

MECHANICAL DRAWING

FOR 2ND YEAR STUDENTS

PREPARED BY

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Subject	Year of student	Hours In Week			Units
		Theory	Practical	Total	
Mechanical drawing	2 nd Year Students	1	3	3	5

The project:-

ان يكون الطالب قادرا على اكتساب المهارة اللازمة لقراءة الرسومات الفنية ومعرفة الرموز والمصطلحات الهندسية والمواصفات القياسية ورسم الاجزاء الميكانيكية المجمعـة والبسيطة والمعقدة والتعرف على كيفية استخدام الحاسوب في الرسم الميكانيكي

The student should be able to acquire the necessary skill to read the technical drawings, knowledge of the symbols, engineering terms, specifications, drawing of the assembled, simple and complex mechanical parts, and learning how to use the computer in the mechanical drawing.

ITEM	WEEK	SYLLABUS
1	1-2	<i>Symbols-Terminology - General review</i>
2	3	<i>Bolts and nuts</i>
3	4	<i>Keyways</i>
4	5-6	<i>Pulleys</i>
5	7-8	<i>Gears</i>
6	9-10	<i>Clearance fittings</i>
7	11-12	<i>Operating marks and parts tables</i>
8	13-20	<i>Detailed and detailed drawing of advanced mechanical systems</i>
9	21-23	<i>Welding symbols</i>
10	24-26	<i>Pipings</i>
11	27	<i>Introduction to computer use in mechanical drawing</i>
12	28-30	<i>Basic principles in the design of metal molds</i>

REFERENCES

1- MACHINE DESIGN, KHURMI 1956-2005 –INDIA

2-Engineering drawing practice (British standard) BS308 Part

3-Machine drawing-K.L.NARAYANA etal 2006-3rd Edition

Bolts and nuts

- A screw thread is formed by cutting a continuous helical groove on a cylindrical surface. The helical grooves may be cut either right hand or left hand. A screwed joint is mainly composed of two elements i.e. a bolt and nut. The screwed joints are widely used where the machine parts are required to be readily connected or disconnected without damage to the machine or the fastening.

Important Terms Used in Screw Threads

The following terms used in screw threads, as shown in Fig. 1, are important from the subject point of view

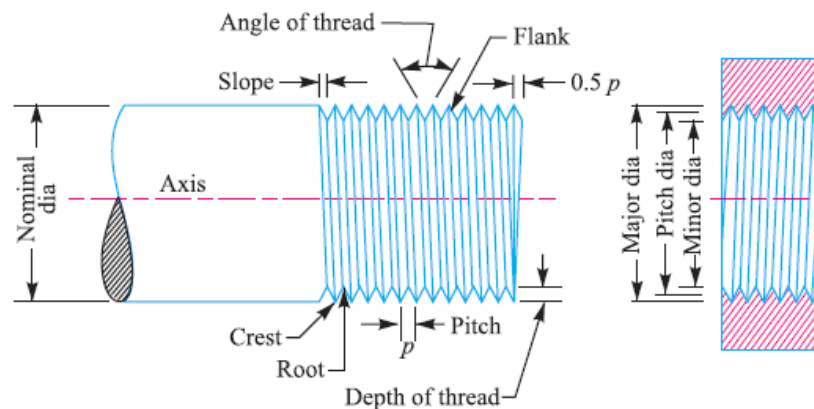
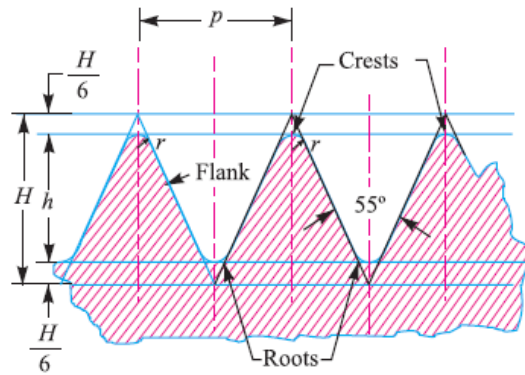


