 P and working depth is 0.5 P. These threads are used in electric bulb and bottles etc. (Fig. 17.11).

![Knuckle threads](image3)

Fig. 17.11 Knuckle threads
(ix) **Buttress threads**: These threads are combined form of square and V–threads. One side of the thread is perpendicular to the axis of the thread and other is inclined at 45°. These are used for power transmission (Fig. 17.12).

![Buttress threads diagram](image)

Theoretical depth, \( D = P \)
Actual depth, \( d = \frac{3}{4} D = 0.75 P \)

**Fig. 17.12** Buttress threads

**Conventional representation of External and Internal Threads**

It takes considerable time to represent a thread in its true form *i.e.*, helical. So in actual practice these are usually shown by Conventional method.

(1) **External threads**: These threads are shown in outside view by means of two continuous thin lines drawn parallel to the axis of the component indicating the minor dia. (root dia.) of the threads. Figure 17.13 shows the external threads in section and without section. In the end view major diameter is shown by full circle and root diameter by three fourth of a circle.

![External threads diagram](image)

**Fig. 17.13** External threads

(2) **Internal threads**: These threads are shown in outside view by means of medium dashed lines which shows major and minor diameters. Figure 17.14 shows the internal threads in section and without section. In the end view root diameter is shown by full circle and major diameter by 3/4th circle.

![Internal threads diagram](image)

**Fig. 17.14** Internal threads
Right-Hand and Left-Hand Threads

A thread is called a right-hand thread if a nut when turned in clockwise direction screws on a bolt. Fig. 17.15 (a). Similarly if the nut screws off the bolt when turned in the clockwise direction, then thread is called left-hand thread [Fig. 17.15 (b)].

![Diagram of right-hand and left-hand threads](image)

**Q. What do you mean by following?**

![Diagram of M50 2f R.H. and M50 2C L.H.](image)

**Ans.**

M 50 — Major diameter is 50 mm
2 — Pitch is 2 mm
f — Fine threads
R.H. — Right-hand threads

M 50 × 2C × L.H.
Here ‘C’ stands for coarse threads and L.H. for left-hand threads.

Here ‘m’ stands for medium threads.