

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC with A++ Grade, ISO 9001:2015 Certified
Kacharam, Shamshabad, Hyderabad - 501218, Telangana, India

www.vardhaman.org

MACHINE DRAWING

(A8311)

Regulations: R22

Department of
MECHANICAL ENGINEERING

August 2024

Syllabus

**Course Structure****A8311 - Computer Aided Machine Drawing**

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	30	1	40	60	100

1. Course Description**Course Overview**

Machine drawing is used to communicate the necessary technical information required for manufacture and assembly of machine components. These drawings follow rules laid down in national and International Organizations for Standards (ISO). Hence the knowledge of the different standards is very essential. Students have to be familiar with industrial drafting practices and thorough understanding of production drawings to make them fit in industries. The following topics have been covered to fulfil the above objectives. Classification of Machine Drawings, Principles of Drawings, Sectioning, Dimensioning, Limits, Fits and Tolerance, Symbols and Conventional Representation, Screw Fasteners, Key Joints, Coupling and its Types, Riveted Joints, Structural Applications, Assembly Drawings, Introduction of Computer Aided Drafting, Introduction of Solid 3D Modeling

Course Pre/co-requisites

A8303 - Engineering Drawing

2. Course Outcomes (COs)

After the completion of the course, the student will be able to:

- A8311.1. Identify product symbols, weld symbols, pipe joints by conventional representation.
- A8311.2. Illustrate various machine components through drawings as per ISO standards.
- A8311.3. Draw machine components by applying the principles of engineering drawing.
- A8311.4. Prepare the part or assembly drawings as per the conventions.
- A8311.5. Analyze part models and assembly drawings for developing 3D model.

3. Course Syllabus**Contents****Machine drawing conventions:**

1. Need for drawing conventions – Introduction to IS conventions
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears.



3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations & their liberal usage.
5. Types of Drawings – working drawings for machine parts.

Wing of machine components:

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, Cotter and knuckle joints.
3. Riveted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawing:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Engine parts – stuffing box, cross head, eccentric, connecting rod, piston assembly.
2. Other machine parts - Screws jack, Machine Vice, Plummer block, Lathe-Tailstock, Tool post and revolving centre.
3. Valves: Steam stop valve, spring loaded safety valve, Feed check valve and Air cock.

NOTE:

1. First angle projection to be adopted.
2. All the drawing components/Assembly to be drawn using any Computer aided drafting package

4. Laboratory Equipment/Software/Tools Required

1. Software Used: Autodesk FUSION 360

5. Books and Materials

Text Books:

1. N. Sidheshwar, P.Kannaiah, "Machine Drawing", 3rd Edition, Tata Mc Graw hill education (P) Ltd, New Delhi, India, 2009.
2. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, "Machine Drawing", 3rd Edition, New Age Publishers, New Delhi, India, 2006.

Reference Books:

1. Dhawan, "Machine Drawing-A Text book of Machine Drawing", 4th Edition, S. Chand Publications, New Delhi, India, 2008.
2. N. Sidheshwar, P.Kannaiah, V.V.S. Sastry, "Machine Drawing", 21st Edition, Tata Mc Graw hill education (P) Ltd, New Delhi, India, 1999.