Figure-1 shows the terms used in screw threads

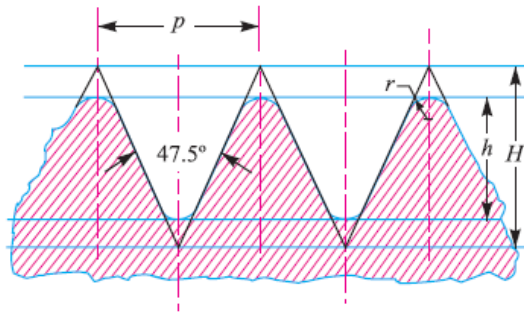
1. British standard whitworth (B.S.W.) thread. This is a British standard thread profile and has coarse pitches. It is a symmetrical V-thread in which the angle between the flanks, measured in an axial plane, is 55° . These threads are found on bolts and screwed fastenings for special purposes.

The various proportions of B.S.W. threads are shown in Fig. 2.



$$H = 0.96 p ; h = 0.64 p ; r = 0.1373 p$$

Fig. 11.2. British standard whitworth (B.S.W) thread.

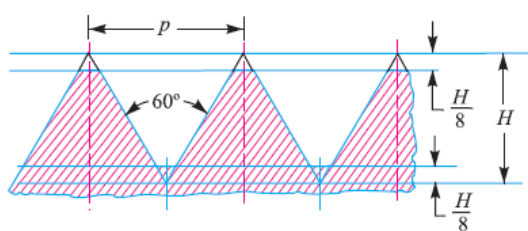


$$H = 1.13634 p ; h = 0.6 p ; r = 0.18083 p$$

Fig. 11.3. British association (B.A.) thread.

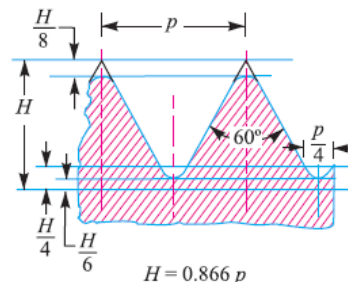
Figure-2 The various proportions of B.S.W. threads

2 American national standard threads. The American national standard or U.S. or Seller's thread has flat crests and roots. The flat crest can withstand more rough usage than sharp V-threads. These threads are used for general purposes e.g. on bolts, nuts, screws and tapped holes. The various proportions are shown in Fig. 3.



$$H = 0.866 p$$

Fig. 11.4. American national standard thread.



$$H = 0.866 p$$

Fig. 11.5. Unified standard thread.

Figure -3 shows the American national standard thread

3. Square thread. The square threads, because of their high efficiency, are widely used for transmission of power in either direction. Such type of threads is usually found on the feed mechanisms of machine tools, valves, spindles, screw jacks etc. The square threads are not so strong as V-threads but they offer less frictional resistance to motion than Whitworth threads. The pitch of the square thread is often taken twice that of a B.S.W. thread of the same diameter. The proportions of the thread are shown in Fig. 4.

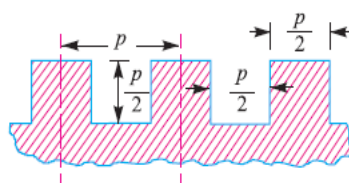


Fig. 11.6. Square thread.

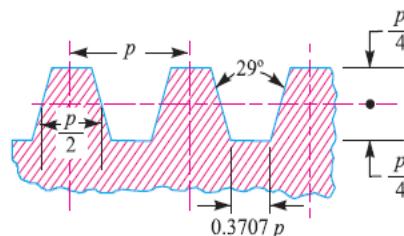


Fig. 11.7. Acme thread.

