MACHINE DRAWING

II B.TECH I SEM

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OBJETIVES

Introduction	**CO1:** Students learn about the conventional representation of materials, machine elements, and sizes of drawing sheets.
UNIT - 1	**CO2:** Explain the concept of how to draw Selection of Views, additional views for machine elements and parts like Screwed fasteners, Keys, Cotters and Pin joints. **CO3:** Explain the concept of how to draw Selection of Views, additional views for machine elements and parts like Riveted joints, Shaft couplings and Bearings.
UNIT - 2	**CO4:** students learn about the drawings of assembled views for the part drawings of the following using conventions like Engine parts.
	CO5: students learn about the drawings of assembled views for the part drawings of the following using conventions like machine parts, Valves.

CONVENTIONAL REPRESENTATIONS

INTRODUCTION

DEPARTMENT OF MECHANICAL ENGINEERING

MAPPING OF COURSE OBJETIVES

INTRODUCTION

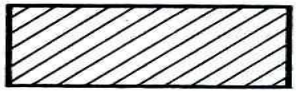
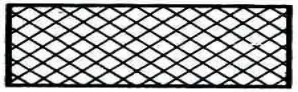
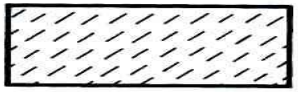
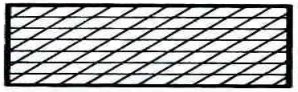
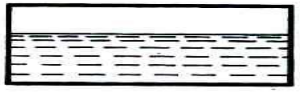
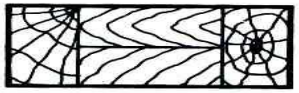
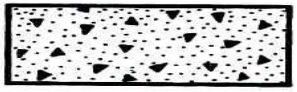
LECTURE	LECTURE TOPIC	KEY ELEMENTS	LEARNING OBJECTIVES
1	Introduction to IS conventions.	Materials, machine component	Understanding the representation of materials machine components (B2)

INTRODUCTION SYLLABUS

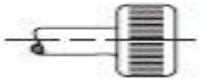
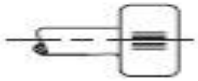
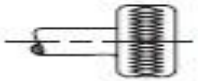
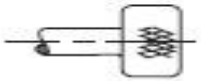
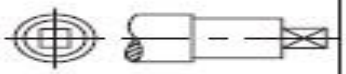
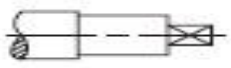
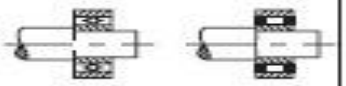
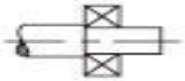
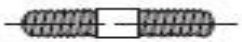
MACHINE DRAWING CONVENTIONS

- Need for drawing conventions –Introduction to IS conventions.
- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears.
- Methods of dimensioning, general rules for sizes and placement of dimensions for holes, canters curved and tapered features.
- Title boxes, their size, location and details -common abbreviations & their liberal usage
- Types of Drawings –working drawings for machine parts.

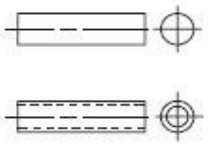
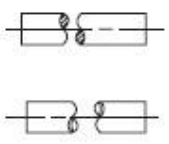
CONVENTIONAL REPRESENTATION OF MATERIALS

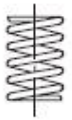
TYPE	CONVENTION	MATERIALS
METALS		STEEL, CAST IRON, COPPER AND ITS ALLOYS, ALUMINIUM AND ITS ALLOYS, ETC
		LEAD, ZINC, TIN, WHITE-METAL, ETC
GLASS		GLASS
PACKING AND INSULATING MATERIALS		PORCELAIN, STONEWARE, MARBLE, SLATE, ETC
		ASBESTOS, FIBRE, FELT, SYNTHETIC RESIN PRODUCTS, PAPER, CORK, LINOLEUM, RUBBER, LEATHER, WAX, INSULATING & FILLING MATERIALS
LIQUIDS		WATER, OIL, PETROL, KEROSENE, ETC
WOOD		WOOD, PLYWOOD, ETC
CONCRETE		

CONVENTIONAL REPRESENTATION OF MACHINE ELEMENTS

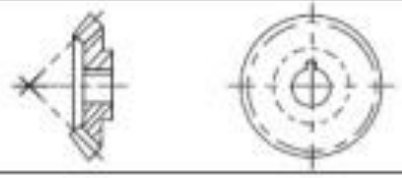
Title	Subject	Convention
Straight knurling		
Diamond knurling		
Square on shaft		
Holes on circular pitch		
Bearings		
External screw threads (Detail)		
Internal screw threads (Detail)		
Screw threads (Assembly)		

CONVENTIONAL REPRESENTATION OF MACHINE ELEMENTS

Title	Subject	Convention
Splined shafts		
Interrupted views		
Semi-elliptic leaf spring		
Semi-elliptic leaf spring with eyes		

Title	Subject	Convention	Diagrammatic Representation
Cylindrical compression spring			
Cylindrical tension spring			

(b)

Title	Convention
Spur gear	
Bevel gear	
Worm wheel	
Worm	

UNIT-1

SCREWES FASTENERS, KEYS, COTTERS, PIN JOINTS, RIVETED JOINTS, SHAFT COUPLINS AND BEARINGS

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTLINE UNIT-1

LECTURE	LECTURE TOPIC	KEY ELEMENTS	LEARNING OBJECTIVES
	Screwed fasteners	Forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.	1. Remember the standard formulas of component (B1). 2. Understand the how to draw a components (B2). 3.Apply the design formulas for components(B3)
	Keys, Cotters and Pin joints	i) Saddle keys, sunk keys ii) Cotter joint with sleeve, cotter joint with socket &spigot ends, cotter joint with a gib. iii)knuckle joint	1. Remember the standard formulas of component (B1). 2. Understand the how to draw a components (B2). 3.Apply the design formulas for components(B3)
	Riveted joints	plates	1. Remember the standard formulas of component (B1). 2. Understand the how to draw a components (B2). 3.Apply the design formulas for components(B3)
	Shaft couplings:	Draw the different types of shaft couplings	1. Remember the standard formulas of component (B1). 2. Understand the how to draw a components (B2). 3.Apply the design formulas for components(B3)
	Bearings	Journal, pivot and collar and foot step bearings	1. Remember the standard formulas of component (B1). 2. Understand the how to draw a components (B2). 3.Apply the design

SYLLABUS-UNIT 1

DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS

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

- **Screwed fasteners:** Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- **Keys, Cotters and Pin joints:**

  Saddle keys, sunk keys

  Cotter joint with sleeve, cotter joint with socket &spigot ends, cotter joint with a gib. iii)knuckle joint
- **Riveted joints** for plates
- **Shaft couplings:**

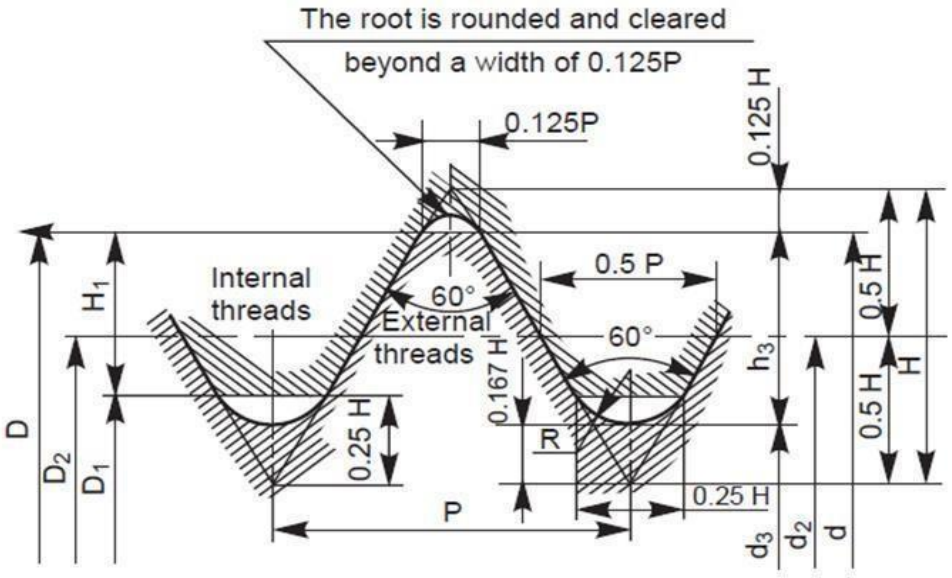
  Rigid couplings-sleeve or muff couplings, Flanged couplings

  Flexible couplings-Bushed pin type flanged coupling, compression coupling

  iii)Dis-engaging couplings-claw coupling, cone coupling

  iv)Non-Aligned couplings-Universal coupling(Hooke's Joint),Oldham coupling, cushion coupling & spigot and socket pipe joint.
- **Bearings:** Journal, pivot and collar and foot step bearings.

SCREW FASTENERS



Internal thread diameters
D - Major diameter
D_2 - Pitch diameter
D_1 - Minor diameter

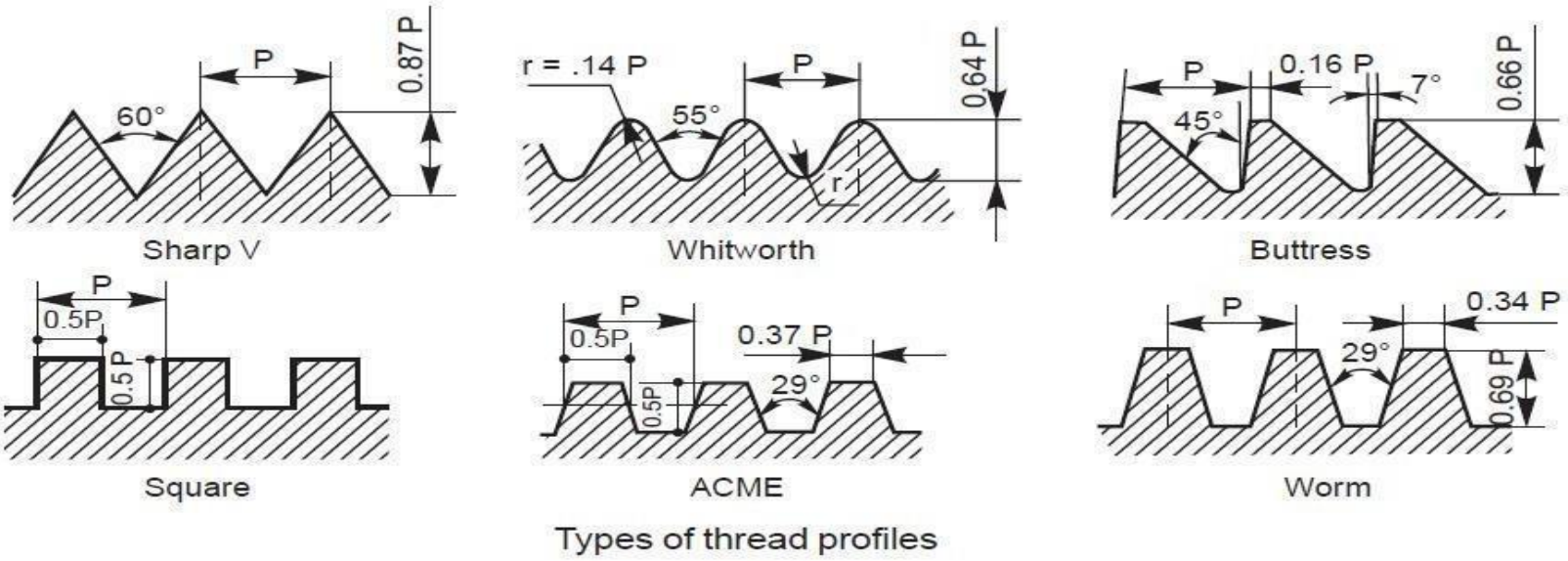
External thread diameters
d - Major diameter
d_2 - Pitch diameter
d_3 - Minor diameter

Metric screw thread

P = Pitch
H = 0.86 P
D = d = Major diameter
$D_2 = d_2 = d - 0.75H$
$D_1 = d_2 - 2(H/2 - H/4) = d - 2H_1$
$= d - 1.08P$

$d_3 = d_2 - 2\,(H/2 - H/6)$
$= d - 1.22P$
$H_1 = (D - D_1)/2 = 5H/8 = 0.54P$
$h_3 = (d - d_3)/2 = 17/24H = 0.61P$
$R = H/6 = 0.14P$

TYPES OF FORM OF THREADS



Types of thread profiles

BOLTED JOINT

Drawing Hexagonal (Bolt Head) Nut

Major or nominal diameter of bolt = D
Thickness of nut, T = D
Width of nut across flat surfaces, W = 1.5D + 3 mm
Radius of chamfer, R = 1.5D

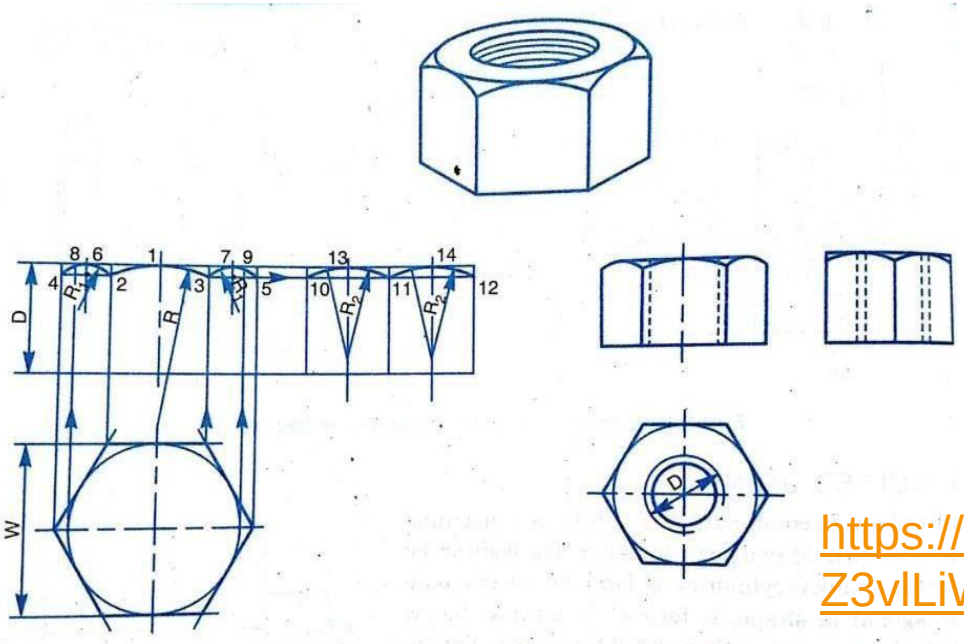


Fig. 5.12 Method of drawing views of a hexagonal nut (Method I)