Experiments

Experiment 1

Machine Elements

1. Description

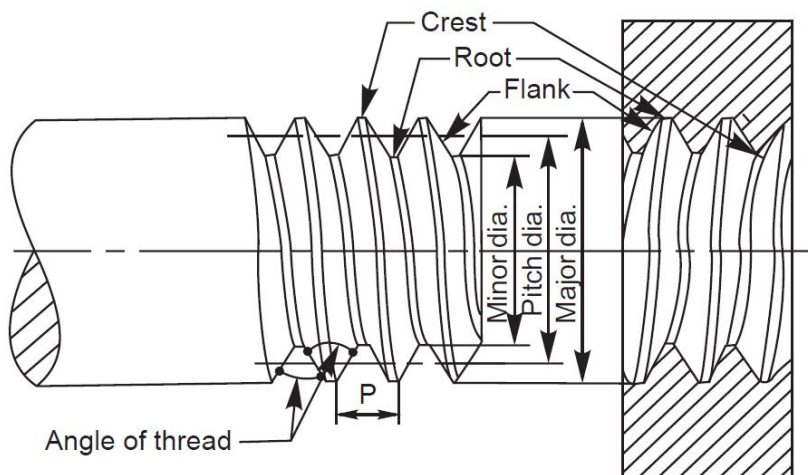
Overview

A machine element used for holding or joining two or more parts of a machine or structure is known as a fastener. The process of joining the parts is called fastening. The fasteners are of two types : permanent and removable (temporary). Riveting and welding processes are used for fastening permanently. Screwed fasteners such as bolts, studs and nuts in combination, machine screws, set screws, etc., and keys, cotters, couplings, etc., are used for fastening components that require frequent assembly and disassembly.

Screwed fasteners occupy the most prominent place among the removable fasteners. In general, screwed fasteners are used : (i) to hold parts together, (ii) to adjust parts with reference to each other and (iii) to transmit power.

2. SCREW THREAD NOMENCLATURE

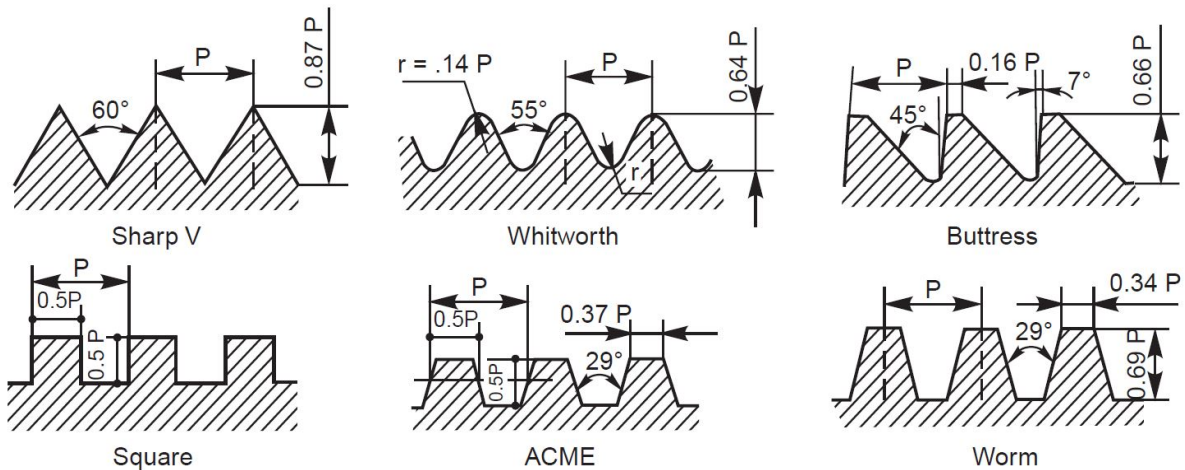
A screw thread is obtained by cutting a continuous helical groove on a cylindrical surface (external thread). The threaded portion engages with a corresponding threaded hole (internal thread); forming a screwed fastener. Following are the terms that are associated with screw threads shown in figure.



