Sri Indu
College of Engineering & Technology
UGC Autonomous Institution
Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH
Estd.2001

NAAC
NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

ENGINEERING WORKSHOP LAB (R22 - R22MED1124)

I BTECH I& II SEMESTER

(COMMON TO ALL BRANCHES)

DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR2022-23

DEPARTMENT OF MECHANICAL ENGINEERING

Branch: COMMON TO ECE, EEE,CSE,IT,CSIT,CS,DS,IoT,AI&ML&AI&D

Class: B.Tech- I Year- I SEM & II SEM

Subject Name: Engineering Workshop Lab

Subject Code: R22MED1124

Academic Year: 2022-23

Regulation: R22

Core/Elective/H&S: ME

Credits: 2.5

No of practical's per week: 03

SNO	Prepared By	Regulation	Date
1	D.DHARMA	R22	
	SANTHOSH KUMAR.B		
2	**Revised By**		
	L.RAVI		
	K.VIJAY KUMAR		

Verified By

Head of the Department

DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING WORKSHOP LAB

INDEX

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTION VISION

TobeapremierInstitutioninEngineering&TechnologyandManagementwithcompetency, values and socialconsciousness.

INSTITUTION MISSION

IM1 Provide high quality academic programs, training activities and researchfacilities.

IM2 Promote Continuous Industry-Institute interaction for employability, Entrepreneurship, leadership and research aptitude amongstakeholders.

IM3 Contribute to the economical and technological development of the region, state and nation.

DEPARTMENT VISION

To be a centre of excellence in Electronics and Communication Engineering Education to produce professionals for ever-growing needs ofsociety

DEPARTMENT MISSION

The Department has following Missions:

DM1: To promote and facilitate student-centric learning.

DM2: To involve in activities that enable overall development of stakeholders.

DM3: To provide holistic environment with state-of-art facilities for students to develop solutions for various social needs.

DM4: Organize trainings in Embedded Systems with Industry interaction.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: **Higher studies:**Graduates with an ability to pursue higher studies and get employment in reputed institutions and organization.

PEO2: **Domain knowledge:** Graduates with an ability to design and develop a product.

PEO3: **Professional career:** Graduates with excellence by multidisciplinary approach to achieve successful professional career.

PEO4: **Life Long Learning:** Graduates with an ability to learn advanced skills to face professional competence through life long learning.

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)

PO	Description
PO 1	**Engineering Knowledge**: Apply the knowledge of mathematics/ science/ engineering fundamentals/ and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify/ formulate/ review research literature/ and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics/ natural sciences/ and engineering sciences.
PO 3	**Design / development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety/ and the cultural/ societal/ and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments/ analysis and interpretation of data/ and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create/ select/ and apply appropriate techniques/ resources/ and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal/ health/ safety/ legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts/ and demonstrate the knowledge of/ and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work:** Function effectively as an individual/ and as a member or leader in diverse teams/ and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large/ such as/ being able to comprehend and write effective reports and design documentation/ make effective presentations/ and give and rEEEive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work/ as a member and leader in a team/ to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for/ and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change

Program Specific Outcomes	
PSO 1	To manure and empower the SICET-ECE students strong in practical, technical and research domains in the areas of Signal/ Image processing. VLSI and wireless Communication.
PSO 2	To design and develop a prototype system that will incorporate user requirements using modern devices and emerging technology for industry automations.
PSO 3	To make the SICET-ECE students as successful industry ready engineers by imparting essential interpersonal skills and wide spread exposure on multi-disciplinary technologies.

Head of the Department

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Academic Year: 2022-23 B.Tech IYear ISem

COs MAPPING WITH POs & PSOs

(R22MED1124**) :** Engineering Workshop Lab

Course outcomes	Statements
C114.1	Study and practice on machine tools and their operations. **(L4-Analyzing)**
C114.2	Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry. . **(L4-Analyzing)**
C114.3	To understand the foundry, house wiring and welding Trades. **(L4-Analyzing)**
C114.4	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. . **(L4-Analyzing)**
C114.5	Apply basic electrical engineering knowledge for house wiring practice.**(L4-Analyzing)**

CO	**Program Outcomes**												**Program Specific Outcomes**		
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO 3**
C114.1	2	2	1	2	1	-	-	-	-	1	1	2	2	2	-
C114.2	2	2	1	3	1	2	-	-	-	2	1	2	2	2	-
C114.3	2	2	1	2	1	-	-	-	-	-	1	2	2	2	-
C114.4	2	2	1	3	3	-	-	-	-	-	1	2	2	2	-
C114.5	2	2	1	3	2	1	-	-	-	-	1	2	2	2	-
C114	2	**2**	**1**	**2.1**	**1.3**	**0.5**	**-**	**-**	**-**	**0.5**	**1**	**2**	**2**	**2**	**-**