https://www.youtube.com/watch?v=lyZ3vlLiWLY

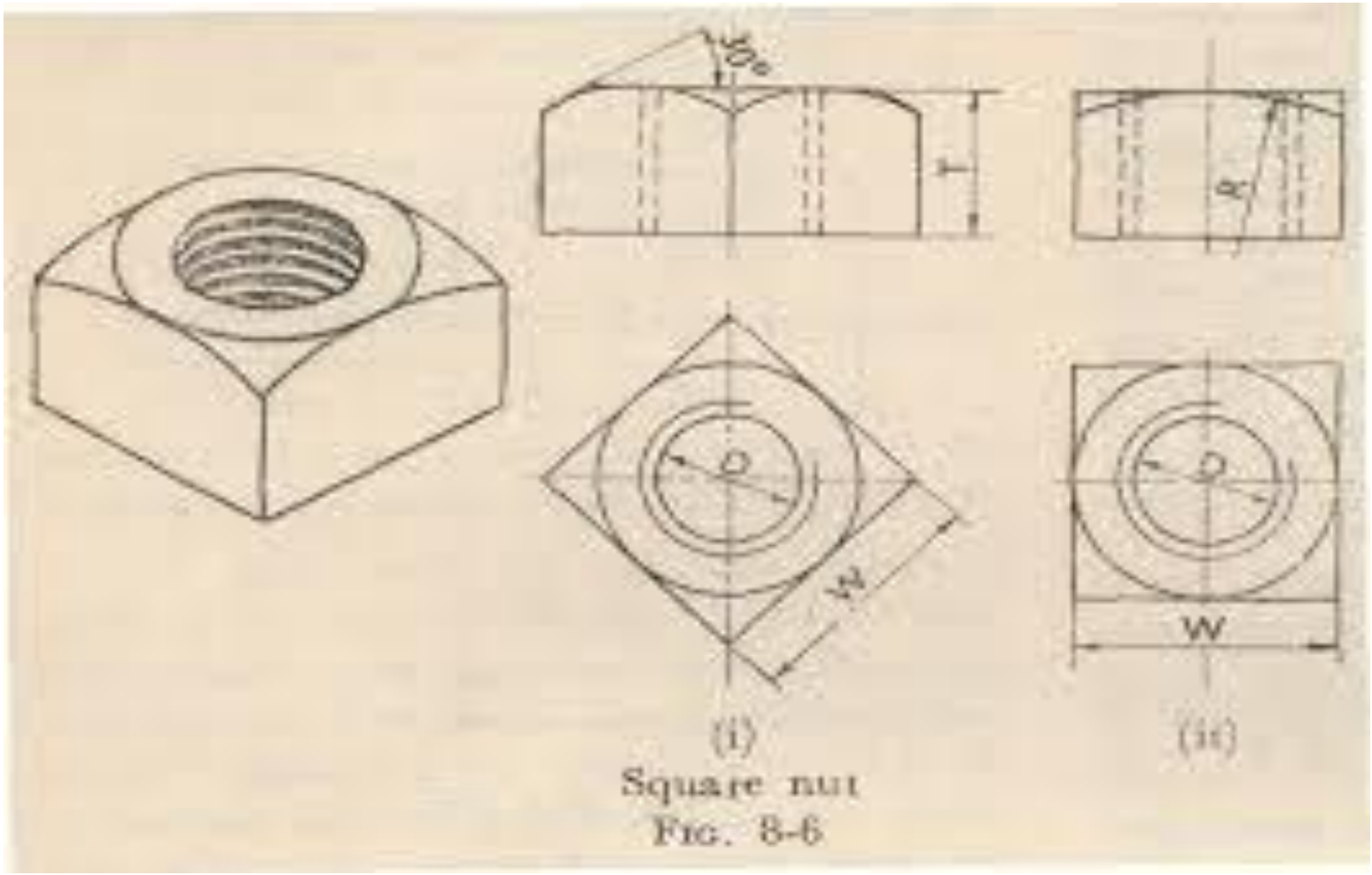
BOLTED JOINT

Drawing Hexagonal (Bolt Head) Nut

https://www.youtube.com/watch?v=lyZ3vlLiWLY

BOLTED JOINT

Drawing of square Nut

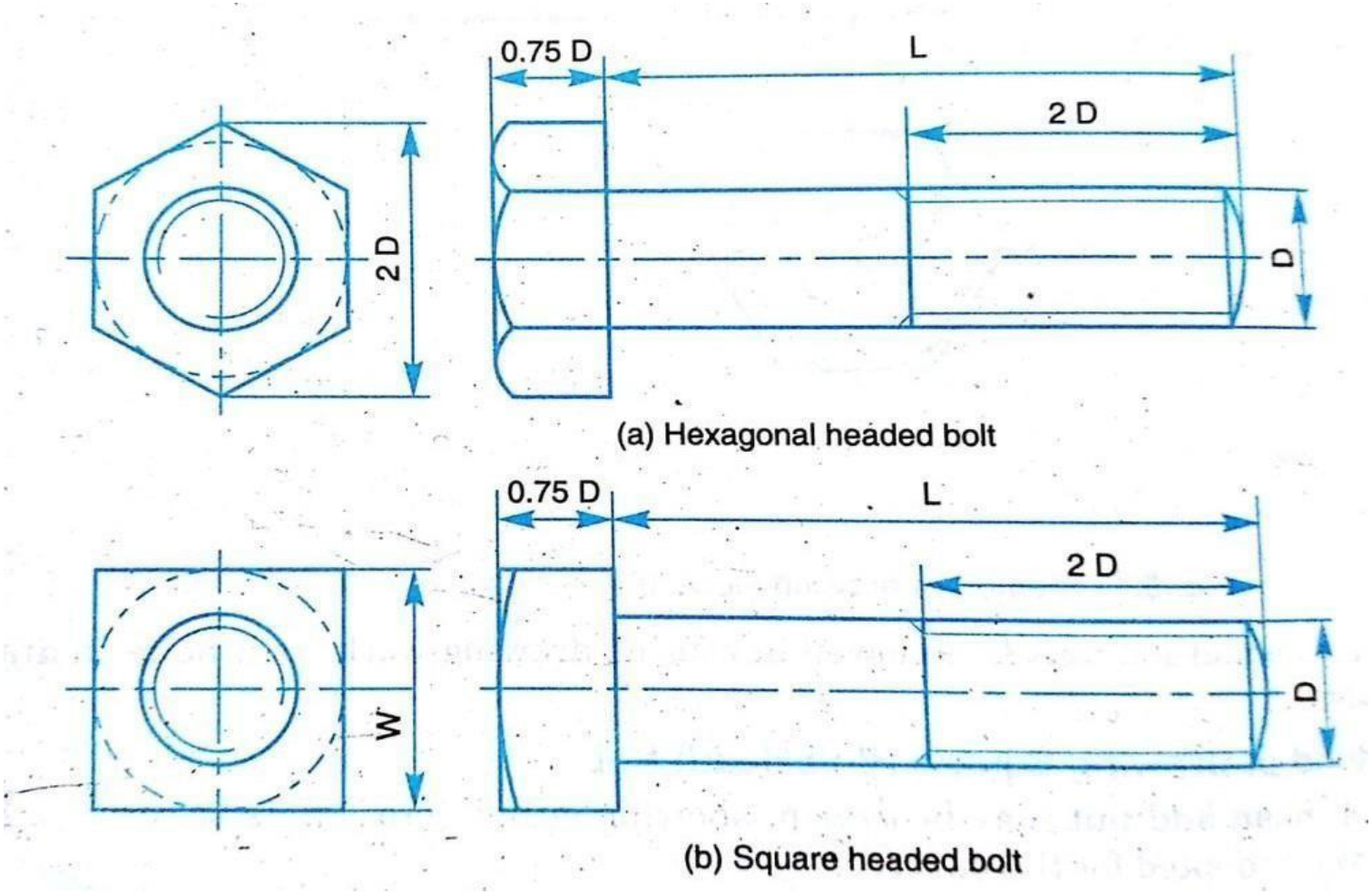


Square nut

FIG. 8-6

BOLTED JOINT

Hexagonal and Square Headed Bolts



BOLTED JOINT

Hexagonal and Square Headed Bolts

https://www.youtube.com/watch?v=FbvBgc9Sq2Y

BOLTED JOINT

Other Forms of Bolts

Square Headed Bolt with Square Neck

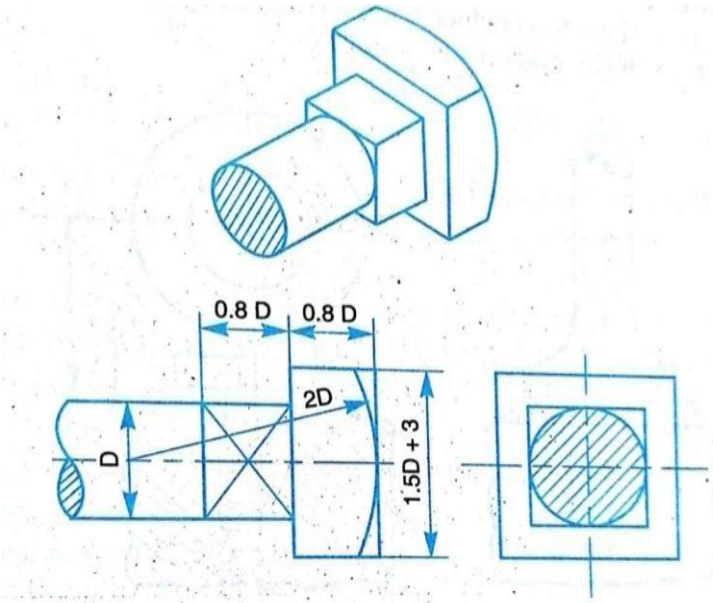


Fig. 5.18 Square headed bolt with square neck

T-Headed Bolt with Square Neck and Hook Bolt:

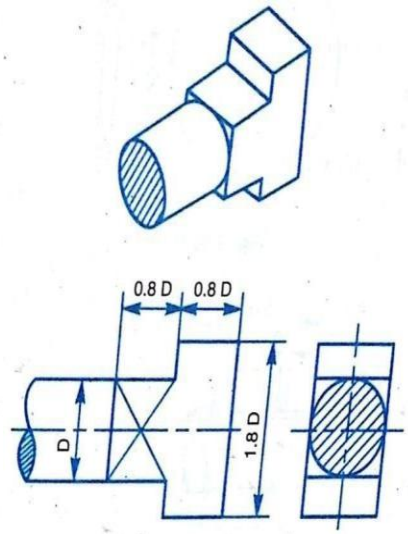


Fig. 5.19 T-headed bolt

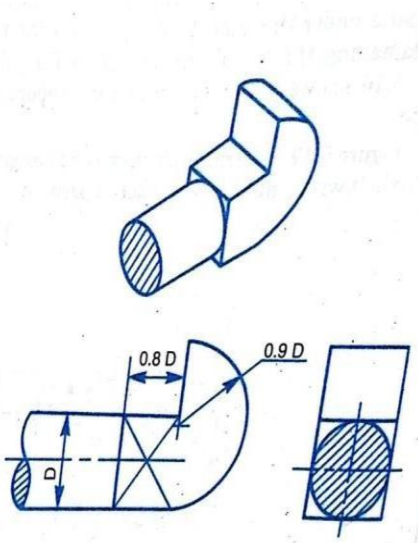
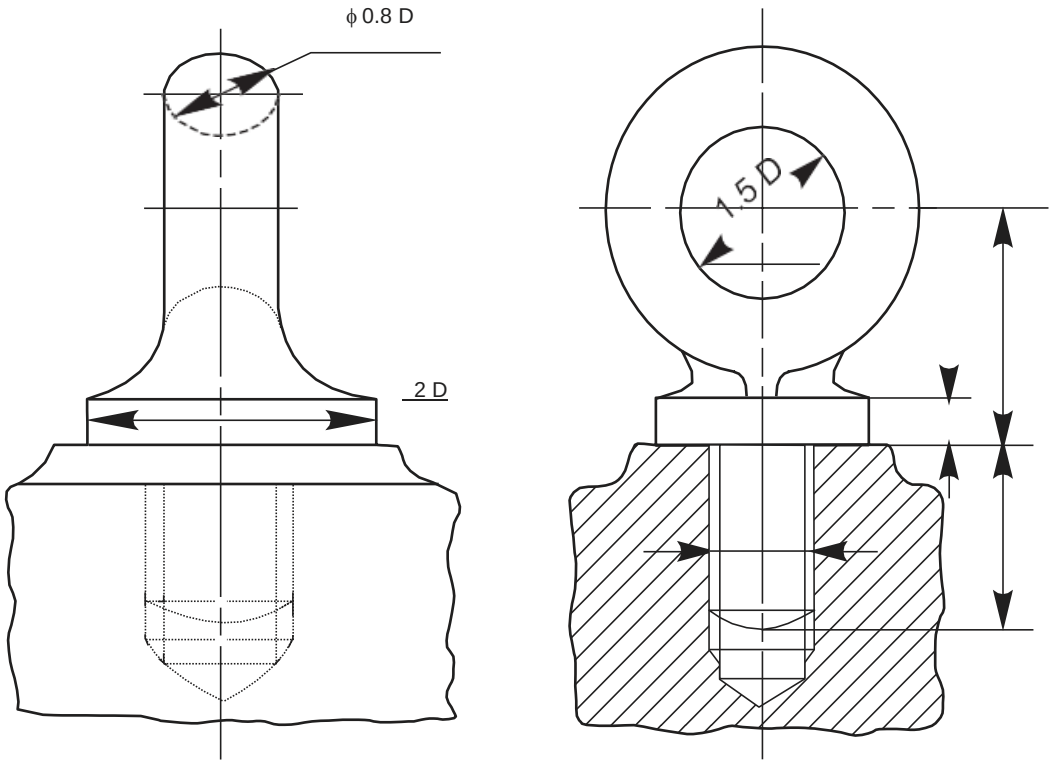


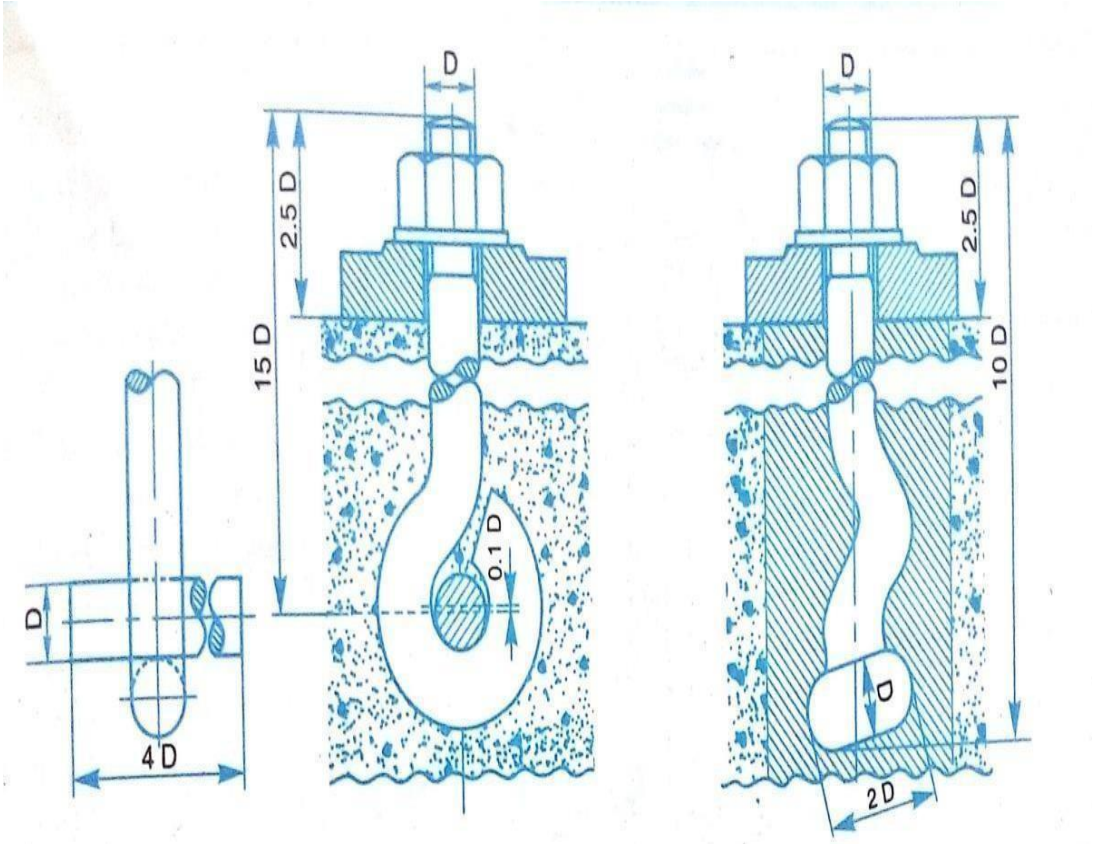
Fig. 5.20 Hook bolt

EYE BOLT

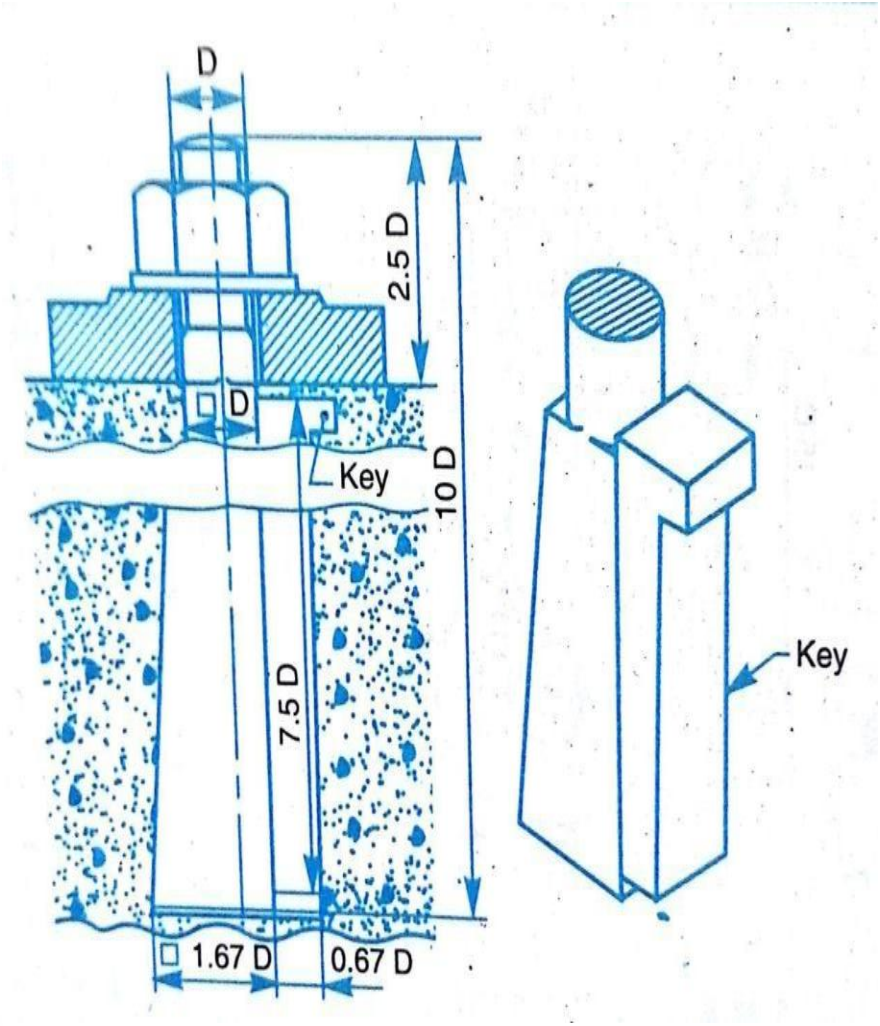


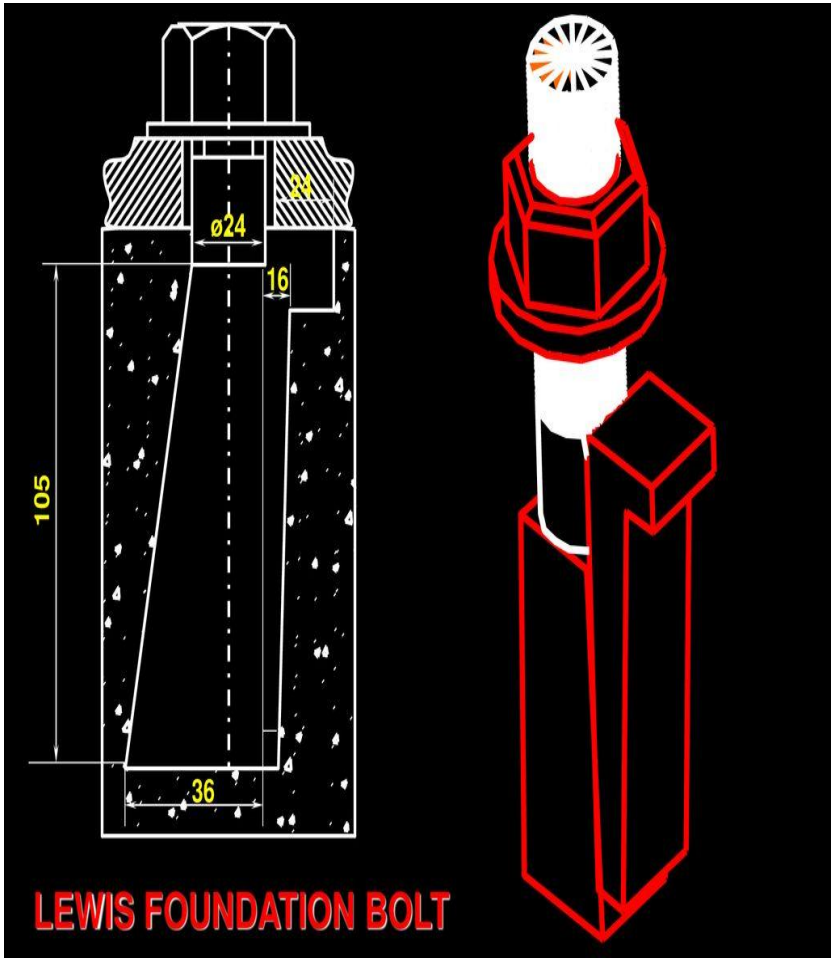
https://www.youtube.com/watch?v=Hrjs3G-HEms