Screw thread nomenclature

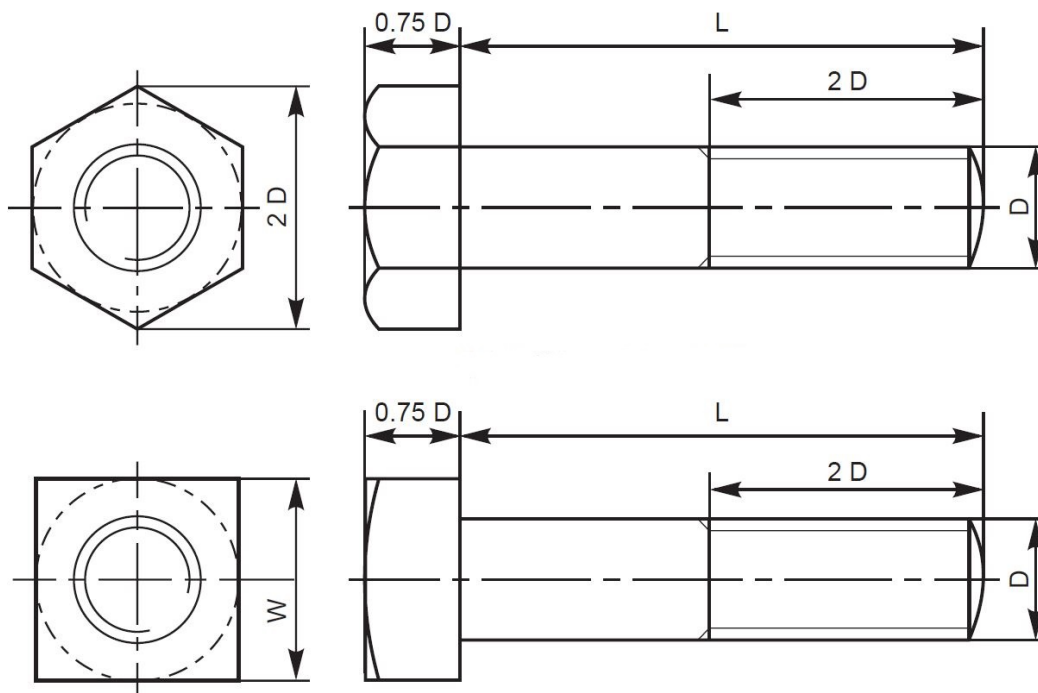
3. Forms of Threads

Bureau of Indian Standards (BIS) adapts ISO (International Organisation for Standards) metric threads which are adapted by a number of countries apart from India.



Types of thread profiles

4. Hexagonal and Square Headed Bolts

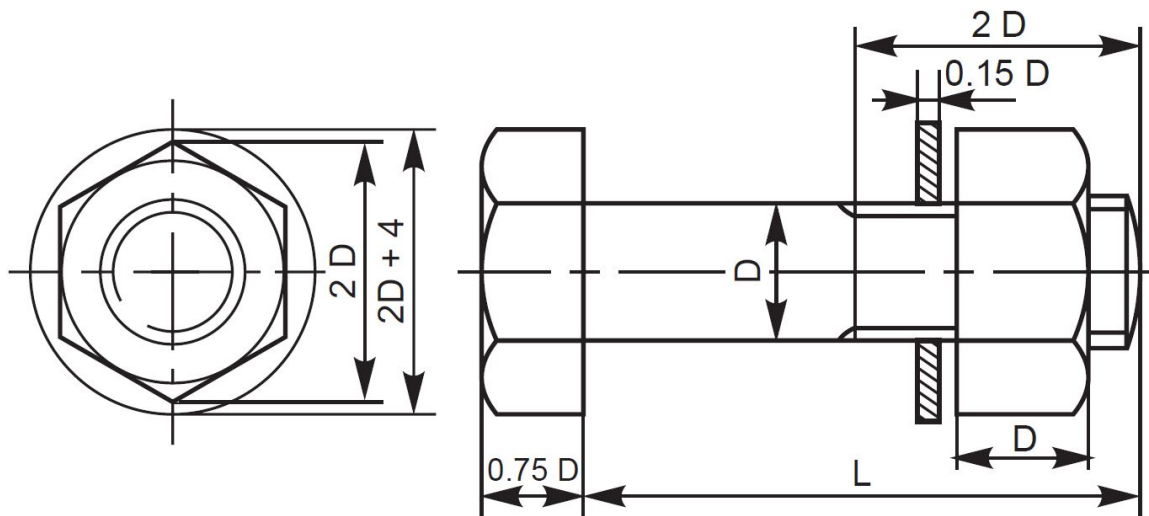
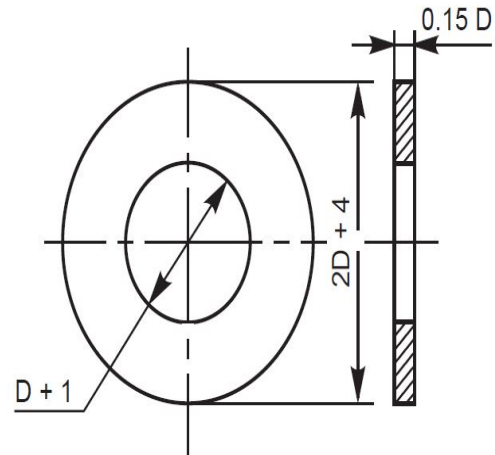


Hexagonal Headed Bolts and Square Headed Bolts

5. Washers

A washer is a cylindrical piece of metal with a hole to receive the bolt. It is used to give a perfect seating for the nut and to distribute the tightening force uniformly to the parts under the joint. It also prevents the nut from damaging the metal surface under the joint.