						APRIL - 23

DAYS					JANUARY -23						1	I SEMESTER END EXAMINATIONS
SUNDAY					1	NEW YEAR/ HOLIDAY					2	HOLIDAY
MONDAY	NOVEMBER -22				2	MID I EXAM					3	COMMENCEMENT OF II SEMESTER CLASSES- I MID
TUESDAY	1				3	MID I EXAM	FEBRUARY - 23		MARCH - 23		4	
WEDNESDAY	2		DECEMBER - 22		4	MID I EXAM	1		1		5	
THURSDAY	3	INDUCTION & ORIENTATION PROGRAM I SEMESTER CLASSES- I MID	1		5	I SEMESTER CLASSES- II MID	2		2		6	
FRIDAY	4		2		6		3		3	MID II EXAM	7	
SATURDAY	5		3		7		4		4	MID II EXAM	8	
SUNDAY	6	HOLIDAY	4	HOLIDAY	8	HOLIDAY	5	HOLIDAY	5	HOLIDAY	9	HOLIDAY
MONDAY	7	INDUCTION & ORIENTATION PROGRAM I SEMESTER CLASSES- I MID	5		9		6		6	MID II EXAM	10	
TUESDAY	8		6		10		7		7	MID II EXAM	11	
WEDNESDAY	9		7		11		8		8	HOLI	12	
THURSDAY	10		8		12		9		9	MID II EXAM	13	
FRIDAY	11		9		13	PONGAL / HOLIDAY	10		10	PREPARATION & LAB END EXAMINATIONS	14	
SATURDAY	12		10		14	PONGAL / HOLIDAY	11		11		15	
SUNDAY	13	HOLIDAY	11	HOLIDAY	15	PONGAL/ HOLIDAY	12	HOLIDAY	12	HOLIDAY	16	HOLIDAY
MONDAY	14		12		16	PONGAL / HOLIDAY	13		13	PREPARATION & LAB END EXAMINATIONS	17	
TUESDAY	15		13		17		14		14		18	
WEDNESDAY	16		14		18		15		15		19	
THURSDAY	17		15		19		16		16	I SEMESTER END EXAMINATIONS	20	
FRIDAY	18		16		20		17		17		21	
SATURDAY	19		17		21		18	SIVARATHRI/ HOLIDAY	18		22	
SUNDAY	20	HOLIDAY	18	HOLIDAY	22	HOLIDAY	19	HOLIDAY	19	HOLIDAY	23	HOLIDAY
MONDAY	21		19		23		20		20	I SEMESTER END EXAMINATIONS	24	
TUESDAY	22		20		24		21		21		25	

WEDNESDAY	23		21		25		22		22	UGADI	26	
THURSDAY	24		22		26	REPUBLIC DAY	23		23	I SEMESTER END EXAMINATIONS	27	
FRIDAY	25		23		27		24		24		28	
SATURDAY	26		24		28		25		25		29	
SUNDAY	27	HOLIDAY	25	X-MAS	29	HOLIDAY	26	HOLIDAY	26	HOLIDAY	30	HOLIDAY
MONDAY	28		26	BOXING DAY/ HOLIDAY	30		27		27	I SEMESTER END EXAMINATIONS		
TUESDAY	29		27		31		28		28			
WEDNESDAY	30		28						29			
THURSDAY			29						30	SRI RAMA NAVAMI		
FRIDAY			30	MID I EXAM					31	I SEMESTER END EXAMINATIONS		
SATURDAY			31	MID I EXAM								

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Sheriguda (V), Ibrahimpatnam, R.R.Dist, Hyderabad - 501 510

D4

BR-22

Lr.No.SICET/AUTO/DAE/BR-22/Academic Cal./655/2022 Date: 27.10.2022

I B.TECH. ACADEMIC CALENDAR
ACADEMIC YEAR : 2022-2023

Dr.G. SURESH,
Principal,

To,
All the HODs
Sir,

Sub: SICET (Autonomous) - Academic & Evaluation - Academic Calendar for **I B.Tech - I & II Semester** for the academic year **2022-23** – Reg.

****

The approved Academic Calendar for **I B.Tech – I & II Semester** for the academic year **2022-23** is given below:

I SEMESTER

S.NO.	EVENT	PERIOD	DURATION
1.	Induction & Orientation Programme	**03.11.2022**	
2.	1St Spell of Instructions for covering First Two and a half Units	03.11.2022 – 28.12.2022	8 Weeks
3.	I Mid Examinations	29.12.2022 – 04.01.2023	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before	10.01.2023	
5.	2nd Spell of Instructions for covering Remaining Two and a half Units	05.01.2023 – 02.03.2023	8 Weeks
6.	II Mid Examinations	03.03.2023 – 09.03.2023	1 Week
7.	Preparation & Practical Examinations and Remidial Mid Test (RMT)	10.03.2023 – 16.03.2023	1 Week
8.	Submission of II Mid Term Examination Marks Marks to the Autonomous Section on or before	16.03.2023	
9.	I Semester End Examinations	17.03.2023 – 01.04.2023	2 Weeks
Commencement of Class-Work for I B.Tech - II Semester 03.04.2023			

II SEMESTER

S.NO.	EVENT	PERIOD	DURATION
1.	Commencement of II Sem Class Work	**03.04.2023**	
2.	1st Spell of Instructions for covering First Two and a half Units (Including Summer Vacation)	03.04.2023 – 10.06.2023	10 Weeks
	Summer Vacation	15.05.2023 – 27.05.2023	2 Weeks
3.	I Mid Examinations	12.06.2023 – 17.06.2023	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before	23.06.2023	
5.	2nd Spell of Instructions for covering Remaining Two and a half Units	19.06.2023 – 12.08.2023	8 Weeks
6.	II Mid Examinations	14.08.2023 – 19.08.2023	1 Week
7.	Preparation & Practical Examinations and Remidial Mid Test (RMT)	21.08.2023 – 26.08.2023	1 Week
8.	Submission of II Mid Term Examination Marks Marks to the Autonomous Section on or before	26.08.2023	
9.	II Semester End Examinations	28.08.2023 – 09.09.2023	2 Weeks
Commencement of Class Work for II B.Tech – I Semester - 11.09.2023			

ACE **CE** **DEAN** **PRINCIPAL**

Copy to all the Heads of the Depts. and AO.