EYE AND BENT FOUNDATION BOLT



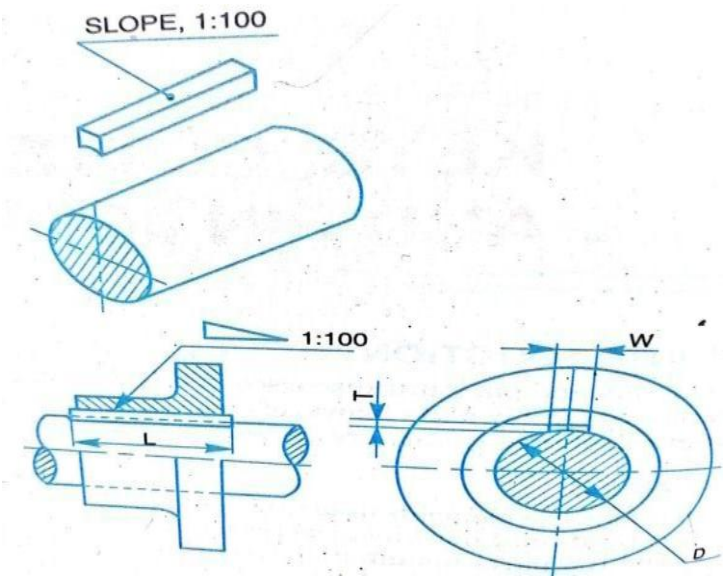
LEWIS FOUNDATION BOLT





KEYS

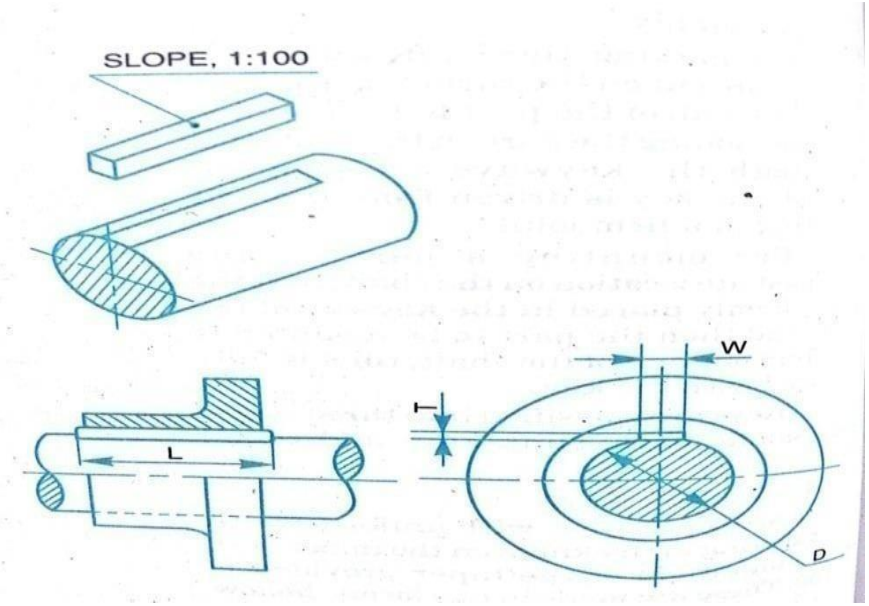
Hollow Saddle Key



https://www.youtube.com/watch?v=cgZW-dulrJk

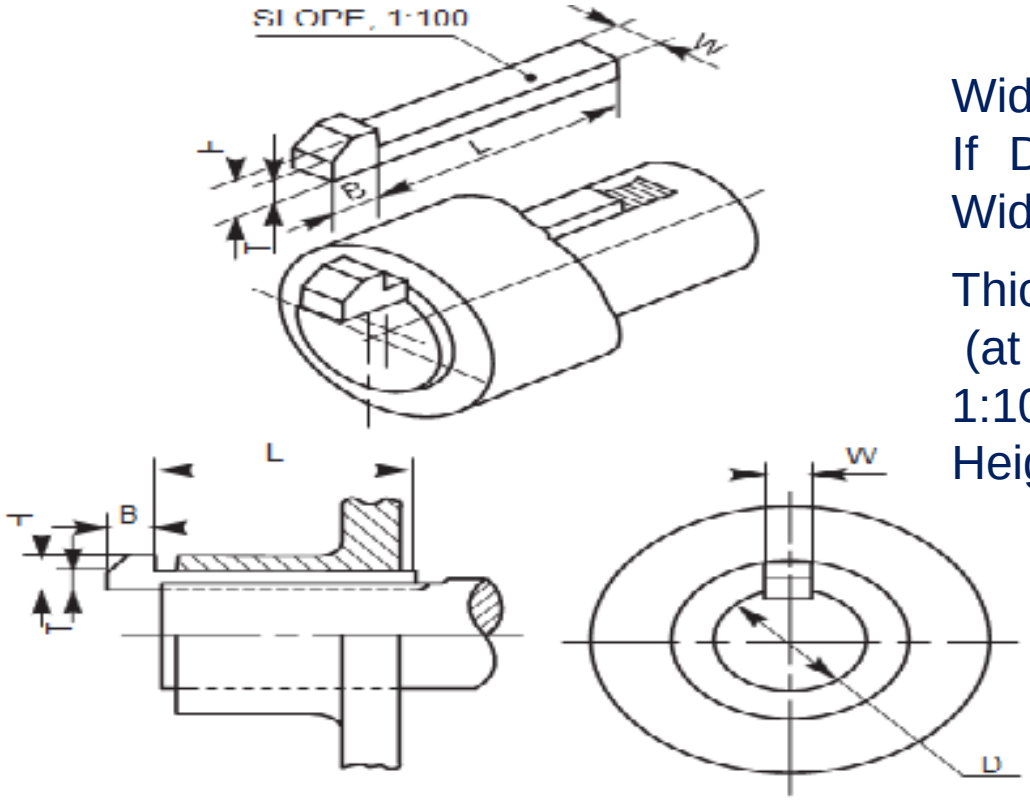
KEYS

Flat Saddle Key



KEYS

Key with gib



Width of head, B = 1.5 T

If D is the diameter of the shaft, then,

Width of key, W= 0.25 D + 2 mm

Thickness of key, T = 0.67 W

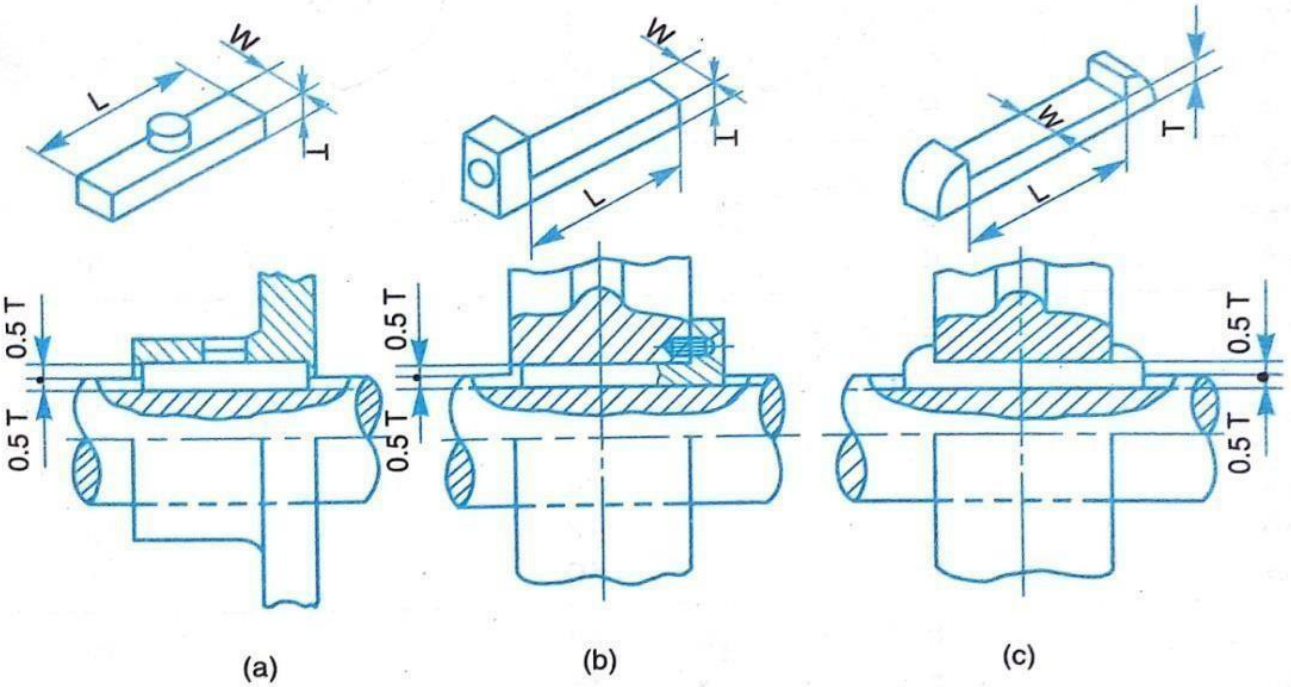
(at the thicker end) Standard taper = 1:100

Height of head, H = 1.75 T

KEYS

(i) peg feather key, (ii) single headed feather key and

(iii) double headed feather key.



KEYS

(i) peg feather key, (ii) single headed feather key and

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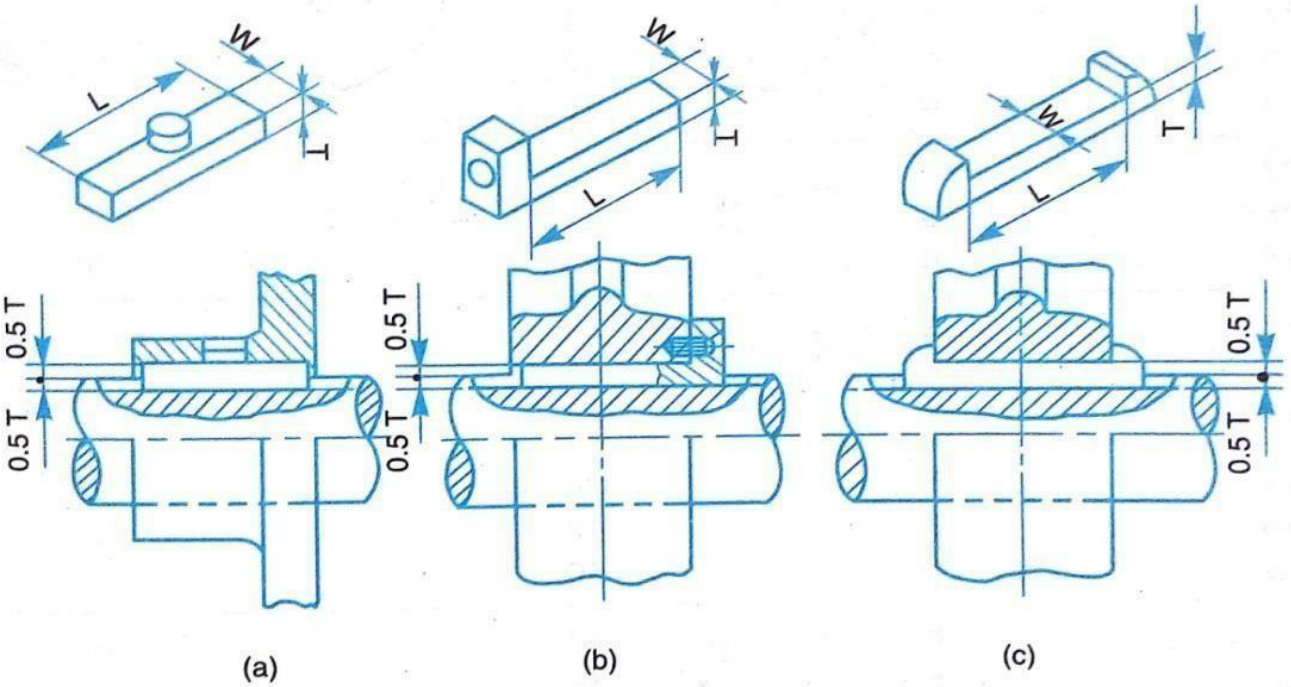
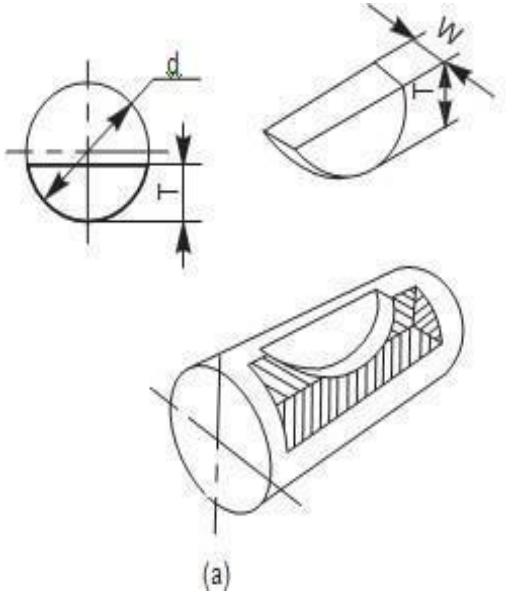
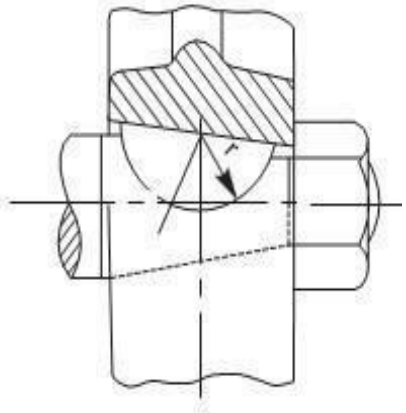


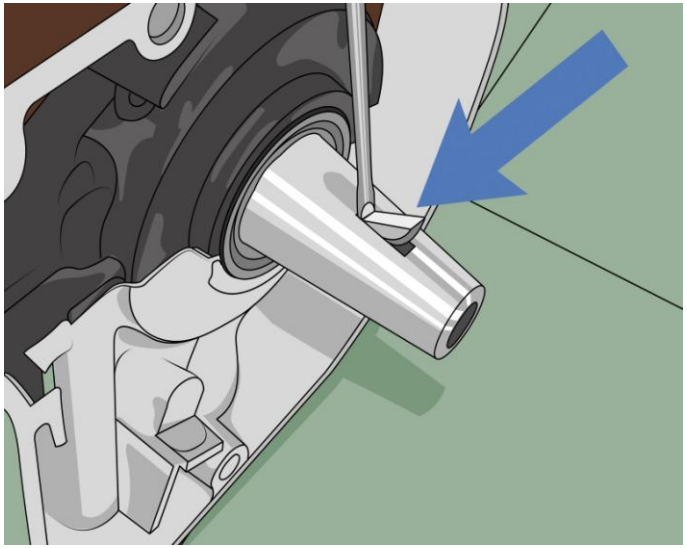
WOODRUFF KEY



(a)



(b)



Key If D is the diameter of the shaft,

Thickness of key, W = 0.25 D

Diameter of key, d = 3 W

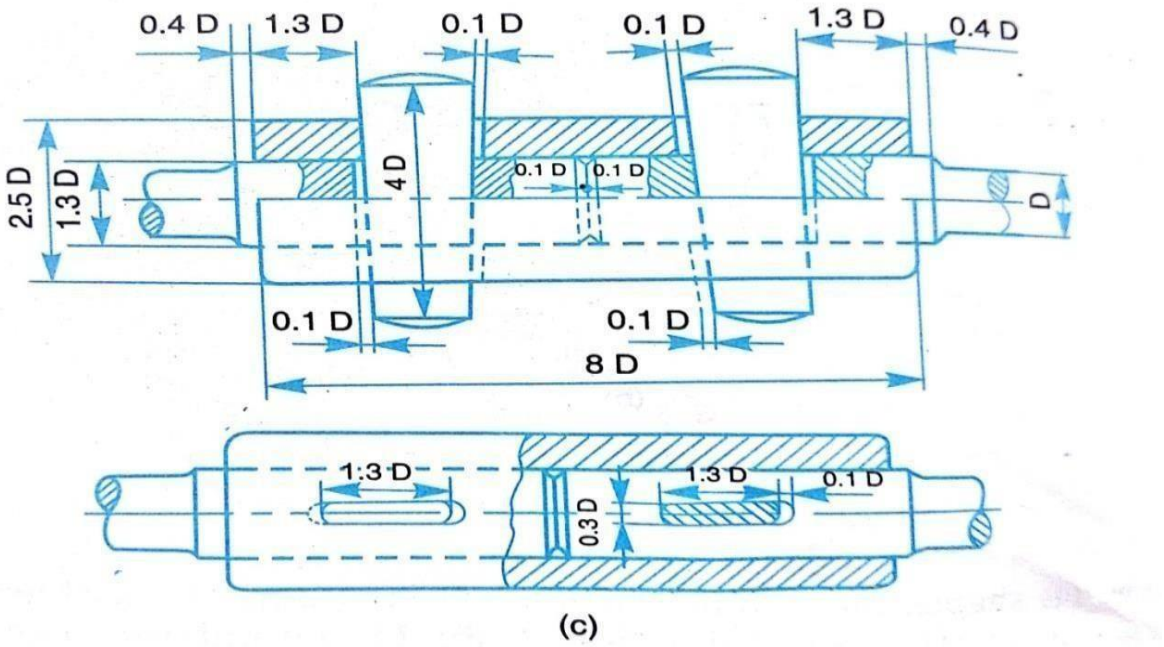
Height of key, T = 1.35 W

Depth of the keyway in the hub, T1 = 0.5 W + 0.1 mm

Depth of keyway in shaft, T2 = 0.85 W

COTTER JOINTS

Cotter Joint with Sleeve



(c)

COTTER JOINTS

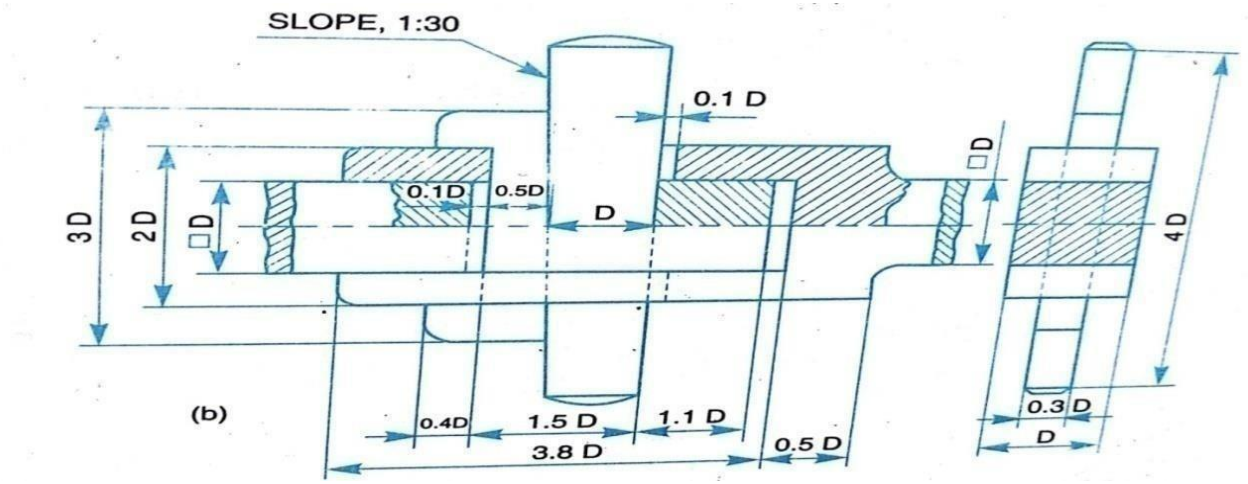
Cotter Joint with Sleeve

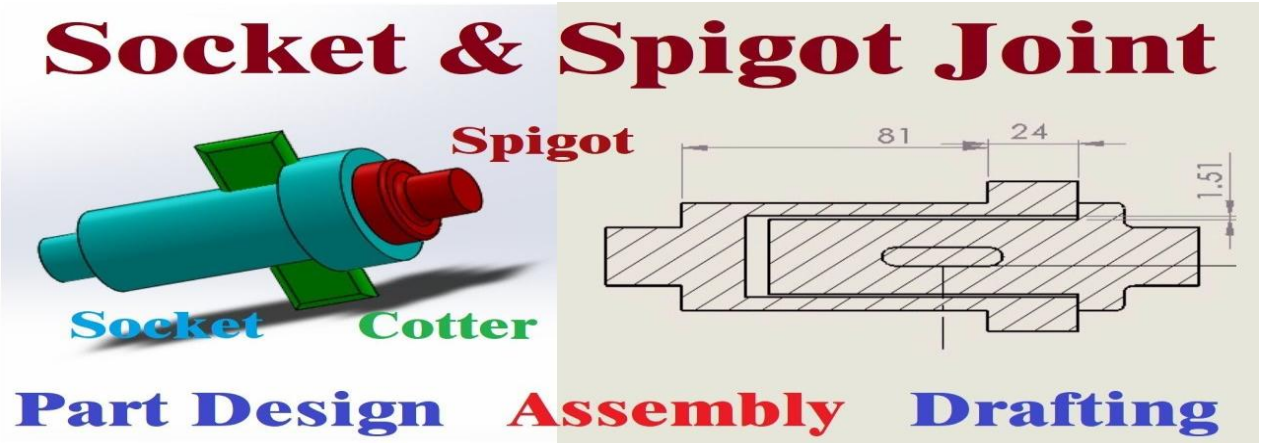
https://www.youtube.com/watch?v=_2h0N-b2Lm4

https://www.youtube.com/watch?v=Nu0PKhTz7JU

COTTER JOINTS

Cotter Joint with Socket and Spigot Ends





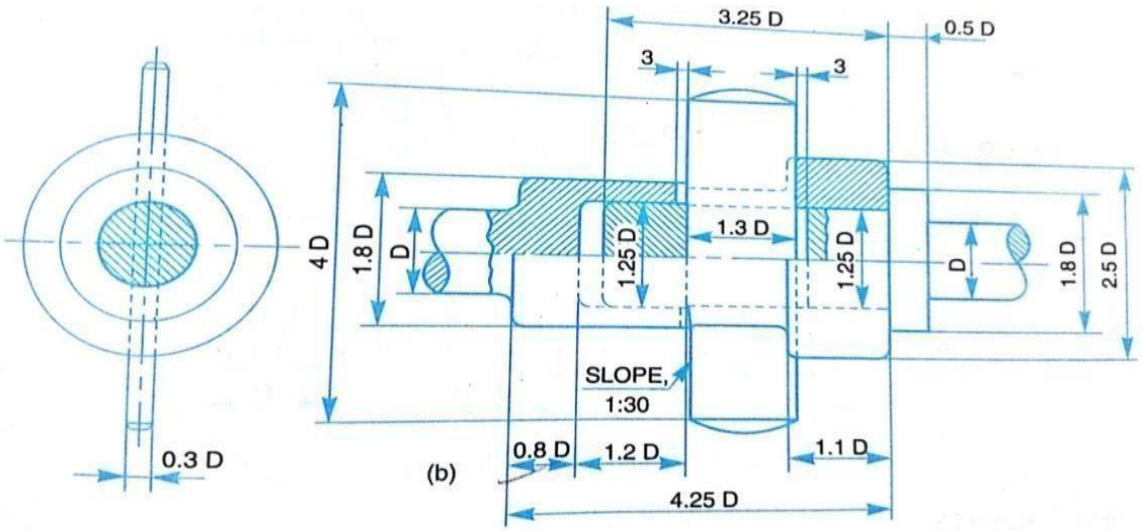
COTTER JOINTS

Cotter Joint with Socket and Spigot Ends

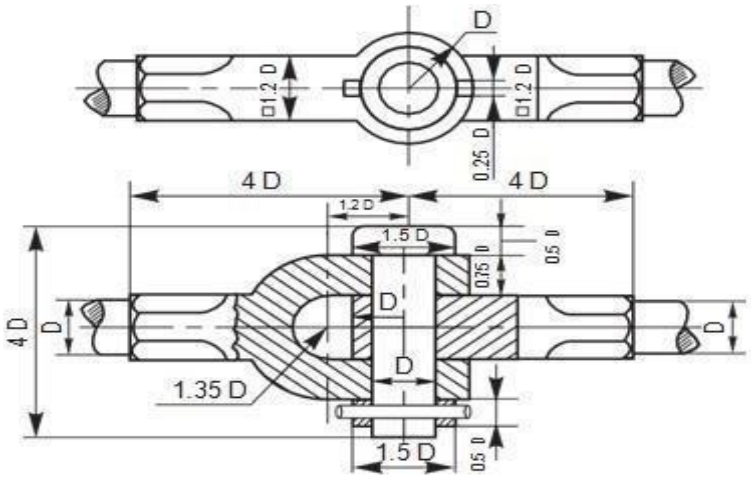
https://www.youtube.com/watch?v=esfr74WhbYg