Figure shows a washer, with the proportions marked.



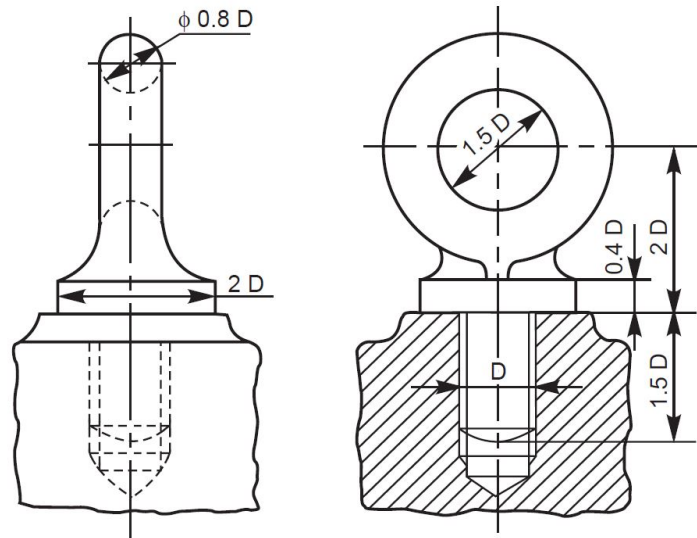
A Hexagonal headed bolt with a nut and a washer in position

6. Eye Bolt

In order to facilitate lifting of heavy machinery, like electric generators, motors, turbines, etc., eye bolts are screwed on to their top surfaces. For fitting an eye bolt, a tapped hole is provided, above the centre of gravity of the machine.

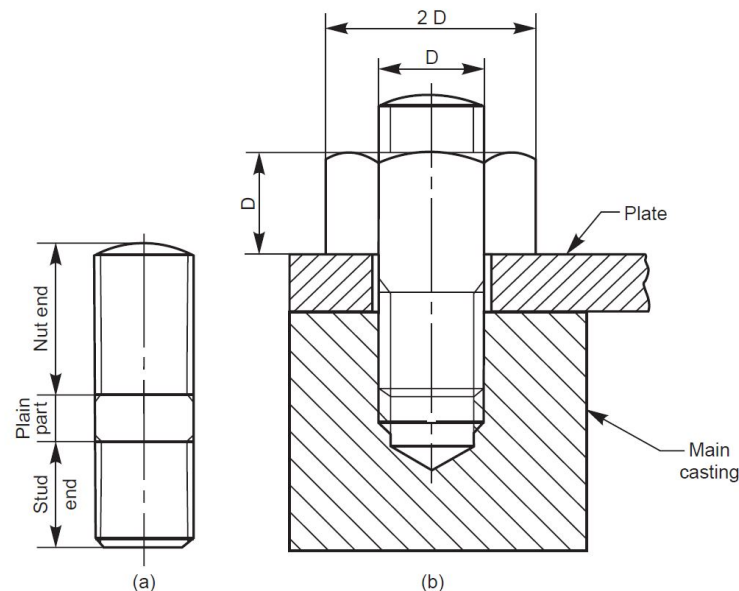
7. Stud Bolt or Stud

It consists of cylindrical shank with threads cut on both the ends (Fig.a). It is used where there is no place for accommodating the bolt head or when one of the parts to be joined is too thick to use an ordinary bolt.



Eye Bolt

The stud is first screwed into one of the two parts to be joined, usually the thicker one. A stud driver, in the form of a thick hexagonal nut with a blind threaded hole is used for the purpose. After placing the second part over the stud, a nut is screwed-on over the nut end. It is usual to provide in the second part, a hole which is slightly larger than the stud nominal diameter. Figure b shows a stud joint.