CONTROLLER OF EXAMINATIONS
Sri Indu College of Engineering & Technology
(An Autonomous Institution under JNTUH)
Sheriguda (V), Ibrahimpatnam, R.R. Dist-501510.

DIRECTOR
(Academic Audit)
Sri Indu College of Engineering & Technology
Sheriguda, IBP, R.R. Dist-501510.

PRINCIPAL
Sri Indu College of Engineering & Technology
(An Autonomous Institution Under JNTUH)
Sheriguda (V), Ibrahimpatnam, R.R. Dist-501510.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - I Year – I Semester

L	T	P	C
0	1	3	2.5

(R22MED1124) ENGINEERING WORKSHOP

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineeringproducts.
- To provide hands on experience about use of different engineering materials, tools,equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipmentand machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work toprescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry.
3. To understand the foundry, house wiring and welding Trades.
4. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
5. Apply basic electrical engineering knowledge for house wiring practice.

Syllabus :

- Introduction to Carpentry : Types Wood, Sizes of Wood or Timber, Characteristics of Wood, Types of Marking and Measuring Tools, Holding Tools, Cutting Tools, Planing Tools, Types of Chisels and their specifications, Drilling and Boring Tools and their Sketches, Wood Working Lathe and its parts, Drilling Machine and its parts, Types of saws, Sawing Machines such as Jigsaw, Bandsaw, Scrollsaw etc., Care and Maintenance of Tools.
- Introduction to Fitting : Holding Tools, Marking and Measuring Tools, Cutting Tools, Taps and Tap Wrenches, Dies and Die Holders, Bench Drilling Machine with Sketch and Specifications, Types of Files, File Card, Types of Hammers, Spanners, Screwdrivers, Fitting operations, Forms of Materials, Care and Maintenance of Tools
- Introduction of Tin-Smithy : Sheet Materials, Hand Tools, Hammers, Stakes, Sheet Metal Joints, Revets and Screws, Soldering and Brazing.
- Introduction to Foundry : Casting and its components such as Molding sands and their types, Properties, Types patterns, Pattern making materials, Tools used for the Molding, Melting Furnaces such as Cupola, Pot Furnace, Crucible Furnace
- Introduction to Welding : Various Welding processes such as Arc Welding, Gas Welding, Resistance Welding, Thermit Welding, Friction Welding, Elementary Symbols of the Welding, Transformers, Motor Generators, Rectifyers, Welding cables, Electrodes and their types, Electrode Holders, Techniques of Welding, Gas Welding their Types
- Introduction to House-wiring : Types of the Tools using House-wiring, Types of Housewiring System, Fuses, Circuit Breakers, Switches, Sockets and Common House-wiring Methods, Various Symbol for Electrical Items.

- Introduction to Black Smithy : Tools and equipment used in the Black Smithy, Forging Temperatures of metals.
- Introduction to the Plumbing, Machine Shop, Metal Cutting, Power Tools.

1.TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2.TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH – DEPARTMENT OF MECHANICAL ENGINEERING

Academic Year: 2022-2023 B.Tech IYear

(R22MED1124**) :** Engineering Workshop Lab

LIST OF EXPERIMENTS

List of Experiments:

Expt No	**Name of the experiment**	**COs Mapped**
1	Prepare the T- lapjoint	CO1
2	Prepare the Dove Tail- lapjoint	CO1
3	v-fitting	CO2
4	Half round fitting	CO2
5	Rectangular Tray	CO3
6	Square Tin	CO3
7	Two lamp Controlled by one switche in series	CO5
8	One lamp controlled by two two way switches	CO5
9	S-Hook	CO2
10	Square Rod	CO2
11	Single piece pattern	CO4
12	Split piece pattern	CO4
13	T- joint	CO3
14	Corner joint	CO3

List of Additional Experiments:

Expt No	Name of the experiment	
1	Plumbing	
2	Machine Shop	

Faculty in-charge

Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist

Department of Electronics and communication Engineering

Name of the Physical laboratory	**: Engineering workshop lab**
Room No	**: GF-114**
Name of the lab incharge (Faculty) (for EWS lab)	**: B.SANTHOSH KUMAR**
Name of the Lab Assistant (for EWS lab)	**: N.Naresh**

LAB FILE:

S.NO	NAME OF THE FILE	(Y/N)
1	V, M, PEO. - HoD signed xerox copy	Y
2	PO, PSOs - HoD signed xerox copy	Y
3	PO, PSO, COs and Mapping - Prepared and signed by faculty incharge	Y
4	List of experiments as per the syllabus. - univeristy xerox copy	Y
5	List of experiments including additional experiments and their CO, PO/PSO mapping.- Prepared and signed by faculty incharge	Y
6	Class timetable highlighting the lab.- HoD signed xerox copy	Y
7	Model Practical End examination questions - Prepared and signed by faculty incharge	Y
8	Schedule of end practical examinations - HoD signed xerox copy	Y
9	List of examiners- HoD signed xerox copy	Y
10	Cycle chart to known the batch size of experiment setup - Prepared and signed by faculty incharge	Y
11	Lab occupancy chart (including names of Lab, faculty in-charges and support staff) -Prepared and signed by Lab incharge	Y
12	List of major equipment. - Prepared and signed by Lab incharge	Y
13	List of the equipment (S.No, Description,suppliers, Date of purchase, unit price, qty, total) - Prepared and signed by Lab incharge	Y
14	List of Labelling/Number code of the equipment - Prepared and signed Lab incharge	Y
15	Dos and Don'ts - Prepared and signed by Lab incharge	Y