COTTER JOINTS

Cotter Joint with a Gib



KNUCKLE JOINT



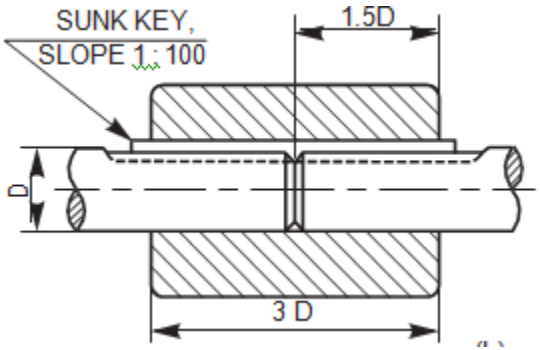
https://www.youtube.com/watch?v=PUgZt2w_tUM

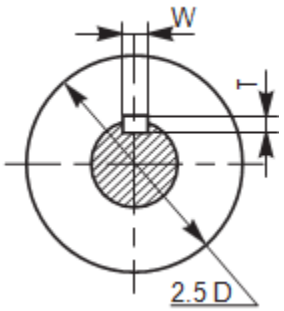
KNUCKLE JOINT

https://www.youtube.com/watch?v=PUgZt2w_tUM

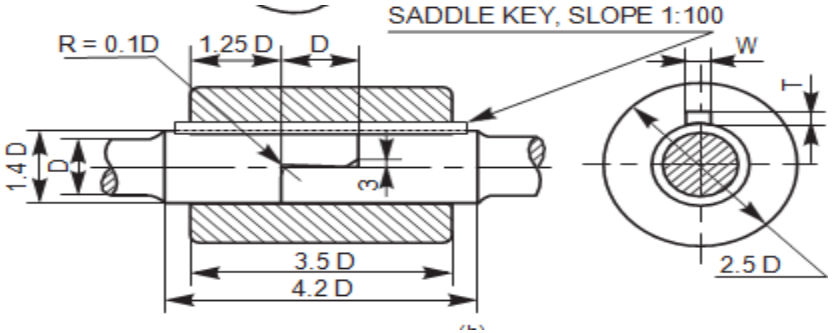
SHAFT COUPLINGS

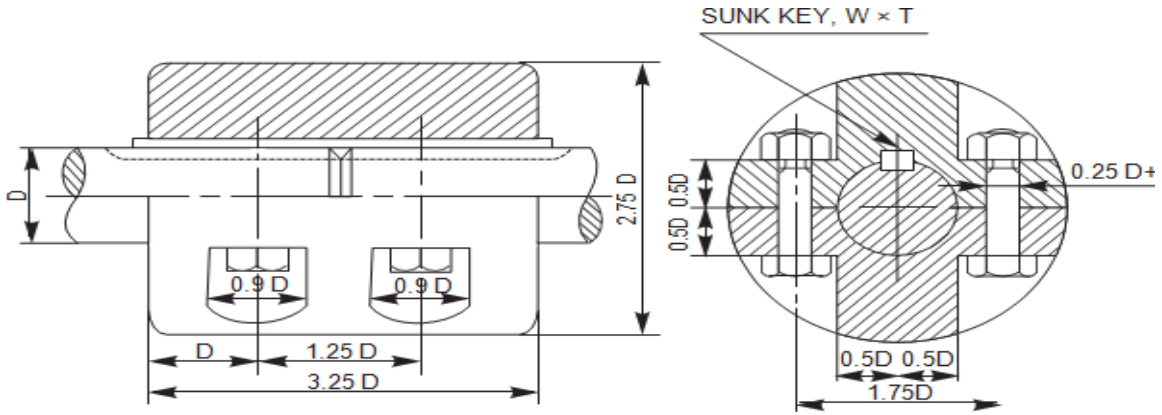
Butt-muff coupling





Half-lap muff coupling

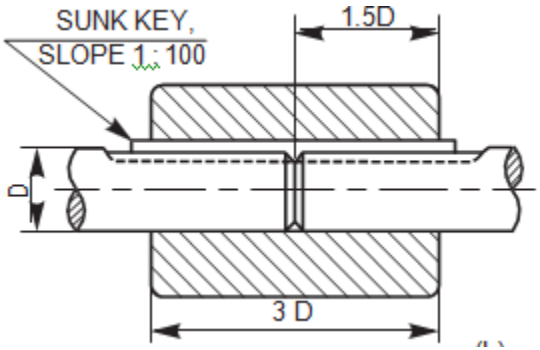


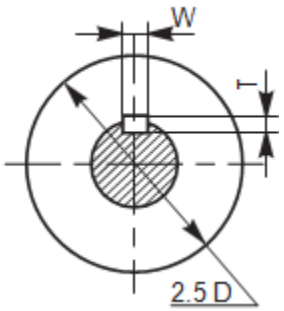


Split-muff coupling

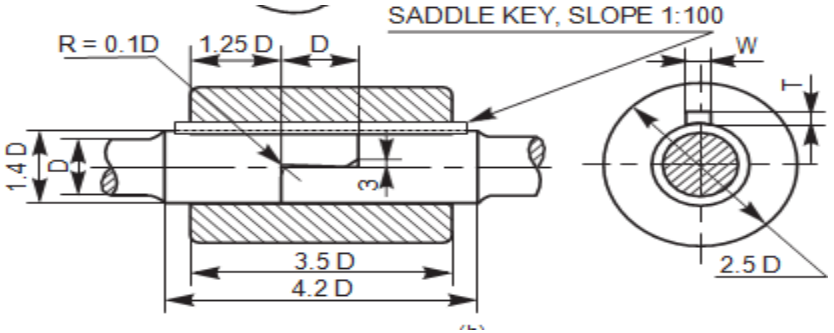
SHAFT COUPLINGS

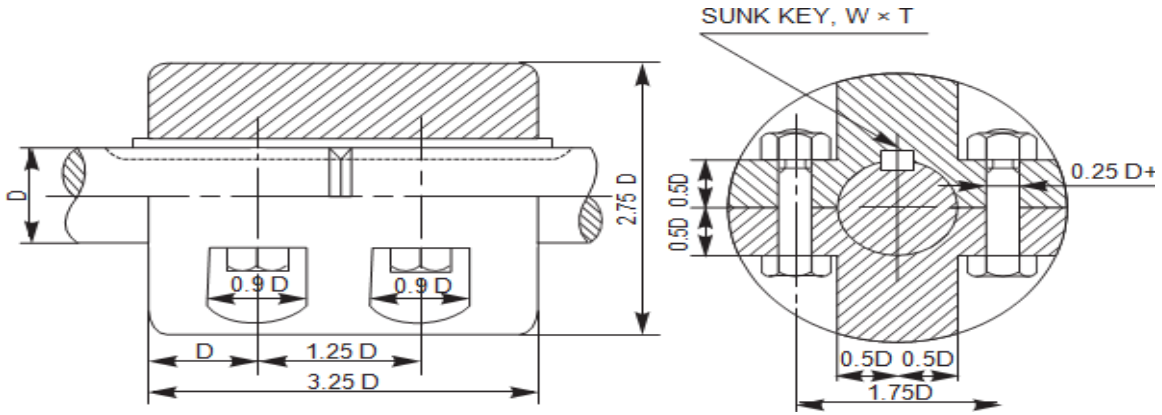
Butt-muff coupling





Half-lap muff coupling





Split-muff coupling

SHAFT COUPLINGS

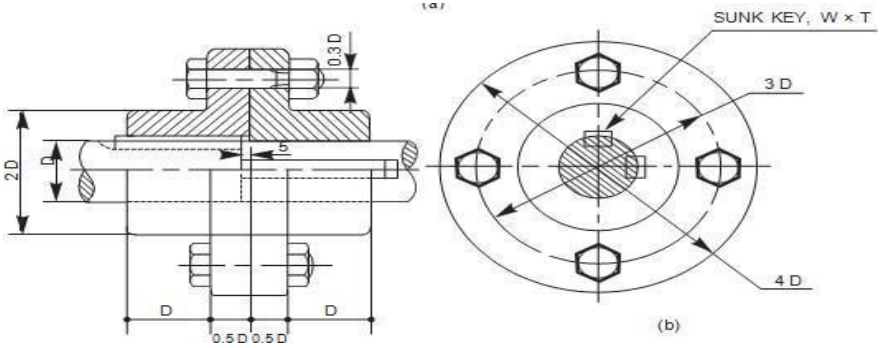
Butt-muff coupling & Half-lap muff coupling

Split-muff coupling

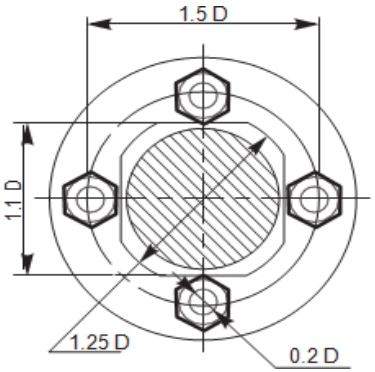
https://www.youtube.com/watch?v=6UGnVM0YaoU

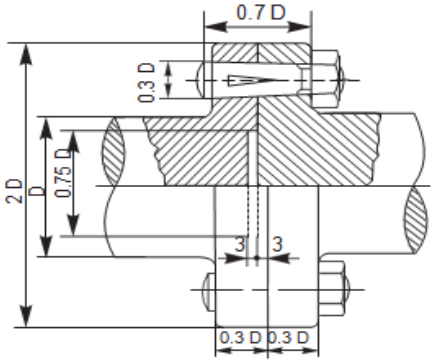
SHAFT COUPLINGS

Flanged coupling

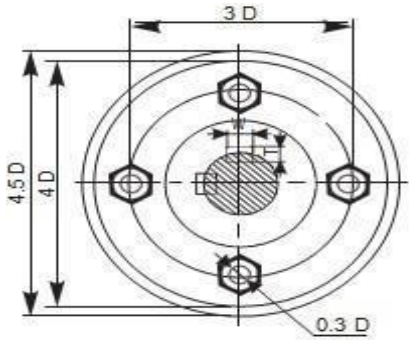


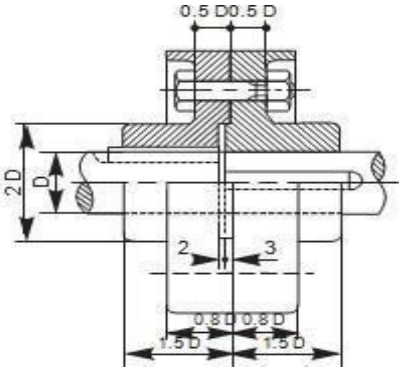
Solid flanged coupling





Protected flanged coupling





SHAFT COUPLINGS

Flanged coupling

https://www.youtube.com/watch?v=TNE0E0YS6qk

Solid flanged coupling

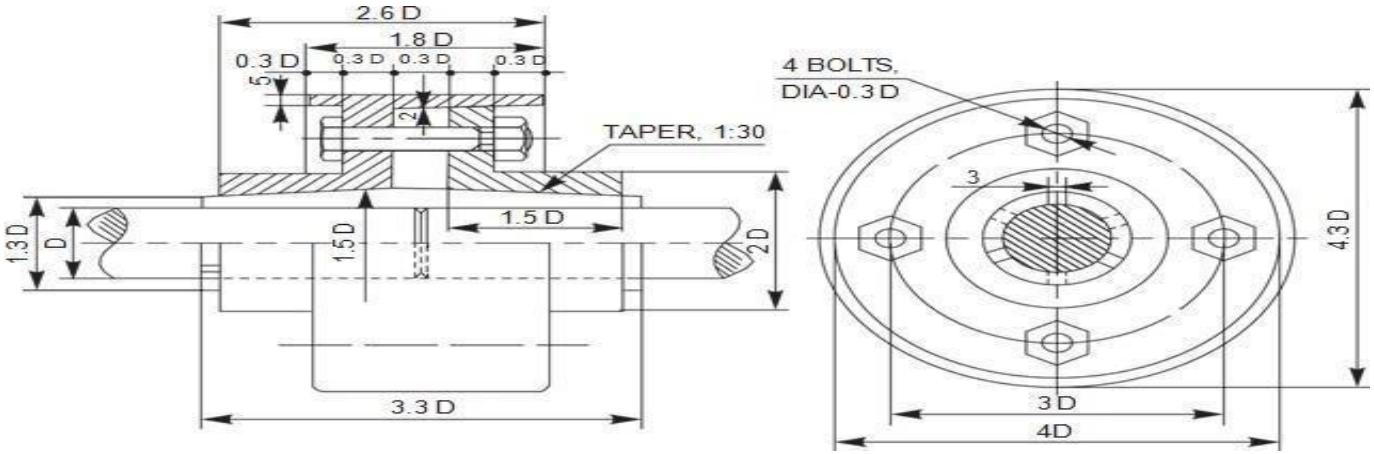
https://www.youtube.com/watch?v=9idc0CzMjCo

Protected flanged coupling

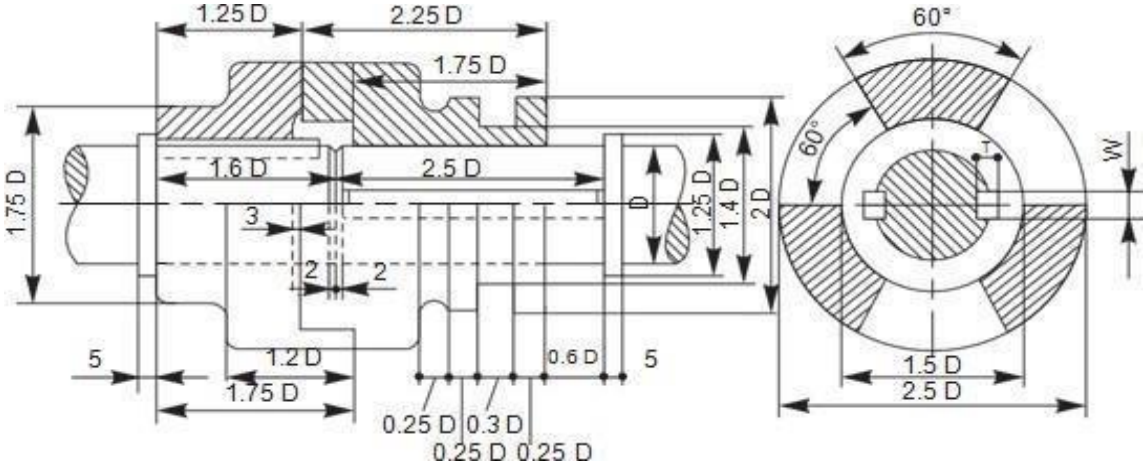
https://www.youtube.com/watch?v=lwYIw0C9RTk