Figure-4 shows the square thread

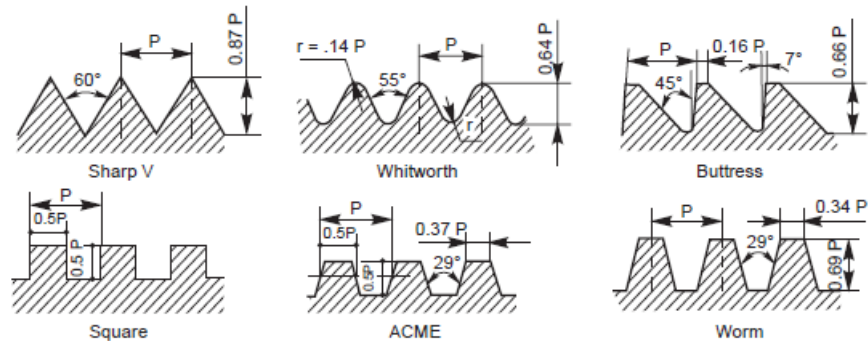


Fig. 5.3 Types of thread profiles

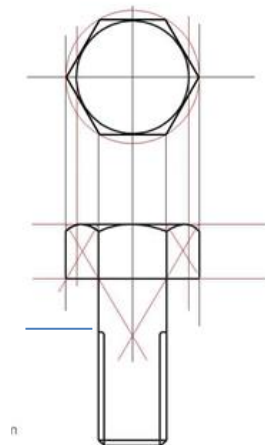
How to draw bolt and nut:

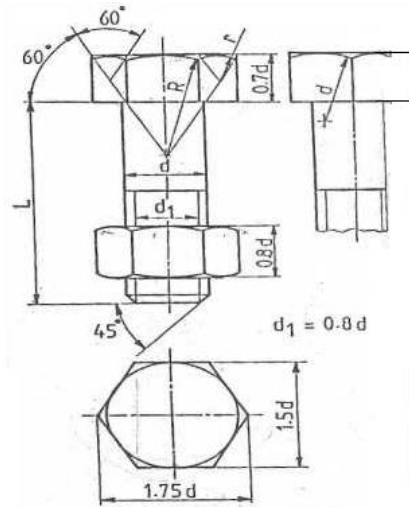
Figure-5 shows the steps to draw bolt and nut and how rules to calculate the illustrated dimensions:

1. The size of the bolt is given by the formula (M 40*1.5) where:
M : Metric system
 40: is the nominal diameter of the bolt (d)
 1.5: pitch of the bolt (coarse or fine)
- 2- The second step to draw the bolt head is to draw ($D=1.5 d$)
- 3- The third step is to draw tangent lines to the circle ($1.5 d$) horizontally and tangent angled lines (60°) to complete the hexagon.
- 4-From the top view the head of the bolt is drawn by selecting the end points of the intersection of the hexagon as shown in the figure below

It may be noted that in the view from the front, the upper outer corners appear chamfered. The end of the teeth is drawn by angle 30°

In the view from the side, where only two faces are seen, the corners appear square.