S.No	Name Of The Experiment
1	Prepare the T- lapjoint
2	Prepare the Dove Tail- lapjoint
3	v-fitting
4	Half round fitting
5	Rectangular Tray
6	Square Tin
7	Two lamp Controlled by one switche in series
8	One lamp controlled by two two way switches
9	S-Hook
10	Square Rod
11	Single piece pattern
12	Split piece pattern
13	T- joint
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Additional Experiments

Exp No.	Name of the experiment
1	Plumbing
2	Machine Shop

	SRI INDU COLLEGE OF ENGG & TECH **LESSON PLAN** **(Regulation :R22)** **DEPARTMENT OF MECHANICAL ENGINEERING**	**Prepared on :4.10.2023** **Rev1:**
	Sub. Code & Title	**ENGINEERING WORKSHOPLAB & R22MED1124**
	Academic Year:2022-23	**Year/Sem./Section** **I/I/ECE(A,B,)**
	Faculty Name & Designation	**B.SANTHOSH KUMAR**

S. No.	**Topic (s)**	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of hours	Actual Date of Handled	CO/RBT
1	Prepare the T- lapjoint	Manual			Demonstration on Black Board & Apparatus	3		CO1/LV
2	Prepare the Dove Tail- lapjoint	Manual			Demonstration on Black Board & Apparatus	3		CO1/LV
3	v-fitting	Manual			Demonstration on Black Board & Apparatus	3		CO2/LIV
4	Half round fitting	Manual			Demonstration on Black Board & Apparatus	3		CO2/LIII
5	Rectangular Tray	Manual			Demonstration on Black Board & Apparatus	3		CO2/LIV
6	Square Tin	Manual			Demonstration on Black Board & Apparatus	3		CO2/LIII
7	Two lamp Controlled by one switche in series	Manual			Demonstration on Black Board & Apparatus	3		I CO2/LV
8	One lamp controlled by two two way switches	Manual			Demonstration on Black Board & Apparatus	3		CO2/LV
9	S-Hook	Manual			Demonstration on Black Board &	3		CO4/LIV

					Apparatus			
10	Square Rod	Manual			Demonstration on Black Board & Apparatus	3		CO3/LV
11	Single piece pattern	Manual			Demonstration on Black Board & Apparatus	3		CO6/LIV
12	Split piece pattern	Manual			Demonstration on Black Board & Apparatus	3		CO5/LIV
13	T- joint	Manual			Demonstration on Black Board & Apparatus	3		CO5/LIV
14	Corner joint	Manual			Demonstration on Black Board & Apparatus	3		CO5/LIV

Sri Indu College of Engineering and Technology

(An Autonomous Institution Under UGC)

Department of MECHANICAL ENGINEERING

ENGINEERING WORKSHOP LAB (R22MED1124)
MASTER TIME TABLE

NAME OF THE FACULTY	B.SANTHOSH KUMAR	**SUBJECTS**	ENGINEERING WORKSHOP LAB

TIME	**09:40am To 10:30am**	**10:30am To 11:20pm**	**11:20am To 12:10pm**		**12:40pm To 1:45pm**	**1:45pm To 2:50pm**	**2:50pm To 4:00pm**
DAY	**1**	**2**	**3**		**4**	**5**	**6**
MON	**AI&ML-A**				**AI&DS-A**		
TUE	**IOT**						
WED	**ME & ECE-A**						
THU				**L U N C H**	**CE & ECE-B**		
FRI	**AI&DS-B**				**AI&ML-B**		
SAT							

HOD PRINCIPAL

WORKSHOP
LAB MANUAL

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - I Year – I Semester

L	T	P	C
0	1	3	2.5

(R22MED1124) ENGINEERING WORKSHOP

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
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- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipmentand machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work toprescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:

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- Introduction to Fitting : Holding Tools, Marking and Measuring Tools, Cutting Tools, Taps and Tap Wrenches, Dies and Die Holders, Bench Drilling Machine with Sketch and Specifications, Types of Files, File Card, Types of Hammers, Spanners, Screwdrivers, Fitting operations, Forms of Materials, Care and Maintenance of Tools
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- Introduction to Welding : Various Welding processes such as Arc Welding, Gas Welding, Resistance Welding, Thermit Welding, Friction Welding, Elementary Symbols of the Welding, Transformers, Motor Generators, Rectifyers, Welding cables, Electrodes and their types, Electrode Holders, Techniques of Welding, Gas Welding their Types
- Introduction to House-wiring : Types of the Tools using House-wiring, Types of Housewiring System, Fuses, Circuit Breakers, Switches, Sockets and Common House-wiring Methods, Various Symbol for Electrical Items.

- Introduction to Black Smithy : Tools and equipment used in the Black Smithy, Forging Temperatures of metals.
- Introduction to the Plumbing, Machine Shop, Metal Cutting, Power Tools.

1.TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2.TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

ENGINEERING WORKSHOP LAB SYLLABUS

S.No.	*Name of the Experiment*
1	Prepare the T- lapjoint
2	Prepare the Dove Tail- lapjoint
3	v-fitting
4	Half Round fitting
5	Rectangular Tray
6	Square Tin
7	Two lamp Controlled by one switches in series
8	One lamp controlled by two two way switches
9	S-Hook
10	Square Rod
11	Single piece pattern
12	Split piece pattern
13	T- joint
14	Corner joint

INSTRUCTIONS TO STUDENTS

Objective of the Laboratory course:

- *To provide an opportunity for learning through doing, observing and testing.*
- *To become familiar with the instruments and gain experience in handling them.*
- *To acquire the skill of making the optimum use of the apparatus.*
- *To establish for yourself the working of physical principles.*
- *To become aware of limitations of the accuracy with which measurements can bemade.*
- *Generally to relate text book information to the behavior of the physical worldaround you.*

(1) **Laboratory work** is the heart of the course and it should be completed satisfactorily. Your performance in the laboratory is taken into account in evaluating theperformance in the course. The final grade is based on your performance in the weekly sessions, the reports you write and on how well you do in the examinations.