SHAFT COUPLINGS

Compression Coupling

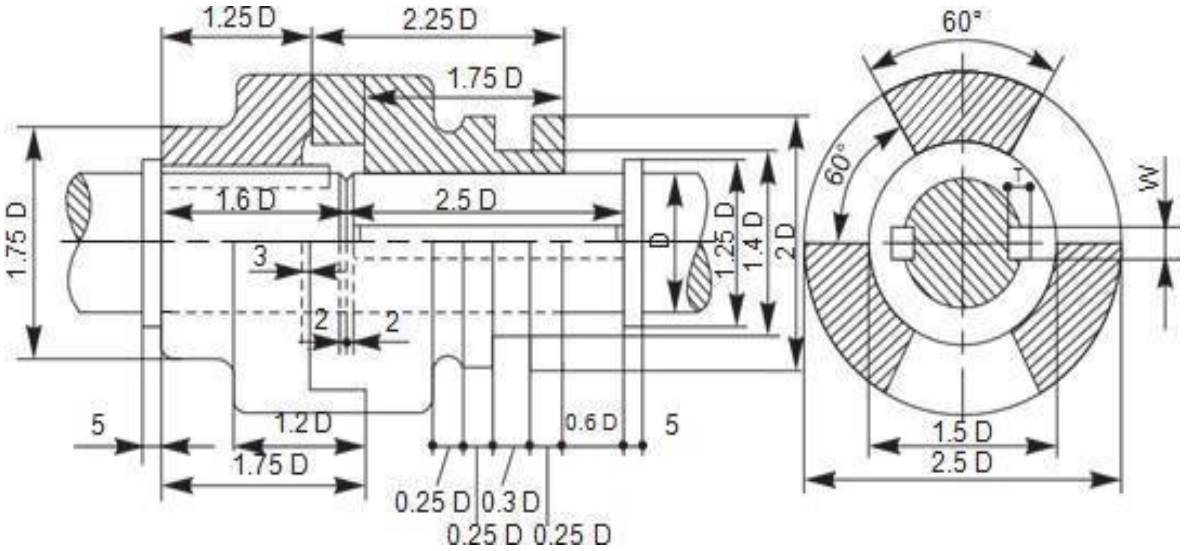


Claw coupling



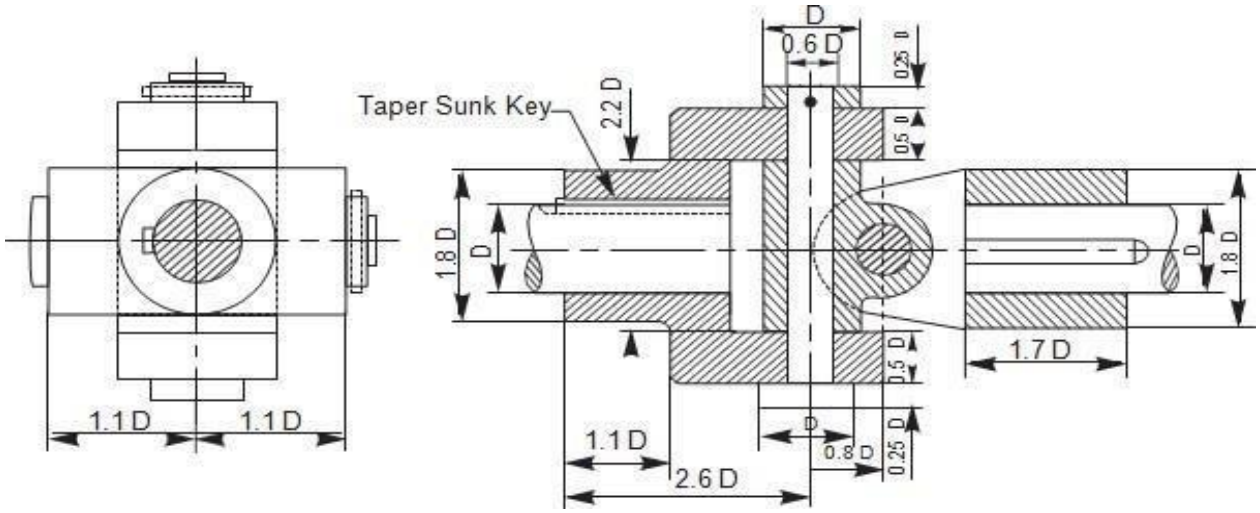
SHAFT COUPLINGS

Cone Coupling

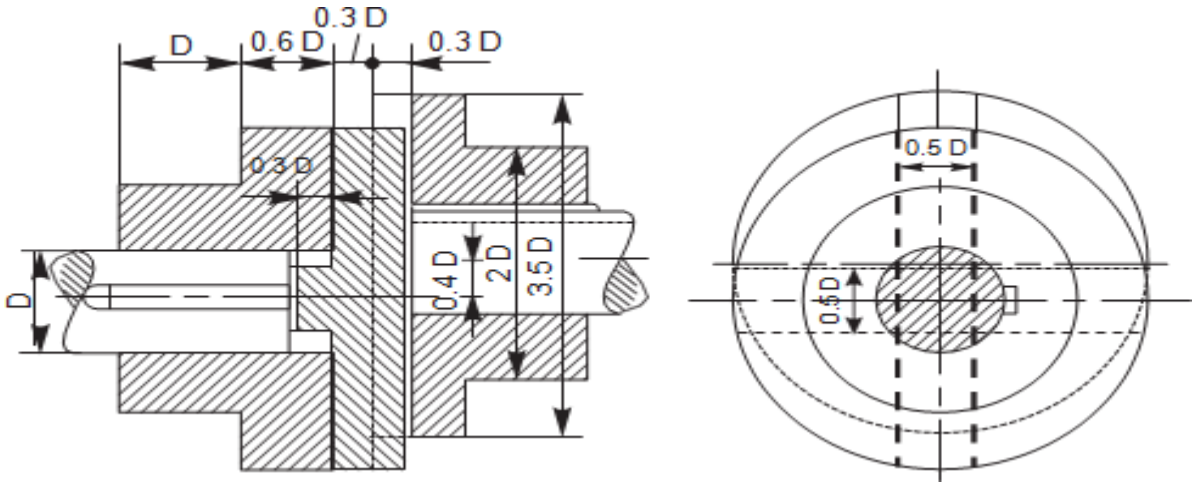


SHAFT COUPLINGS

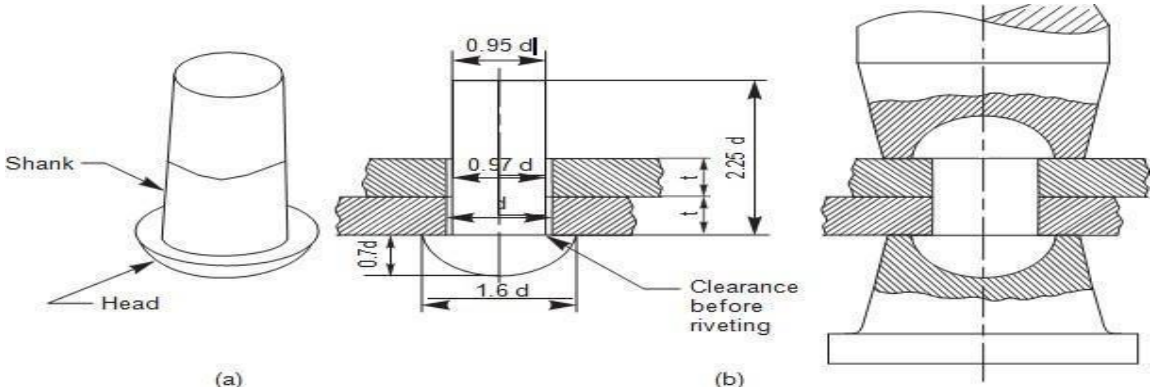
Universal Coupling (Hooke's Joint)



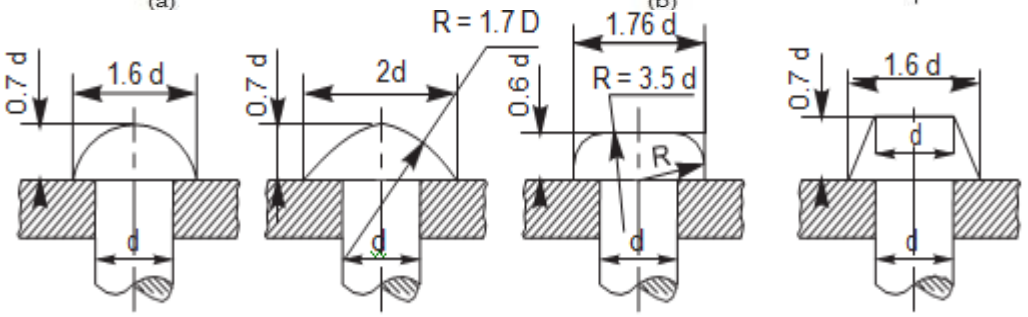
Oldham Coupling



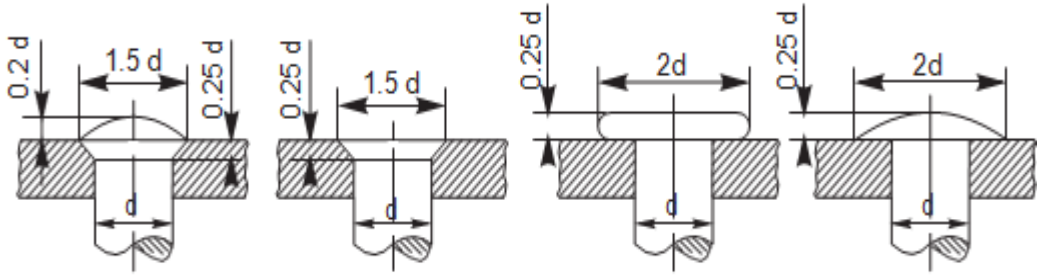
RIVETTED JOINTS



Rivet

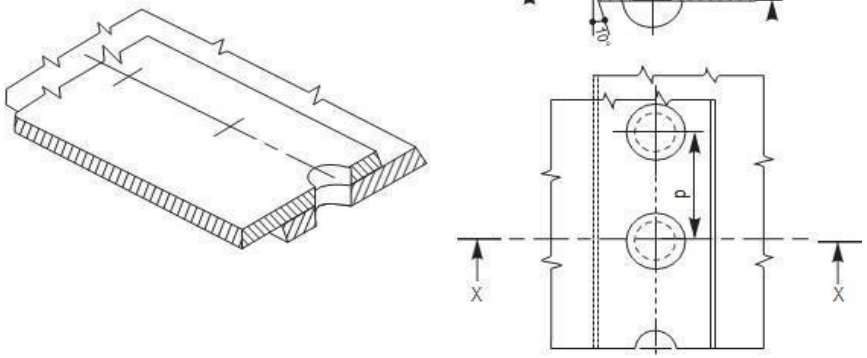


Types of rivet heads

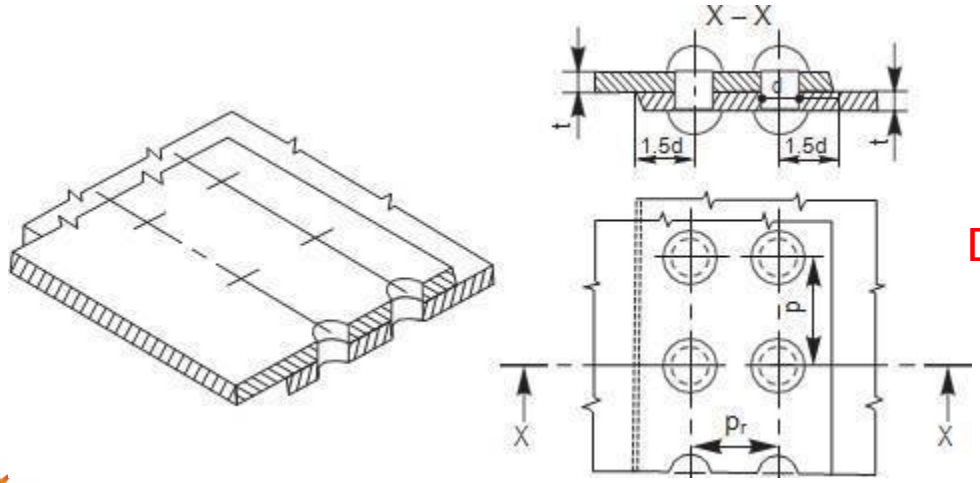


RIVETTED JOINTS

Lap Joints



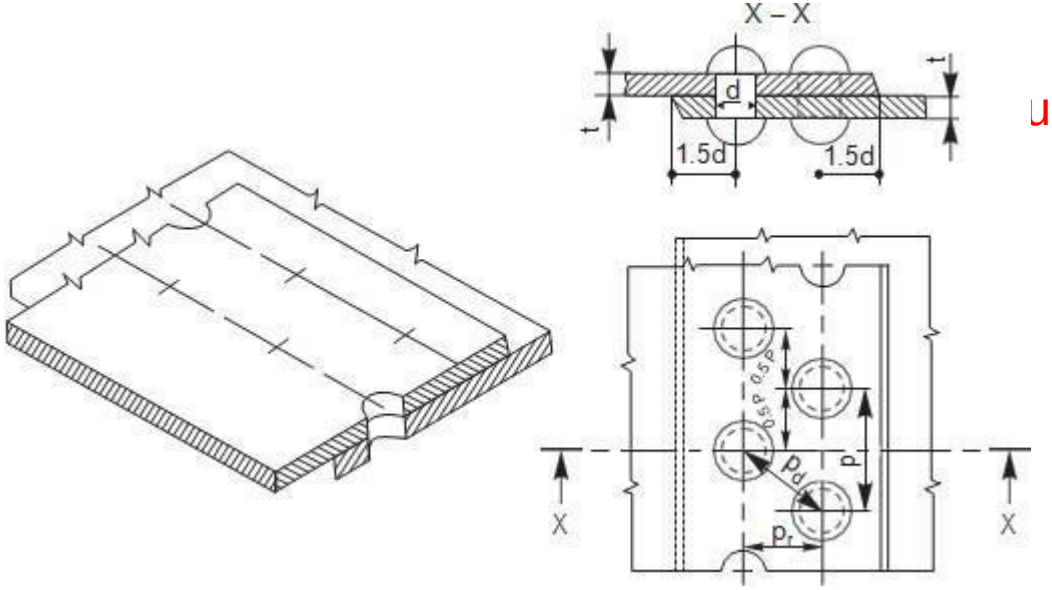
Single riveted lap joint



Double riveted chain lap joint

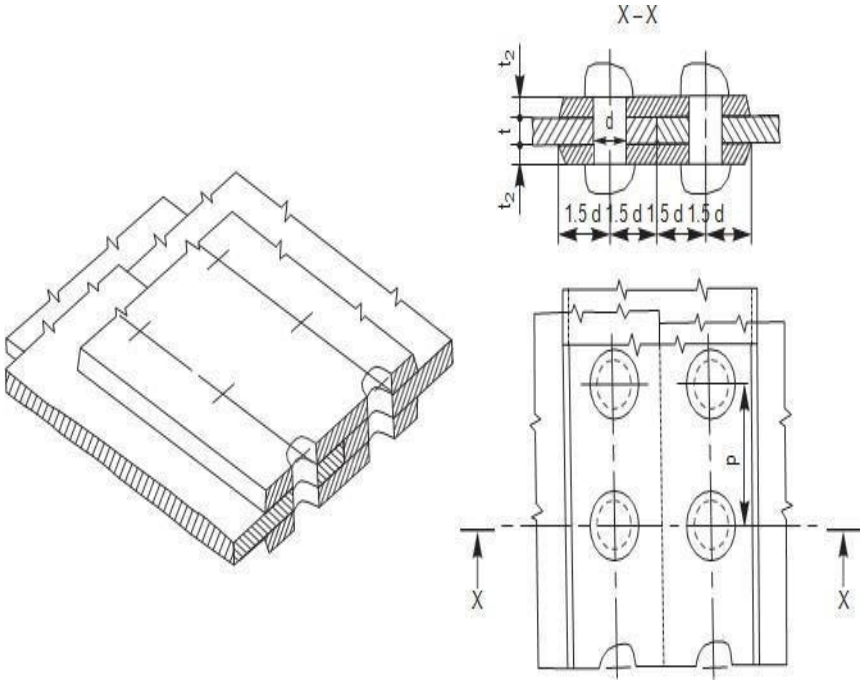
RIVETTED JOINTS

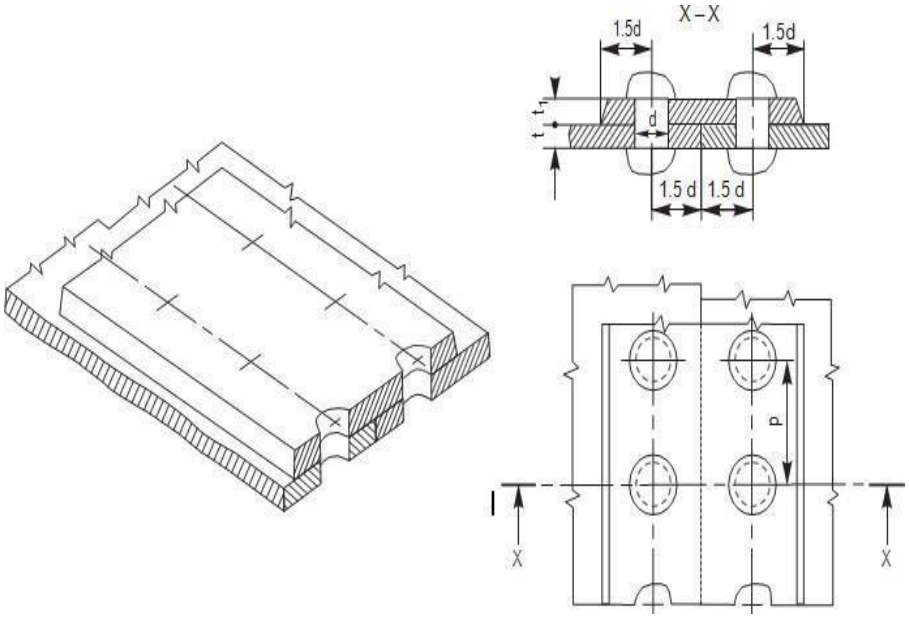
Lap Joints



uble riveted zig-zag lap joint

BUTT JOINTS

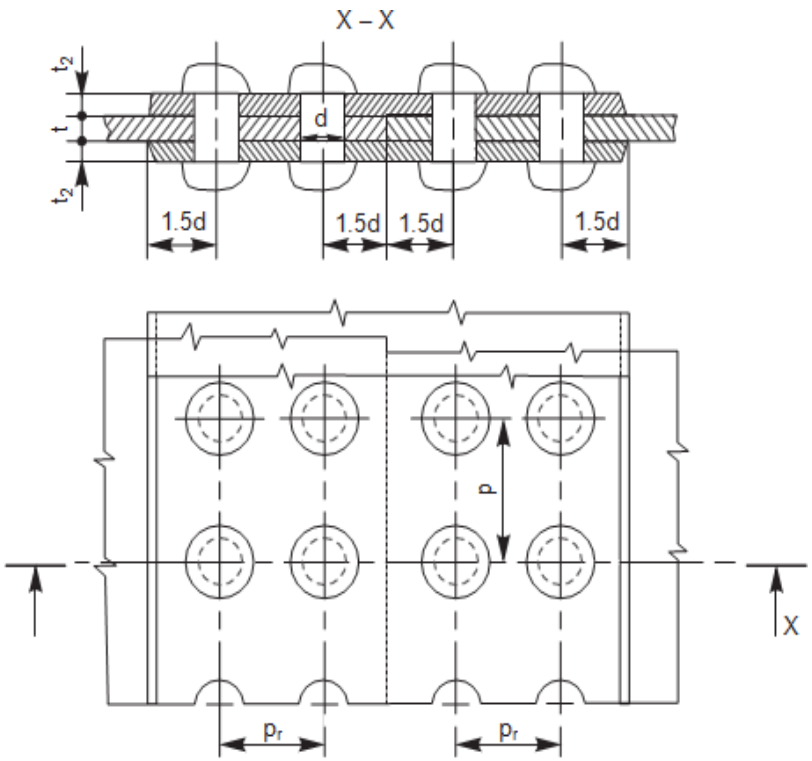




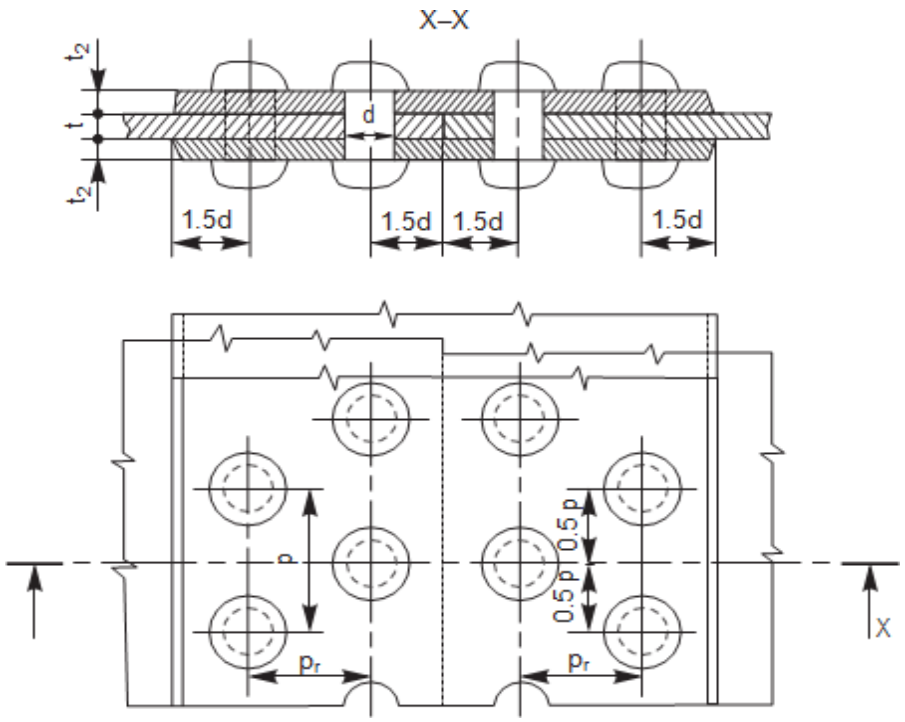
Single riveted, double strap butt joint

Single riveted, single strap butt joint

BUTT JOINTS



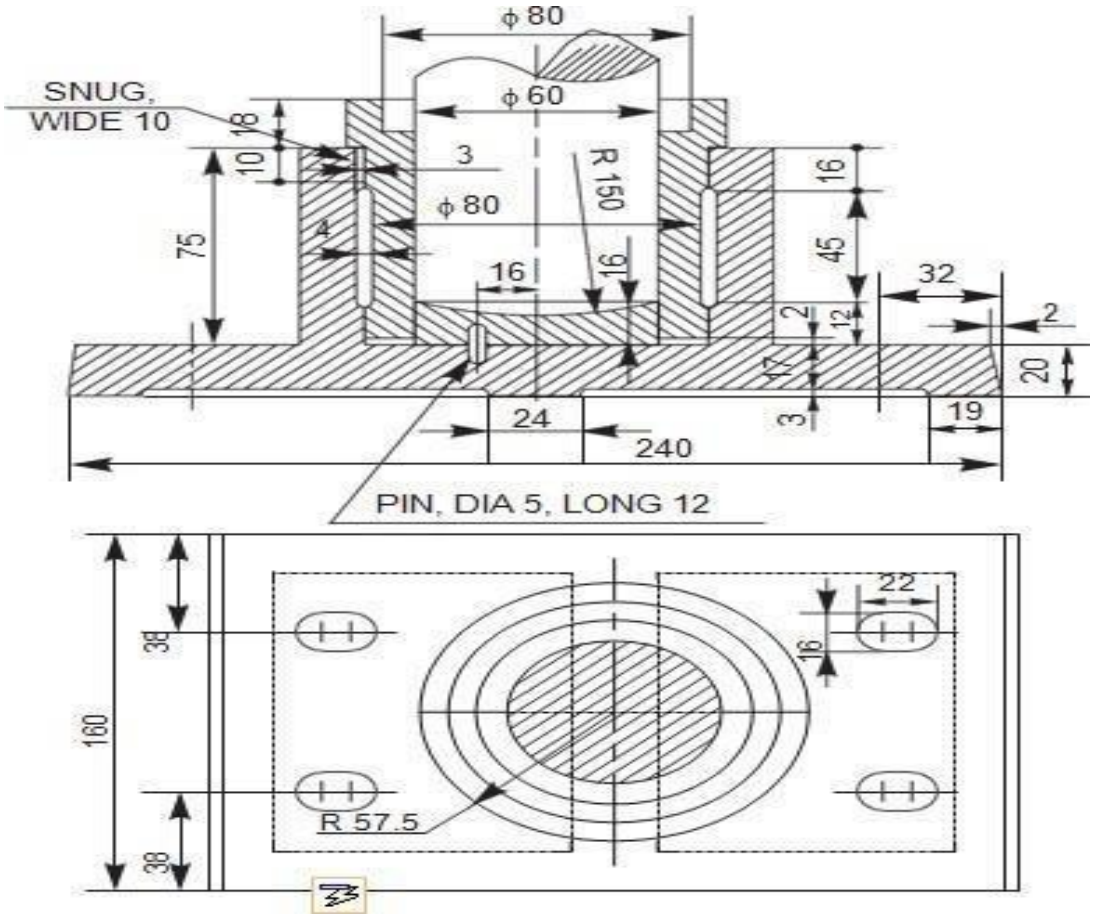
Double riveted, double strap chain butt joint