$$R = 1.5d$$

$$r = 0.4d$$

$$d_1 = 0.8d$$

Figure- 5 shows bolt and nut dimension rules

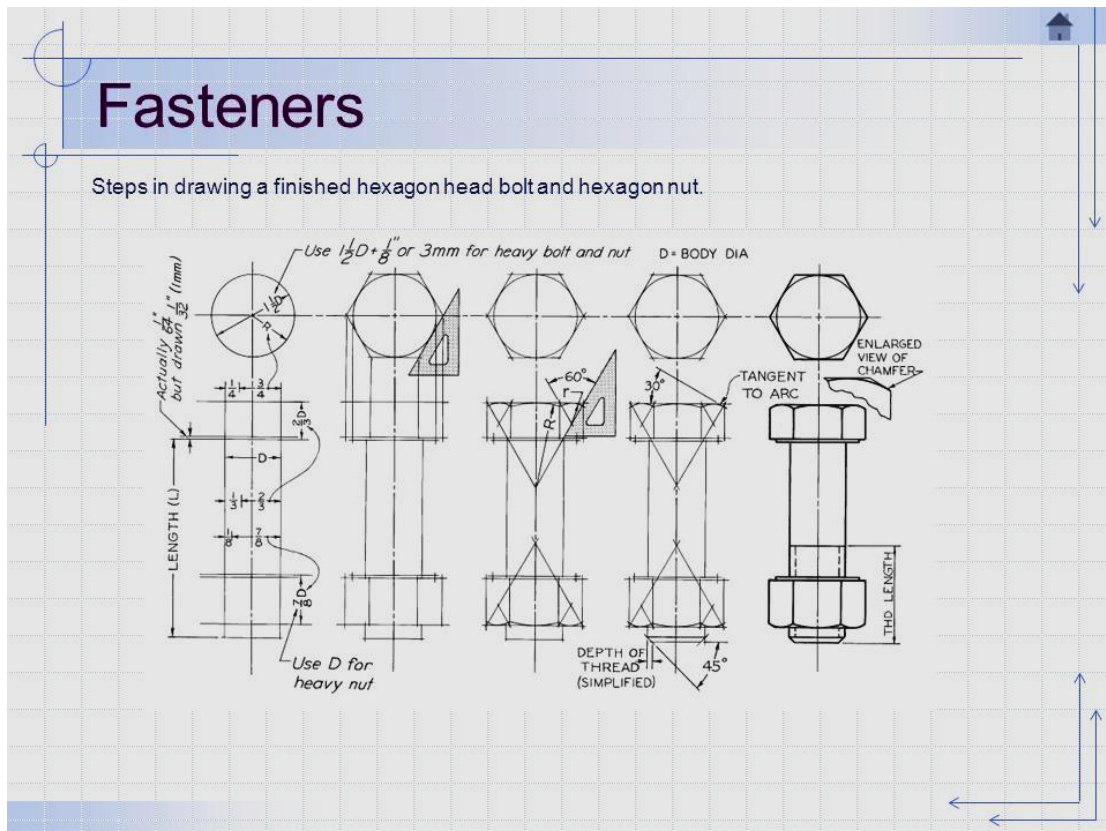


Figure shows steps in drawing finished hexagonal head bolt and hexagonal nut

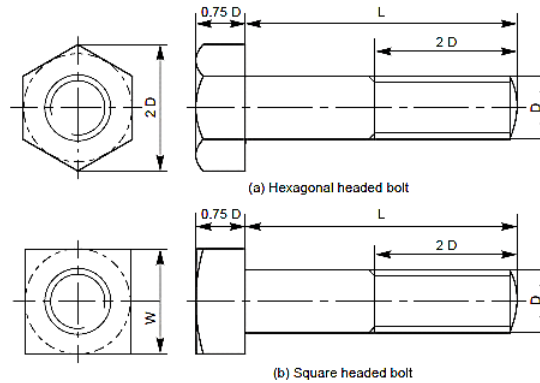


Fig. 5.15

Figure-5 types of cap screws

How to draw a washer

Figure-6 shows the rules how to draw a washer and

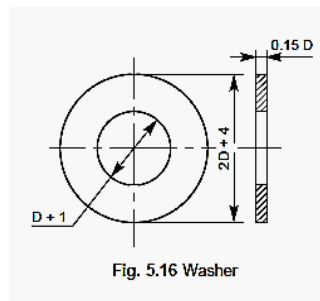
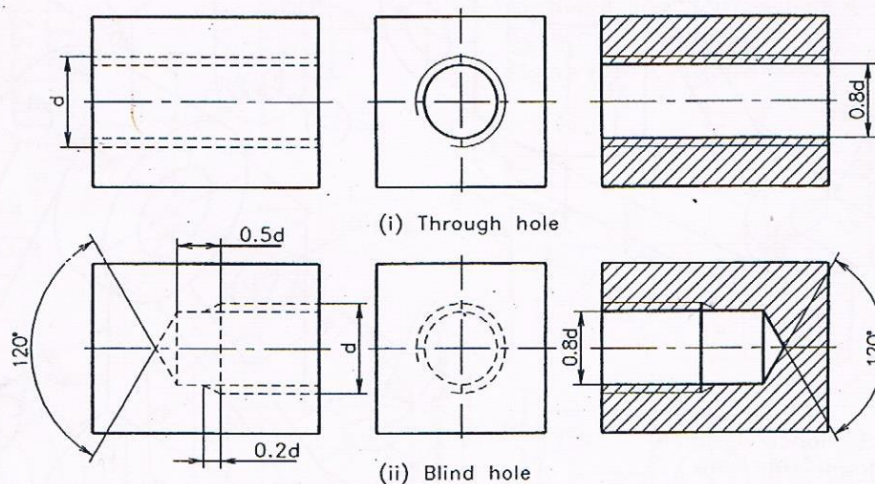


Fig. 5.16 Washer

Figure-6 shows washer dimensio

Representation of internal thread

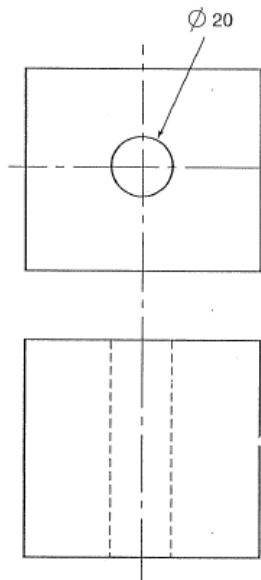


Drilled holes

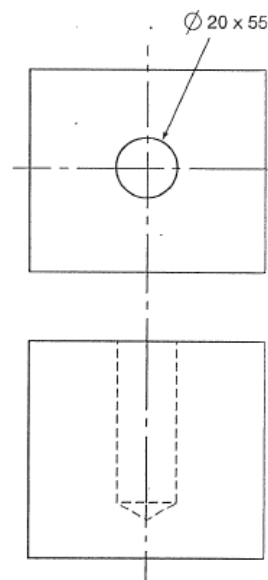
Plain drilled holes are shown in plan view by a circle of appropriate diameter in a thick (type A) line. Hidden holes are shown using a dashed line.

The diameter of the hole is shown by a note.

If the hole is 'blind' - meaning that it does not go right through the workpiece - the note must also give the depth of the hole. Unless otherwise specified, the depth given in the note refers to the depth of the cylindrical portion of the hole and not to the point of the drill.



straight through drilled hole



blind drilled hole

Threaded holes

For visible screw threads, the crest of the thread is defined by a thick (type A) line and the root of the thread shown by a thin (type B) line.

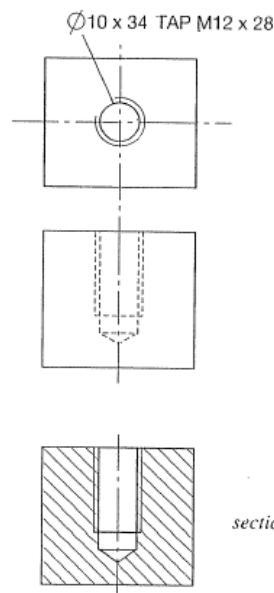
In plan view the root of the thread is represented by a thin (type B) line forming part of a circle, the length being not less than three quarters of a full circle.

For hidden threads, the root and crest of the thread are represented by dashed lines.

In section, the hatching should extend to the line defining the crests of the thread.

The limit of useful length of a screw thread is shown by a transverse line between the lines which define the root of the thread. This is a thick (type A) line for visible threads and a dashed line for hidden threads.

Details of the hole and the thread are given in a suitable note.



Stud bolt