(2) ***Preparation***: Before coming to the laboratory session you must carefully read the instructions given for performing the experiment of the day. Unless you come fully prepared with this background material you will not able to complete the required work and, what is more, you will miss the opportunity of learning all aspects of the experiment. Lack of background often makes the experiment uninteresting and much more time has to be spent later for an understanding of the points missed. Thus, for your own benefit, prior study of the instructions is very important.

(3) You must bring Observation notes for every lab session. *You must get at least oneobservation of each kind checked and signed by your faculty, failing which your report will not be graded.* You must complete all experimental work during the session.

(4) ***Equipment needs your care***: On reaching the laboratory you should check the apparatus provided and ascertain if there are any shortages or malfunctions. If the apparatus is complicated, ask the instructor to inspect before you proceed with the actualperformance of the experiment. Set up the equipment in accordance with the instructions. Proceed carefully and methodically. Make the required measurements and record them neatly in tabular form.

(5) ***Acceptable results with given apparatus:*** It is more important to see what resultyou get with given apparatus rather than what is the 'correct' result. The apparatus given to you is capable of certain accuracy and your result may be completely acceptable evenif it differs from 'correct' results. You must learn to do things on your own even if you might make mistakes some times.

(6) ***Graphs:*** Each graph should occupy one complete sheet; the information as to quantities plotted, scale chosen and units should be mentioned clearly on the graph in ink.

(7) Following is the **Format of the Report**:

- Your name, roll number, date, title of the experiment.
- A clear statement of what is to be done.
- Essential diagram of the experiment and the formulae used.
- Well – tabulated observations (Tables should be neat and self explanatory)

(8) ***<u>You must bring pen, pencil, eraser, calculator, scale and Observation notes.</u>***

(9) You must keep your work place neat and clean and leave the lab neat and tidy.

GRADING:

The overall lab examination is for **100** marks. In that 60 marks are for **Semester End Examination** conducted at the end of the semester. Remaining **40** marks will be awarded for the **Continuous Internal evaluation.**

INDEX

S.No.	Name of the Experiment	Date	Remarks
1			
2			
3			
4			
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Sri Indu College of Engineering and Technology

(An Autonomous Institution Under UGC)

Department of MECHANICAL ENGINEERING

MASTER TIME TABLE

SUBJECT	ENGINEERING WORKSHOP

TIME / DAY	09:40am To 10:30am	10:30m To 11:20pm	11:20am To 12:10pm		12:40pm To 1:45pm	1:45pm To 2:50pm	2:50pm To 4:00pm
	1	2	3		4	5	6
MON	AIML -A (DHARMA & GOUSE)			LUNCH	AIDS-A (DHARMA & GOUSE)		
TUE	IOT (GURUMURTHY& SANTHOSH)						
WED	ECE –A &MECH (SANTHOSH & GURUMURTHY)						
THU					ECE –B& CIVIL (SANTHOSH & GOUSE)		
FRI	AIDS-B (DHARMA & GOUSE)				AIML -B (DHARMA & GOUSE))		
SAT							

HOD PRINCIPAL

Sub. Code & Title	**ENGINEERING WORKSHOP LAB**		
Academic Year: 2022-23		**Year/Sem./Section**	I – I SEM- ECE
Faculty Name & Designation		B.SANTHOSH KUMAR & ASSISTANT PROFESSOR	

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO
			From	To				
1	**Introduction to CARPENTRY**	R1	1.1	1.7	Black board & Demonstration			
1.1	T lap joint	R1	1.24	1.25	Black board & Demonstration	03		CO1,CO2,CO3
1.2	Dovetail Joint	R1	1.26	1.27	Black board & Demonstration	03		CO1,CO2,CO3
II	**Introduction to Fitting**	R1	8.11	8.33	Black board & Demonstration			
2.1	V-Fitting	R1	8.36	8.37	Black board & Demonstration	03		CO1,CO2,CO3
2.2	Half Round- Fitting	R1	8.40	8.41	Black board & Demonstration	03		CO1,CO2,CO3
III	**Introduction to Tin-smithy**	R1	10.1	10.17	Black board & Demonstration			
3.1	Square Tin	R1	10.18	10.19	Black board & Demonstration	03		CO1,CO2,CO3
3.2	Rectangular Tray	R1	10.20	10.21	Black board & Demonstration	03		CO1,CO2,CO3
IV	**Introduction to House wiring**	R1	3.1	3.21	Black board & Demonstration			

4.1	Two lamps controlled by one switch	R1	3.22	3.23	Black board & Demonstration	03		CO2,CO3,CO4
4.2	One lamp controlled by 2 two way switches	R1	3.24	3.25	Black board & Demonstration	03		CO2,CO3,CO4
V	**Introduction to Foundry**	R1	11.1	11.13	Black board & Demonstration			
5.1	Single piece pattern	R1	11.14	11.15	Black board & Demonstration	03		CO1,CO2,CO3
5.2	Split piece pattern	R1	11.16	11.17	Black board & Demonstration	03		CO1,CO2,CO3
VI	**Introduction to Black smithy**	R1	9.1	9.11	Black board & Demonstration			
6.1	S-Hook	R1	9.16	9.17	Black board & Demonstration	03		CO1,CO2,CO3
6.2	Square Rod	R1	9.12	9.13	Black board & Demonstration	03		CO1,CO2,CO3
VII	**Introduction to Welding**	R1	5.1	5.19	Black board & Demonstration			
7.1	Corner Joint	R1	5.24	525	Black board & Demonstration	03		CO1,CO2,CO3
7.2	Butt Joint	R1	5.22	5.23	Black board & Demonstration	03		CO1,CO2,CO3
	Review	**Signature of the HOD/Coordinator**						