Double riveted, double strap zig-zag butt joint

RIVETED JOINTS ANIMATION

PIVOT OR FOOT-STEP BEARING



https://www.youtube.com/watch?v=l4HM1R5dNHo

COURSE OUTLINE UNIT-2

UNIT-2

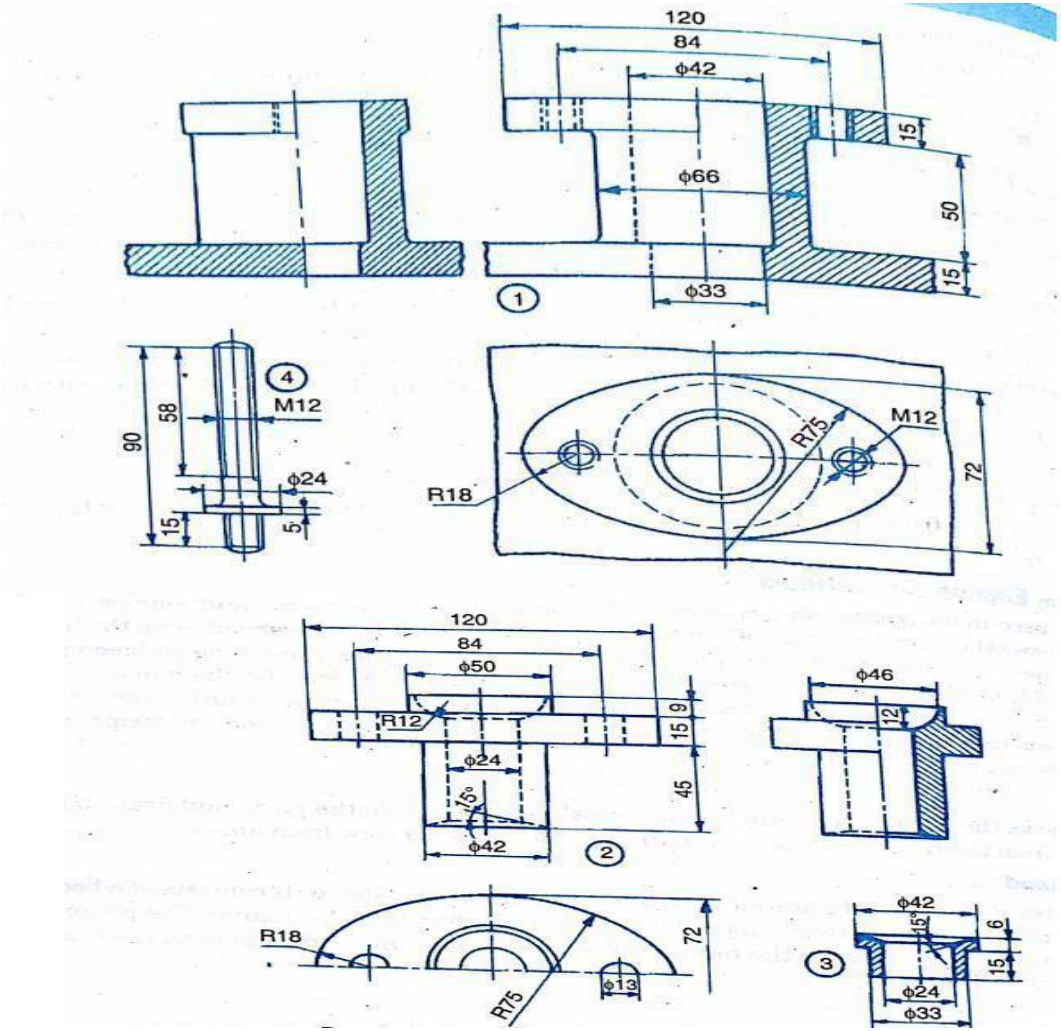
NO OF LECTURE HOURS:

LECTURE	LECTURE TOPIC	KEY ELEMENTS	LEARNING OBJECTIVES
1.	**Engine parts**	stuffing box, cross head, Eccentric, Petrol Engine connecting rod	1. Understand the PART drawing of assembly components (B2). 2.Apply the assembly procedure (B3)
2.	**machine parts**	Screws jack, Machine Vice, Plummer block, Tailstock	1. Understand the PART drawing of assembly components (B2). 2.Apply the assembly procedure (B3)
3.	**Valves**	spring loaded safety valve, feed check valve	1. Understand the PART drawing of assembly components (B2). 2.Apply the assembly procedure (B3)

COURSE OBJECTIVES

UNIT - 2	CO4: students learn about the drawings of assembled views for the part drawings of the following using conventions like Engine parts.
	CO5: students learn about the drawings of assembled views for the part drawings of the following using conventions like machine parts, Valves.

STUFFING BOX



STUFFING BOX

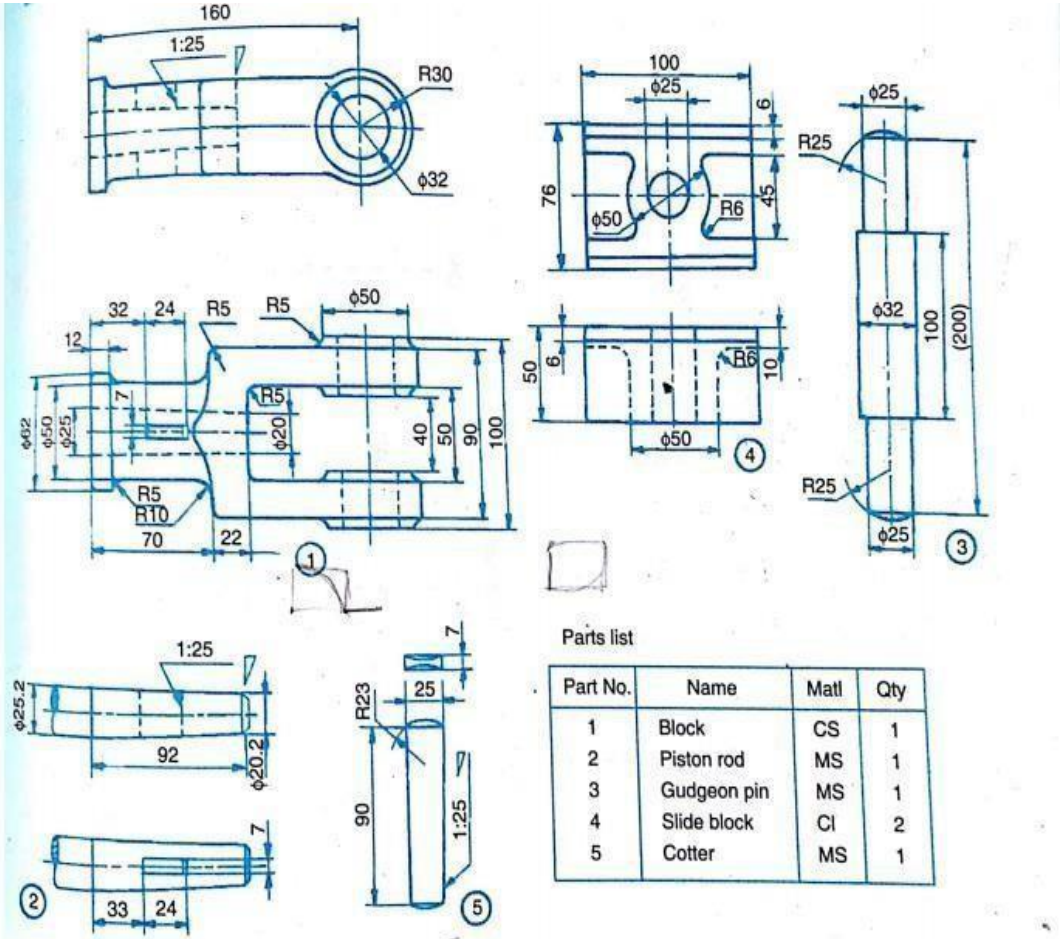
Assembly Drawing Link

https://www.youtube.com/watch?v=rLDC1L1WFW8

Assembly Drawing animation Link

https://www.youtube.com/watch?v=8ar0oYyF5a8

STEAM ENGINE CROSSHEAD



Parts list

Part No.	Name	Matl	Qty
1	Block	CS	1
2	Piston rod	MS	1
3	Gudgeon pin	MS	1
4	Slide block	CI	2
5	Cotter	MS	1

Fig. 18.2 Steam engine crosshead

STEAM ENGINE CROSSHEAD

Assembly Drawing Link

https://www.youtube.com/watch?v=iESHDRW1Rks

Assembly Drawing animation Link

https://www.youtube.com/watch?v=z9Sudq0vUSE

CROSSHEAD

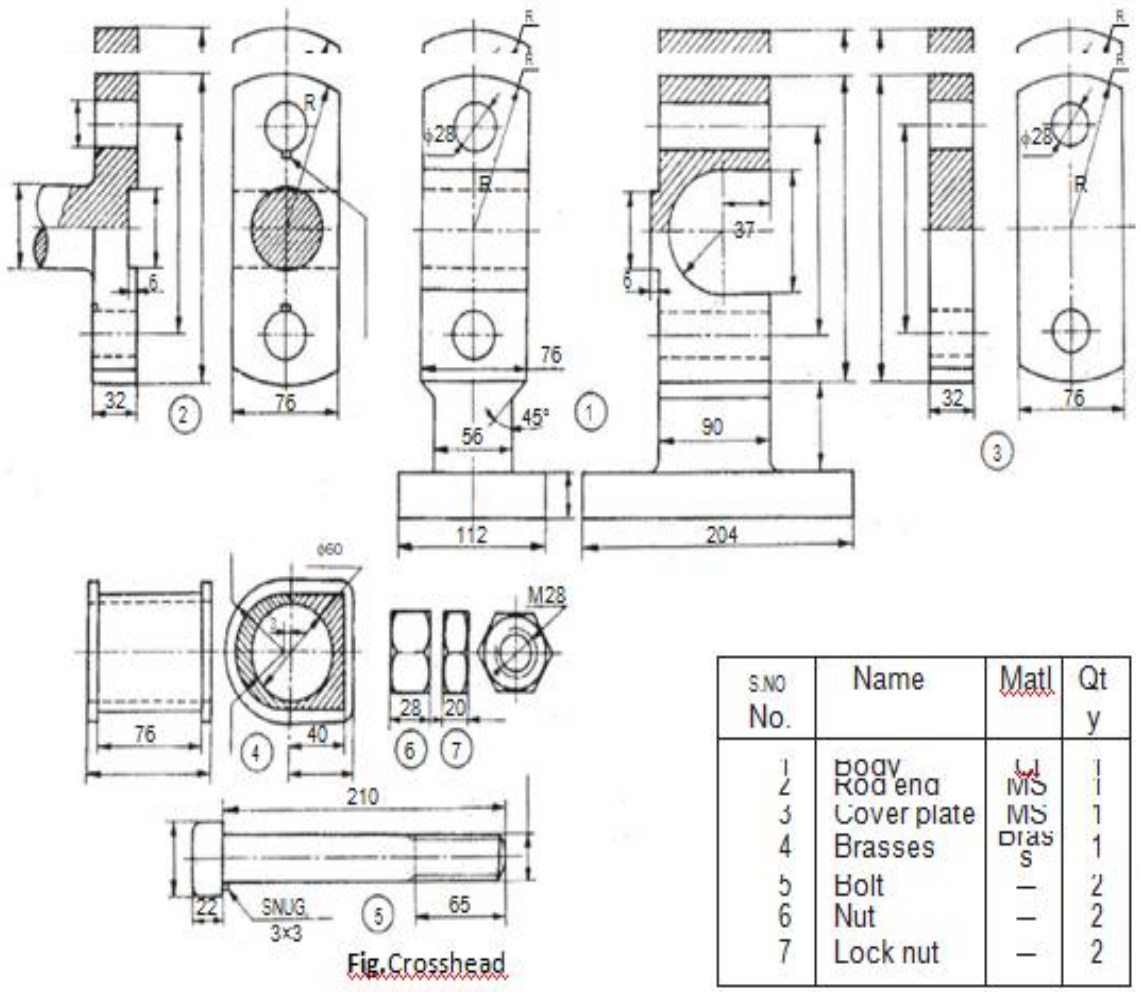


Fig.Crosshead

S.NO No.	Name	Matl	Qty
1	Body	M.I	1
2	Rod end	MS	1
3	Cover plate	MS	1
4	Brasses	Brass	1
5	Bolt	—	2
6	Nut	—	2
7	Lock nut	—	2

CROSSHEAD

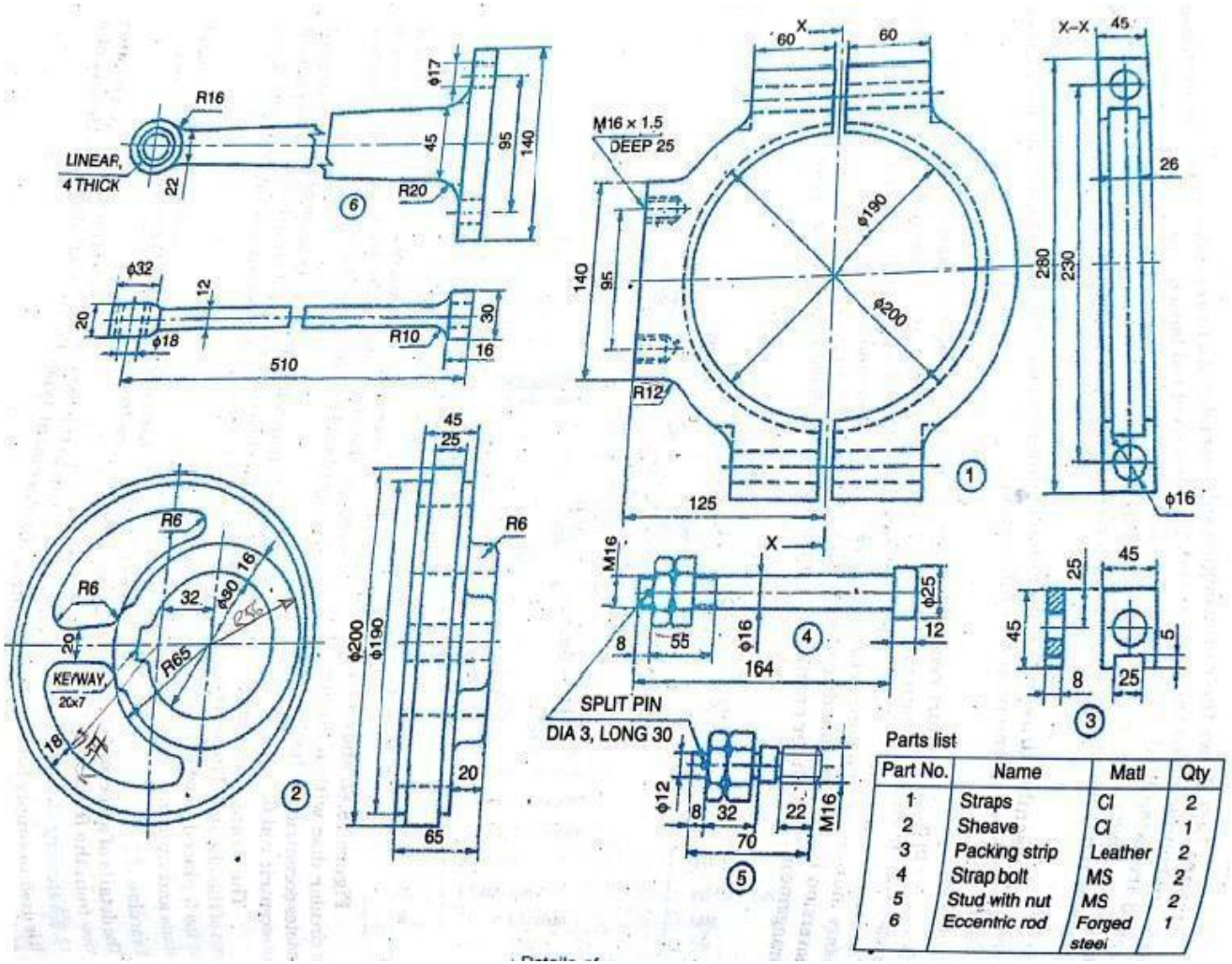
Assembly Drawing Link

https://www.youtube.com/watch?v=Ept1ztQsXsM

Assembly Drawing animation Link

https://www.youtube.com/watch?v=jm5sOOhNo6c

ECCENTRIC



Parts list

Part No.	Name	Matl	Qty
1	Straps	CI	2
2	Sheave	CI	1
3	Packing strip	Leather	2
4	Strap bolt	MS	2
5	Stud with nut	MS	2
6	Eccentric rod	Forged steel	1