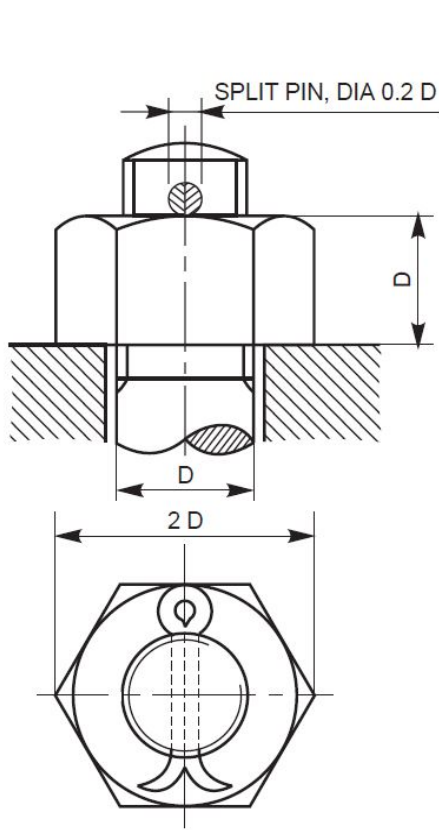


Eye Bolt

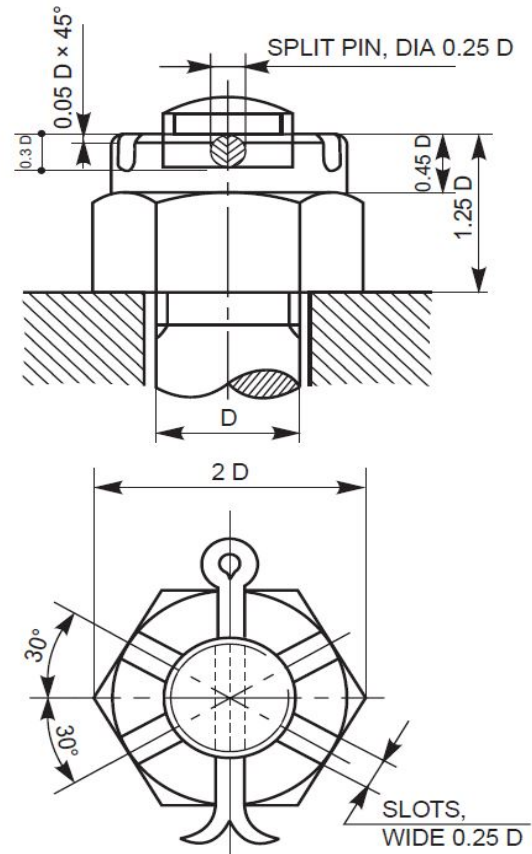
8. Locking Arrangement for NUTS

The bolted joints, though removable in nature, are required to stay firm without becoming loose, of their own accord. However, the joints used in the moving parts of a machinery,

may be subjected to vibrations. This may slacken the joint, leading to serious breakdown. To eliminate the slackening tendency, different arrangements, as discussed further, are used to lock the nuts.



Locking by split pin



Castle nut



9. VIVA QUESTIONS

1. What is a fastener and what is meant by fastening ?
2. What are the various applications of screwed fasteners ?
3. Define the following terms with respect to screw threads : (a) pitch (b) pitch diameter, (c) major diameter, (d) minor diameter, (e) lead, (f) crest, (g) root and (h) thread angle.
4. Distinguish between the following : (a) metric and BSW threads, (b) square and ACME threads, (c) left hand and right hand threads and (d) pitch and lead of a thread.
5. What is a multi-start thread and how it differs from a single start thread ?
6. Where are multi-start threads used and why ?
7. What is the pitch and lead in the case of a double start thread ?
8. What type of thread is used for the screw jack and lathe lead screw and why ?
9. Why hexagonal shape is preferred to square one for nuts ?
10. Why are washers used in bolted joints ?
11. What is a T-bolt and where is it used ?
12. What is an eye-bolt and for what purpose is it used ?
13. What is a stud bolt and where is it used ?
14. What is a set screw ? What is its function ?
15. What are locking devices ? Where and why are they used ?
16. What are foundation bolts and where are they used ?