CARPENTARY

INTRODUCTION:

Wood work or carpentry deals with making joints for a variety of applications like doorframes, cabinet making furniture, packing etc.,

Timber:-

Timber is a name obtained from well grown plants or trees. The timber must cut in such a way that the grains run parallel to the length. The common defects in timber are knots, wet rot, dry rot etc.,

Market sizes of timber:-

Timber is sold in market in various standard shapes and sizes. They are:-

Log:-

The trunk of a tree, which is free from branches.

Balk:-

The log sawn to have roughly square cross section.

Post:-

A timber piece, round or square in cross section with more than 275 mm in width, 50 to150 mm in thickness and 2.5 to 6.5 mts length.

Board:-

A sawn timber piece, below 175 mm in width and 30 mm to 50 mm in thickness.

Reapers:-

Sawn timber pieces of assorted and nonstandard sizes, which don't conform to the aboveshapes.

WORK HOLDING TOOLS:

Carpentry vice:-

It is a work holding device. When handle vice is turned in a clockwise direction, the sliding jar forces the work against the fixed sawn. The greater the force applied to the handle, the tighter to the work held.

Bar clamp:-

It is a rectangular (or) square block with V-groove on one or both sides opposite to each other. It holds cylindrical work pieces.

C-Clamp:-

This is used to hold work against an angle plate or V-block.

MARKING AND MEASURING TOOLS:

Try square:-

It is used for marking and testing the square ness of planed surfaces. It consists of a steel blade, fitted in a cast iron stock. It is also used for flatness. The size of a try square usedfor varies from 150 mm to 300 mm, according to the length of the blade. It is less accurate when compared to the try square used in fitting shop.

Fig : 1 steel rule

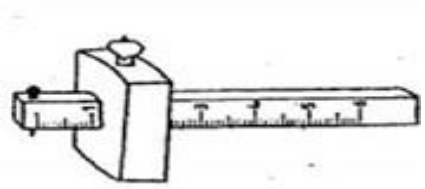


fig: 2 marking Gauge

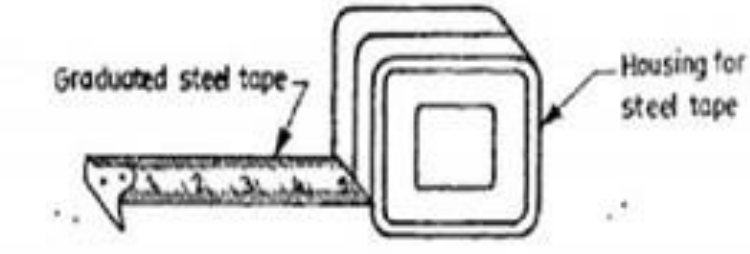


Fig: 3 steel tape

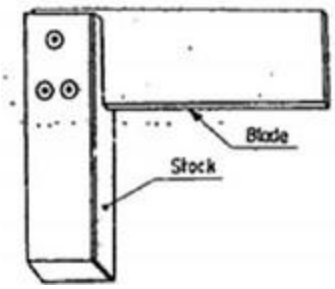


fig: 4 Try square

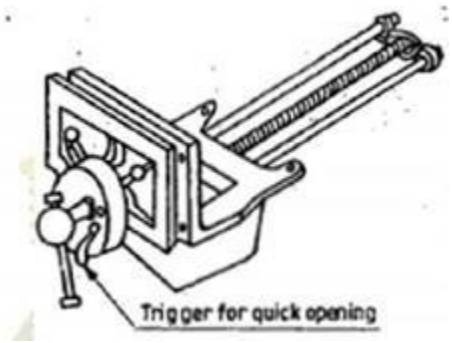


Fig: 5 corpenter vice

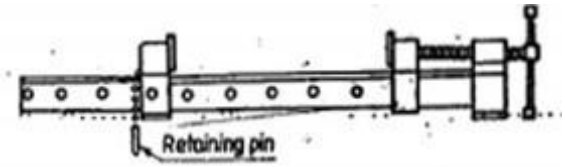


Fig: 6 Bar clamp

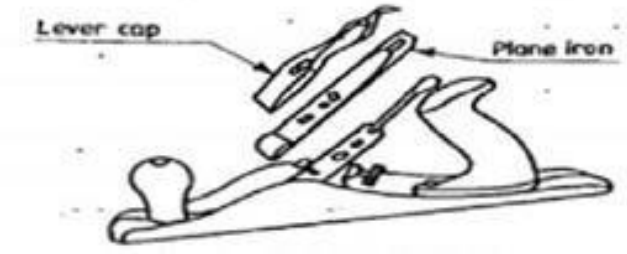


Fig: 7 metal jack plane

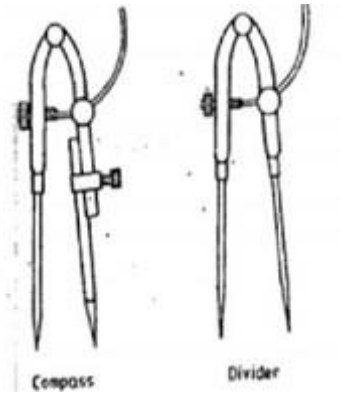


Fig: 8 compass and divider

Marking gauge:-

It is a tool used to mark lines parallel to the edges of wooden pieces. It consists of a square wooden stem with a riding wooden stock on it. A marking pin, made of steel is fitted on the stem. A mortise gauge consists of two pins. In these it is possible to adjust the distance between the pins, to draw two parallel lines on the stock.