ECCENTRIC

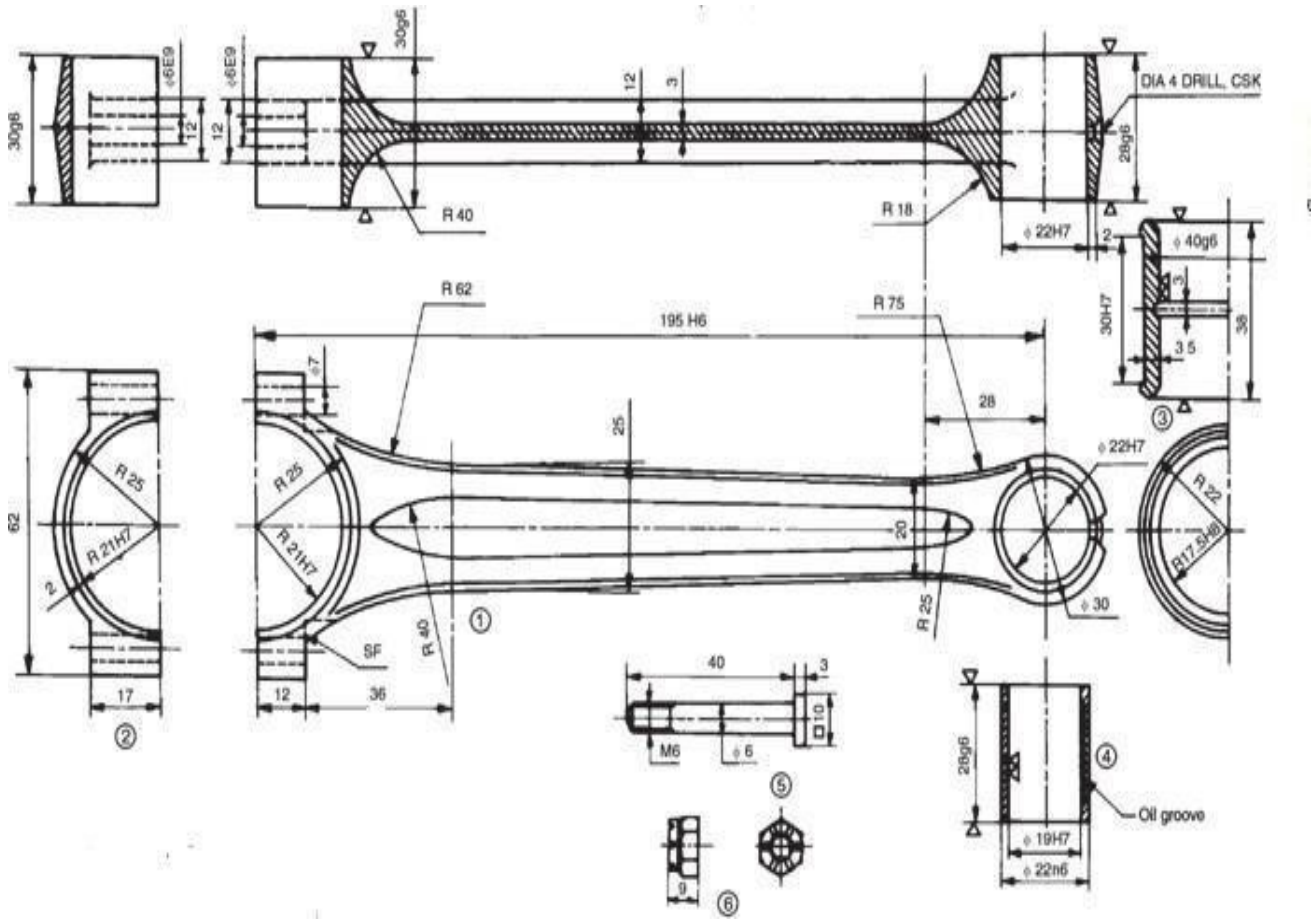
Assembly Drawing Link

https://www.youtube.com/watch?v=-Lts0axaeis

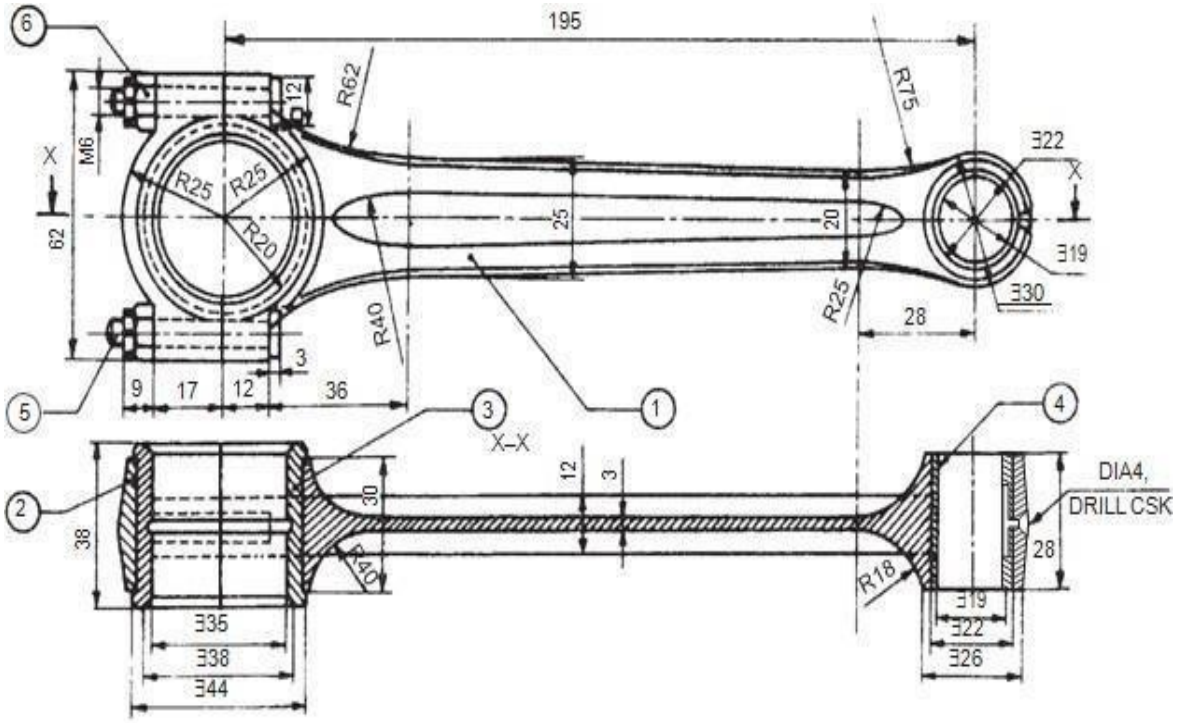
Assembly Drawing animation Link

https://www.youtube.com/watch?v=xbzWbB-pLL4

CONNECTING ROD



CONNECTING ROD



Parts list

Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

CONNECTING ROD

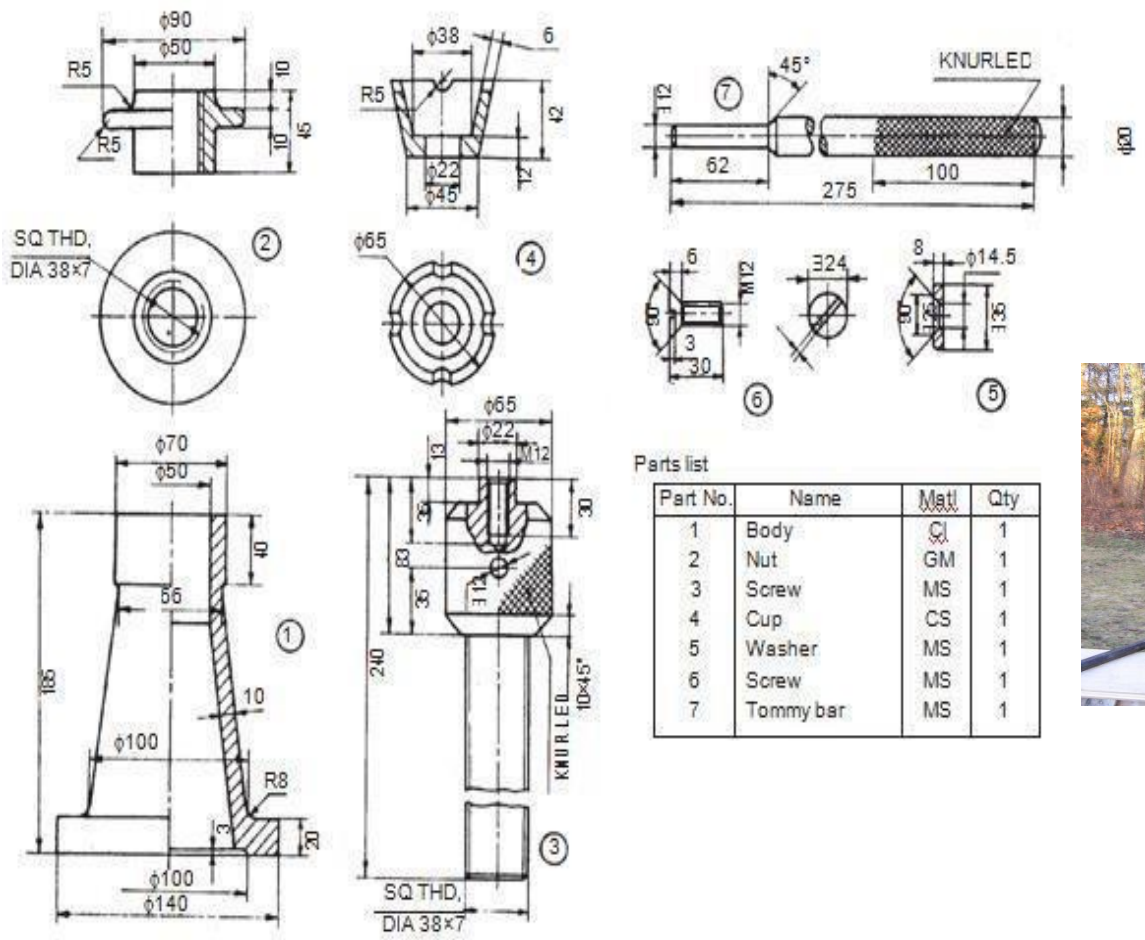
Assembly Drawing Link

https://www.youtube.com/watch?v=ZoCn4Pb6rLU

Assembly Drawing animation Link

https://www.youtube.com/watch?v=6emnuUPytLo

SCREW JACK



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

Screw jack

SCREW JACK

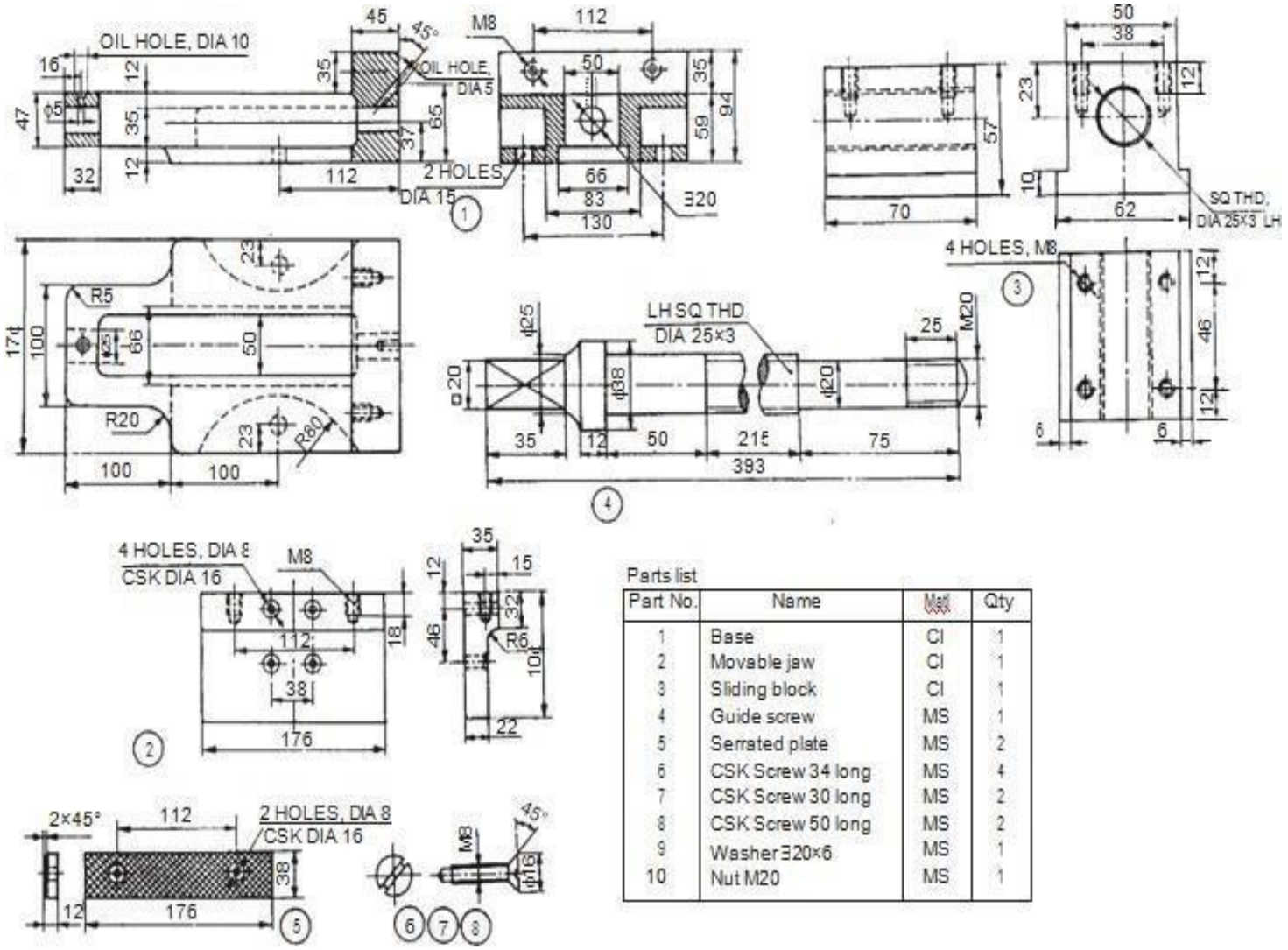
Assembly Drawing Link

https://www.youtube.com/watch?v=H_nOMxAoI84

Assembly Drawing animation Link

https://www.youtube.com/watch?v=r7ajkX1DrYw

MACHINE VICE



Parts list

Part No.	Name	Matl	Qty
1	Base	CI	1
2	Movable jaw	CI	1
3	Sliding block	CI	1
4	Guide screw	MS	1
5	Serrated plate	MS	2
6	CSK Screw 34 long	MS	4
7	CSK Screw 30 long	MS	2
8	CSK Screw 50 long	MS	2
9	Washer ∃20×6	MS	1
10	Nut M20	MS	1

MACHINE VICE

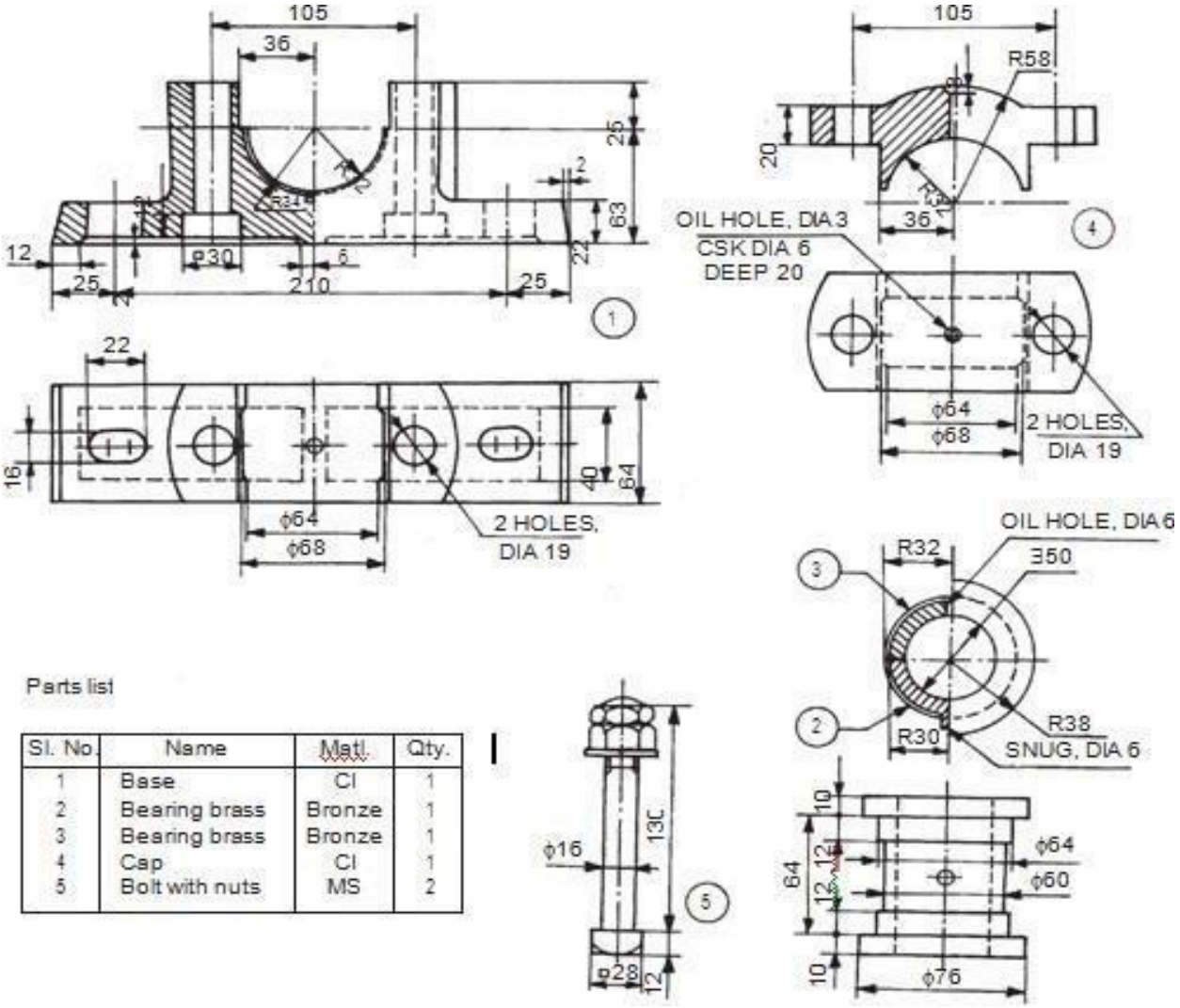
Assembly Drawing Link

https://www.youtube.com/watch?v=sghEwiN2tkE

Assembly Drawing animation Link

https://www.youtube.com/watch?v=Ss5nBSIr5MY

PLUMMER BLOCK



Parts list

Sl. No.	Name	Matl.	Qty.
1	Base	CI	1
2	Bearing brass	Bronze	1
3	Bearing brass	Bronze	1
4	Cap	CI	1
5	Bolt with nuts	MS	2

MACHINE VICE

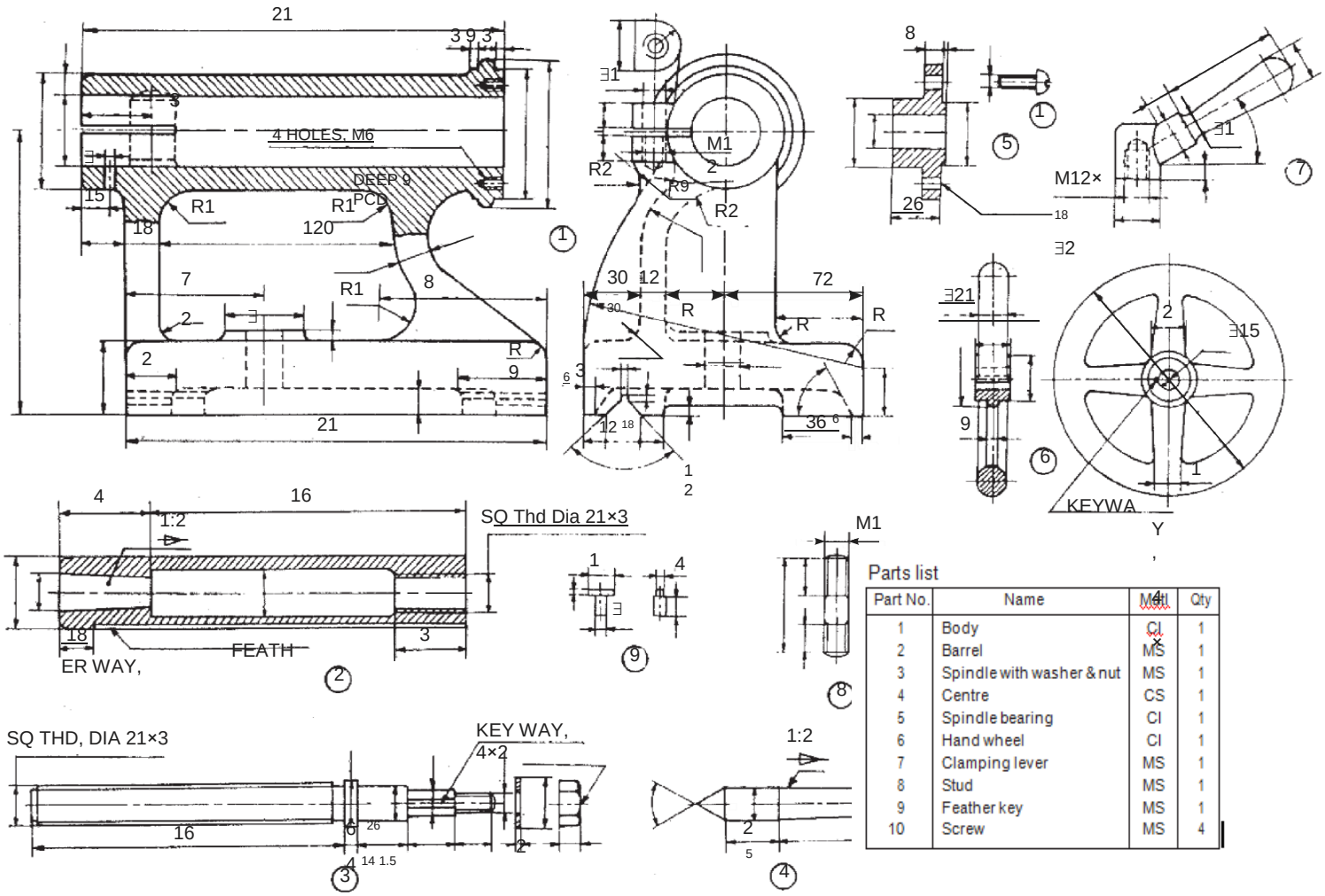
Assembly Drawing Link

https://www.youtube.com/watch?v=igsyruvtIWg

Assembly Drawing animation Link

https://www.youtube.com/watch?v=Y-_LjEjyLhA

LATHE TAIL-STOCK



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Barrel	MS	1
3	Spindle with washer & nut	MS	1
4	Centre	CS	1
5	Spindle bearing	CI	1
6	Hand wheel	CI	1
7	Clamping lever	MS	1
8	Stud	MS	1
9	Feather key	MS	1
10	Screw	MS	4