Compass and dividers:-

This is used for marking circles, arcs, laying out perpendicular lines on the planed surfaceof the wood.

CUTTING TOOLS:

Hack saw:-

It is used to cross cut the grains of the stock. The teeth are so set that the saw kerfs will bewider than the blade thickness. Hard blades are used to cut hard metals. Flexible blades are having the teeth of hardened and rest of the blade is soft and flexible.

Chisels:-

These are used for removing surplus wood. Chisels are annealed, hardened and temperedto produce a tough shank and a hard cutting edge.

Rip saw:-

It is used for cutting the stock along the grains. The cutting edge of this saw makes a sleeper angle about 60o whereas that saw makes an angle of 45o with the surface of the stock.

Tenon saw:-

It is used for cutting tenons and in fine cabinet works. The blade of this saw is very thin and so it is used stiffed with back strip. Hence, this is sometimes called back saw. The teeth shapes similar to cross cut saw.

DRILLING AND BORING TOOLS:

Auger bit:-

It is the most common tool used for boring holes with hard pressure.

Gimlet:-

This is a hand tool used for boring holes with hand pressure.

Hand drill:-

Carpenters brace is used to make relatively large size holes, whereas hand drill is used fordrilling small holes. A straight shank drill is used with these tools. It is small light in weight and may be conveniently used than the brace. The drill is clamped in the chuck.

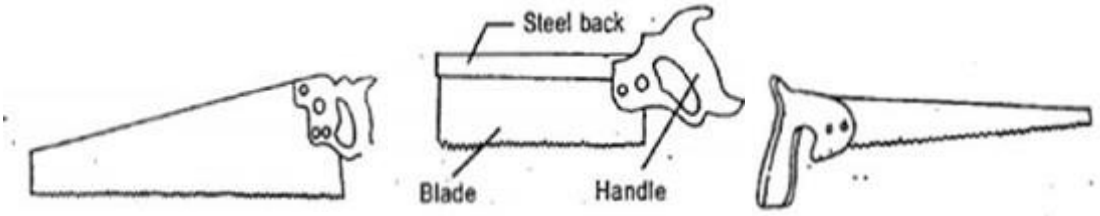


Fig: 9 cross cut saw Fig: 10 Tenon saw Fig: 11 compass saw

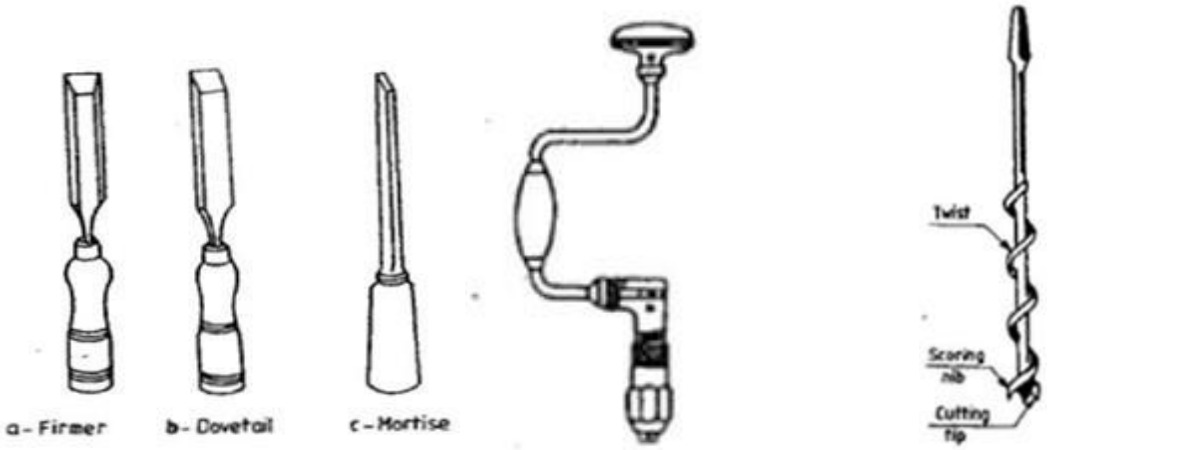


Fig: 12 Chisels Fig: 13 Carpenter's brace Fig: 14 Auger bit

Fig: 15 Gimlet Fig: 16 wood rasp file Fig:17 Mallet

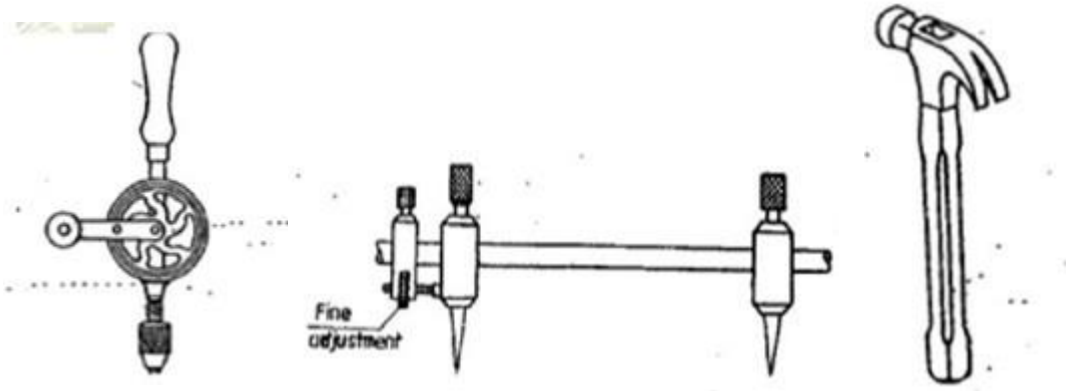


Fig: 18 Hand drill Fig: 19 Trammel Fig: 20 Claw hammer

MISCELLANEOUS TOOLS:

Ball peen hammer:-

It has a flat face, which is used for general work and a ball end is used for riveting.