LATHE TAIL-STOCK

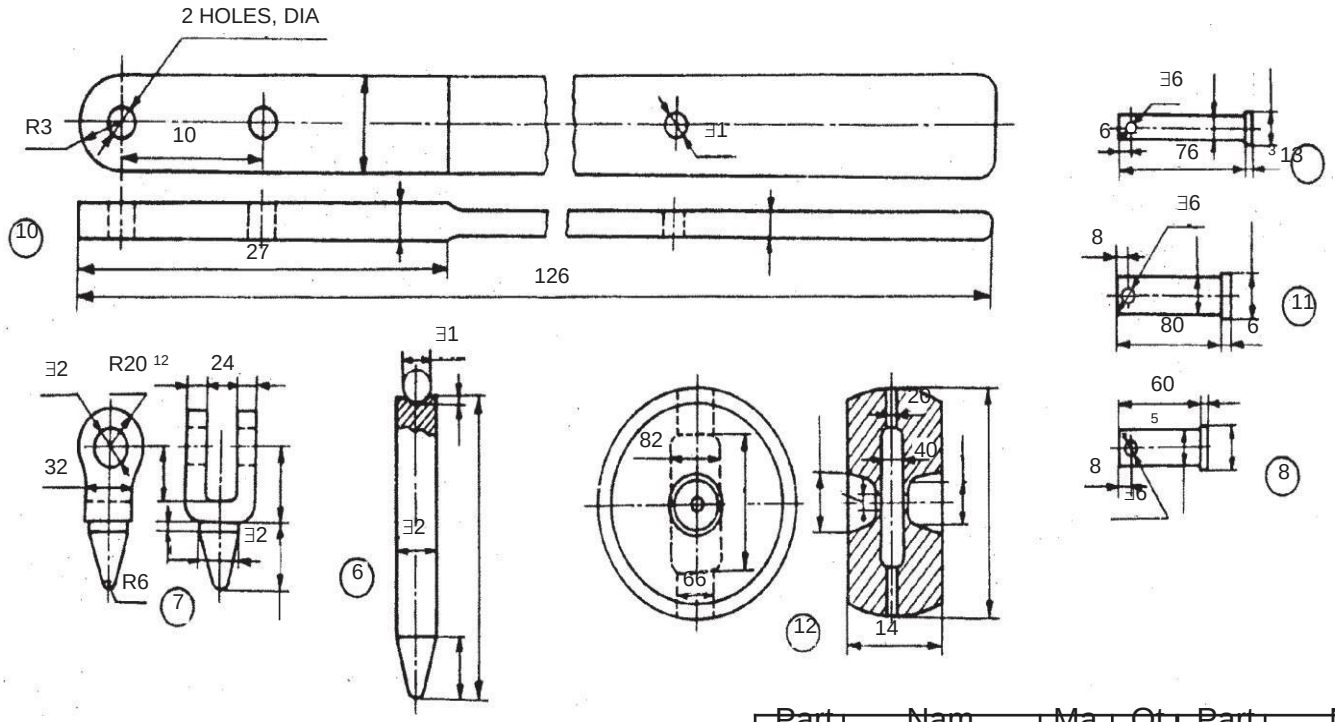
Assembly Drawing Link

https://www.youtube.com/watch?v=16SufCt10WY

Assembly Drawing animation Link

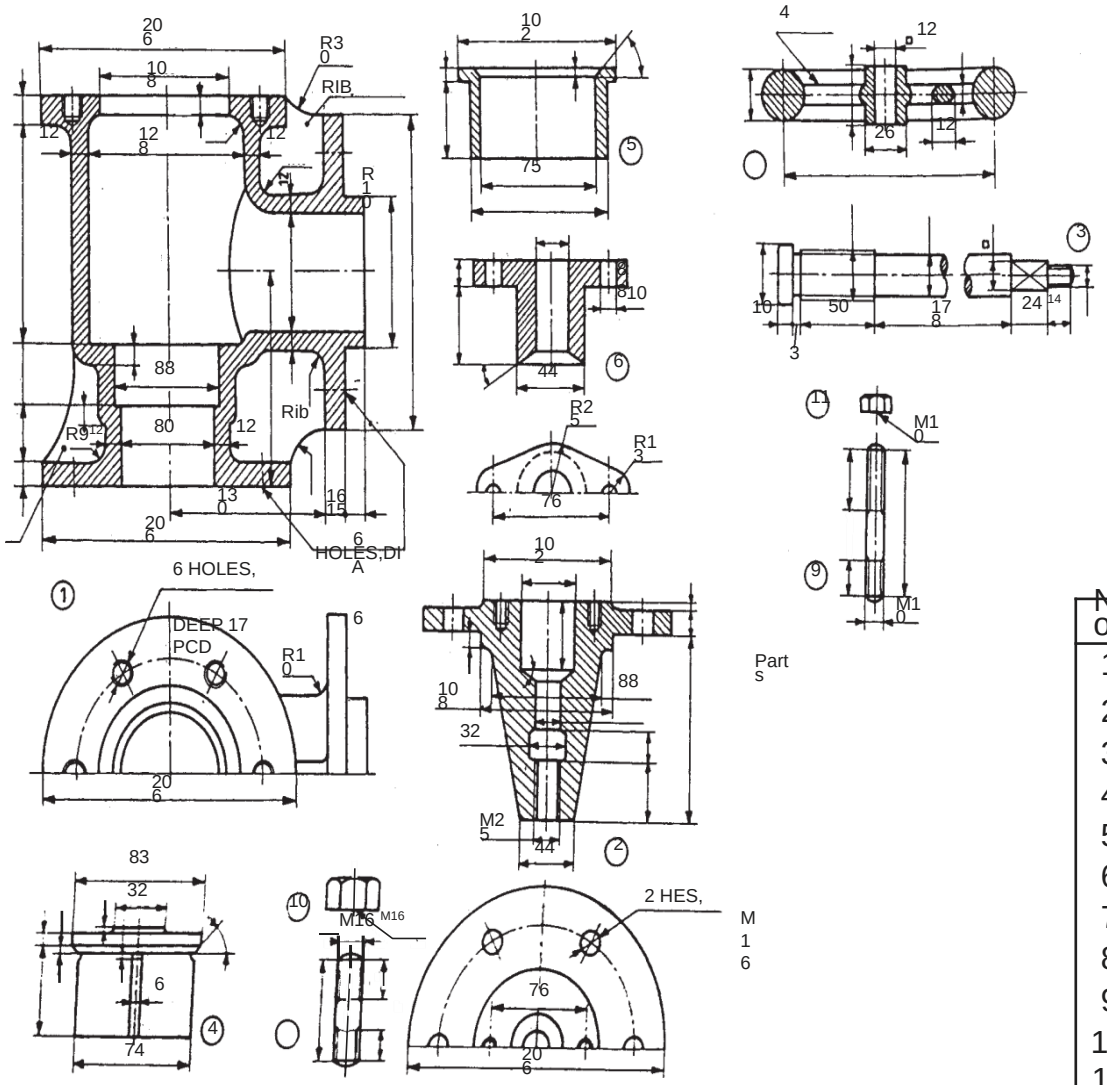
https://www.youtube.com/watch?v=rrnbS10iYDA

SPRING LOADED SAFETY VALVE



Part No.	Name	Matl	Qty	Part No.	Name	Matl	Qty
1	Body	CI	1	8	Toggle-pin	MS	1
2	Valve seat	GM	1	9	Lever guide	MS	1
3	Valve	GM	1	10	Lever	FS	1
4	Cover	CI	1	11	Fulcrum pin	MS	1
5	Cover bush	Brass	1	12	Weight	CI	1
6	Spindle	MS	1	13	Lever pin	MS	1
7	Toggle	MS	1	14	Stud with nut M20	—	6

FEED CHECK VALVE



No.	Name	Matl.	Qty
1	Body	CI	1
2	Cover	CI	1
3	Spindle	MS	1
4	Valve	GM	1
5	Valve seat	GM	1
6	Gland	GM	1
7	Hand wheel	CI	1
8	Stud	MS	6
9	Stud	MS	2
10	Nut	MS	6
11	Nut	MS	3

FEED CHECK VALVE

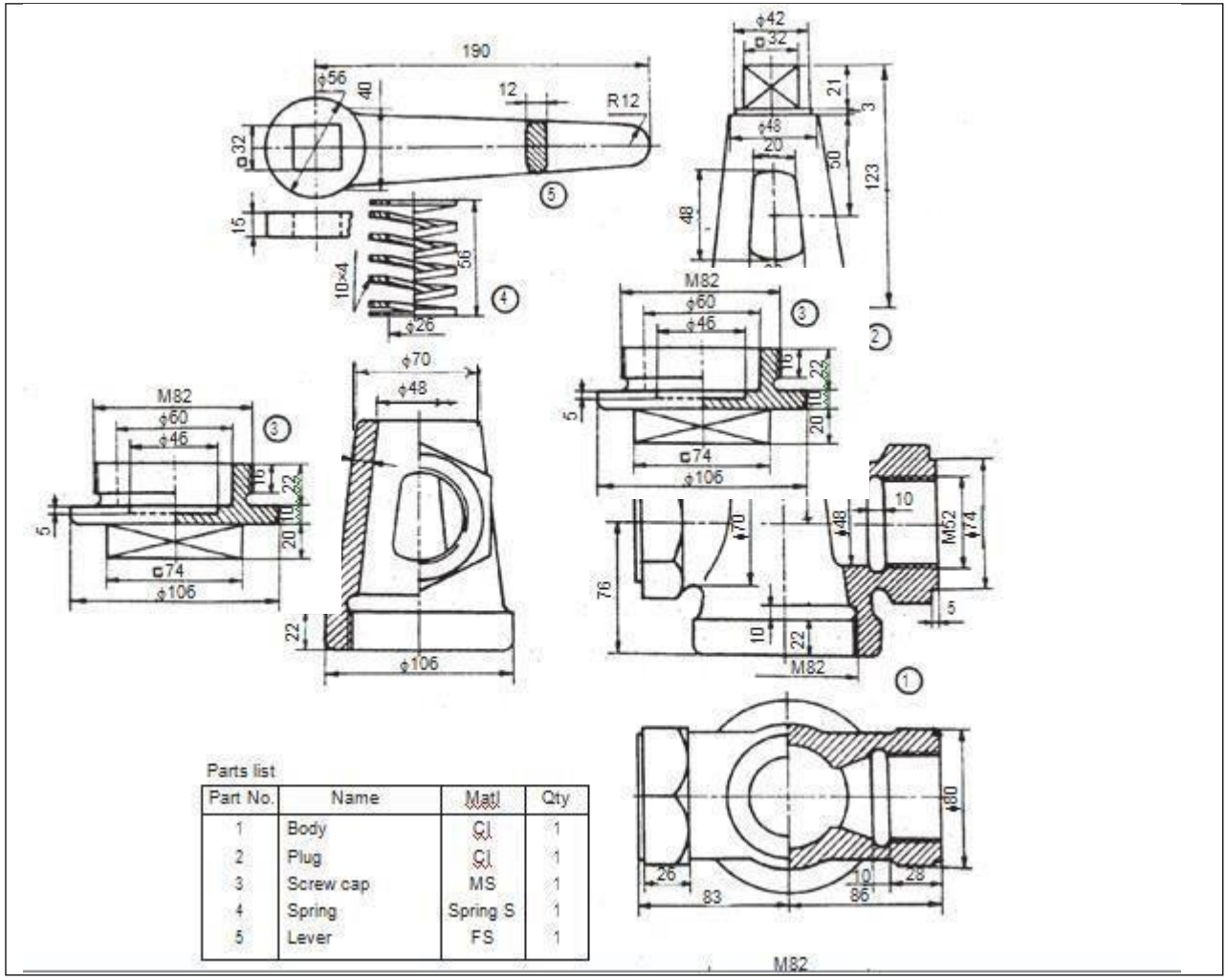
Assembly Drawing Link

https://www.youtube.com/watch?v=KCIy0n4tAUo

Assembly Drawing animation Link

https://www.youtube.com/watch?v=unMZIAiuzwY

AIR COCK



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Plug	CI	1
3	Screw cap	MS	1
4	Spring	Spring S	1
5	Lever	FS	1

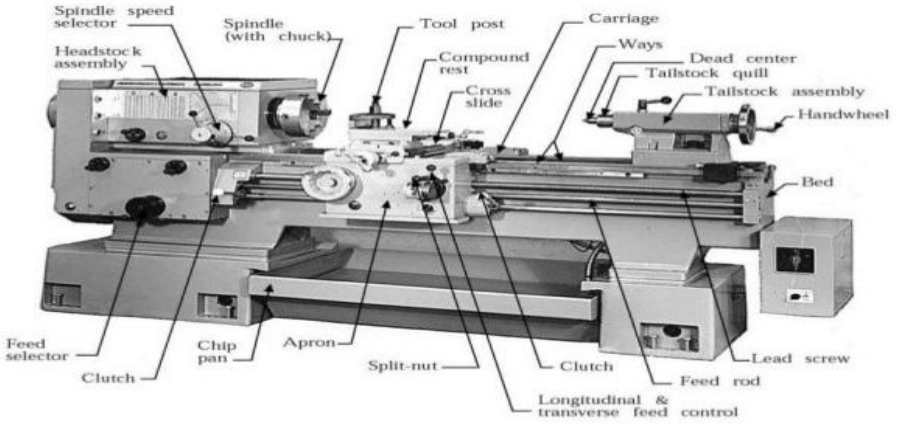
AIR COCK

Assembly Drawing animation Link

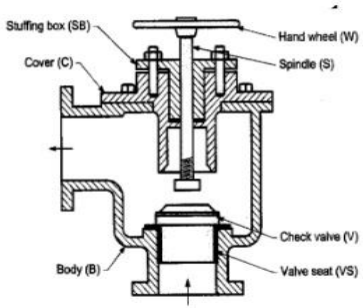
https://www.youtube.com/watch?v=CmNWh_wRDKo

INDUSTRIAL APPLICATIONS

INDUSTRIAL APPLICATIONS



FEED CHECK VALVE



Feed check valve works as NRV (Non-return valve).

Prevents the back flow of water from the boiler when the feed water pump is either not working or in case of its failure.

QUESTION PAPER

Code No: R17A0310 **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, May 2019

Machine Drawing

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper consists of 2 parts. Answer any **TWO** Questions from part-A, Which carries of 28 marks and Part-B consist of one question which is compulsory which carries 42 marks.

******

Part- A (28 Marks)

Answer any two of the following (14*2=28)

1. Draw the sectional front view of a universal coupling joining two shafts of diameter 50 mm. Show the dimensions.
2. Draw the sectional view from the front and top view of a single riveted single strap butt joint with plates of thickness 15 mm.
3. Sketch the sectional front view of rag foundation bolt of diameter 25 mm. Show the proportionate dimensions in the drawing.

Part-B (42 Marks) (1*42=42M)

4. Develop the assembly drawing views as mentioned below of Screw Jack using the part drawings shown in Figure.1.
   (i) Half-Sectional Front View
   (ii) Top View

Figure 1. Details of Screw Jack

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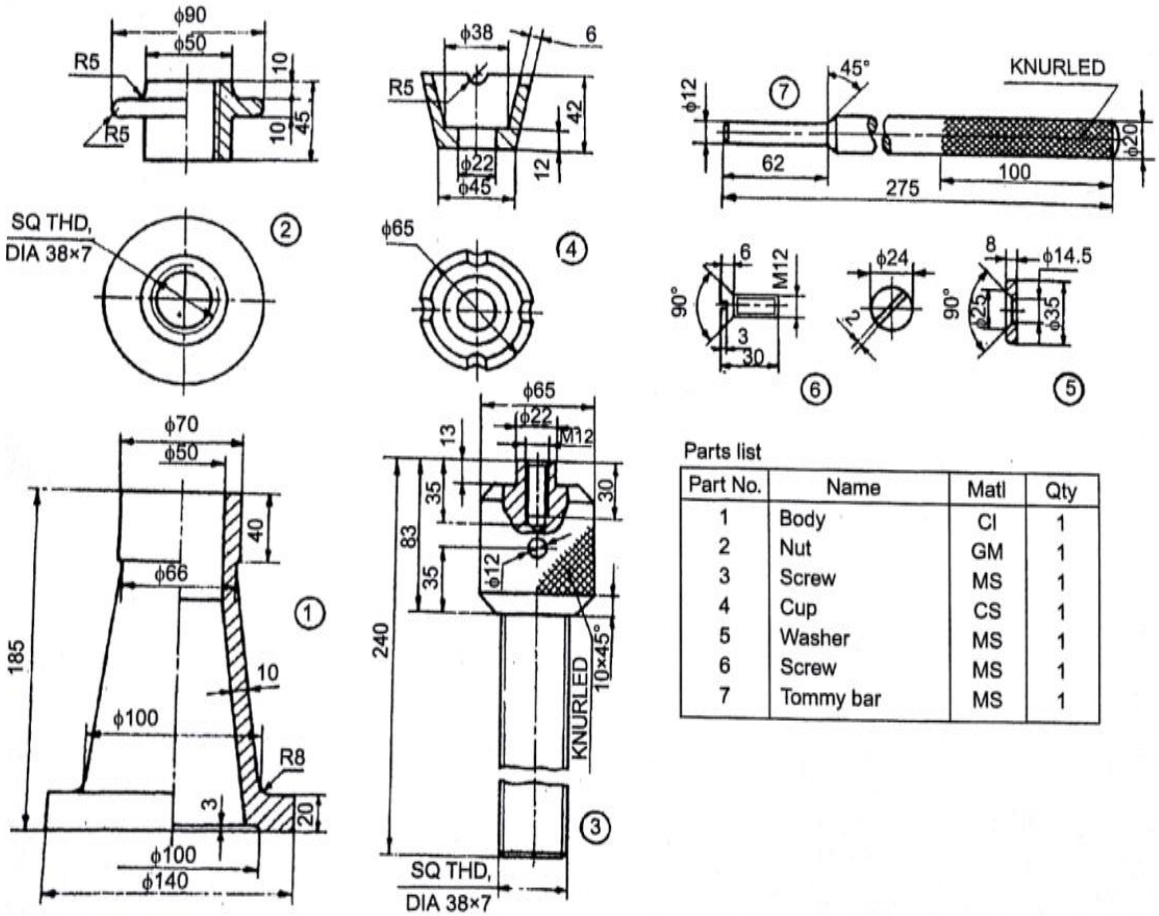
QUESTION PAPER



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1