Mallet:-

It is used to drive the chisel, when considerable force is to be applied, steel hammer should not be used for these purpose, as it may damage the chisel handle. Further, for better to apply a series of light taps with the mallet rather than a heavy single blow.

Claw hammer:-

It is a striking flat at one end and the claw at the others. The face issued to drive nails into wood and for other striking purpose and the claw for extracting nails out of wood.

Pinches:-

It is made of steel with a hinged and is used for pulling out small nails from wood.

Wood rasp file:-

It is a finishing tool used to make the wood smooth, remove sharp edge finishing fillets and other interior surfaces. Sharp cutting teeth are provided on its surface for the purpose. This file is exclusively used in wood work.

CARPENTRY SECTION

T-LAP JOINT

EXPERIMENT NO: 1 **DATE:**

Aim: - To make a T- lap joint

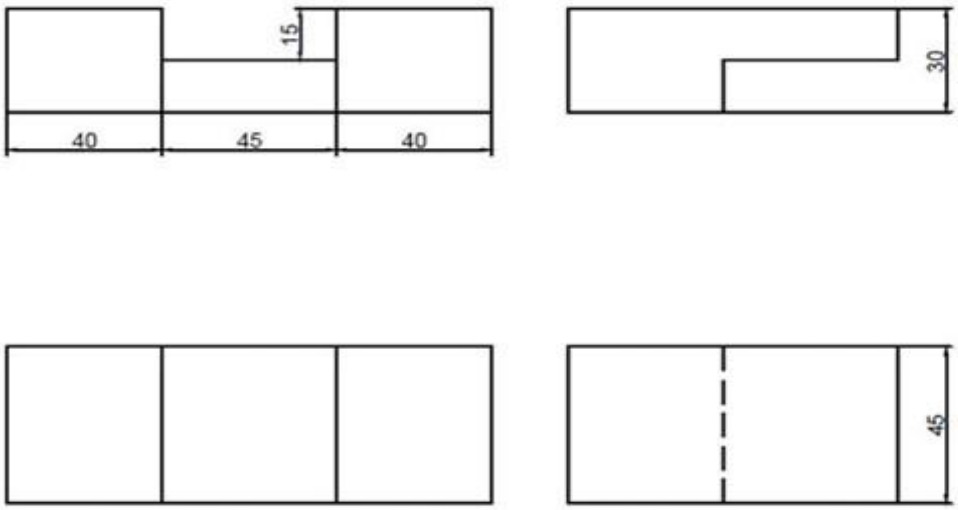
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 50 x 35 x 250 mm–2 Nos.

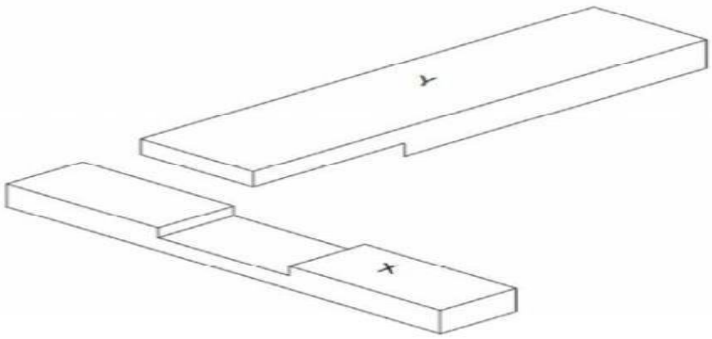
Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



T-LAP JOINT

ALL DIMENTIONS ARE IN MM



T-LAP JOINT

Procedure: -

1. The given reaper is checked for dimensions.
2. They are planed with jack plane and checked for straightness.
3. The two surfaces are checked for squareness with a try square.
4. Marking gauge is set and lines are marked at 30 and 45 mm to mark the thickness and width of the model respectively.
5. The excess material is first chiseled with firmer and then planned to correctsize.
6. The mating dimensions of the parts X and Y are then marked using steel ruleand marking gauge.
7. Using the crosscut saw, the portions to be removed are cut in both the pieces, followed by chiseling.
8. The ends of both the parts are chiseled to the exact lengths.
9. The fine finishing is given to the parts, if required so that, proper fitting is obtained.
10. The parts are fitted to obtain a slightly tight joint.

Safety precautions: -

1. Loose cloths are to be avoided.
2. Tools to be placed at their proper placed.
3. Hands should not be placed in front of sharp edged tools.
4. Use only sharp tools.
5. Care should be taken, when thumb is used as a guide in cross cutting and ripping.
6. Handle while chiseling, sawing and planning with care.7.

Result: - T- lap joint is made as per the required dimensions.

CARPENTRY SECTION

DOVETAIL LAP JOINT

EXPERIMENT NO: **DATE:**

Aim: - To make a Dovetail lap joint from the given reaper of size 50 x35 x250 mm.

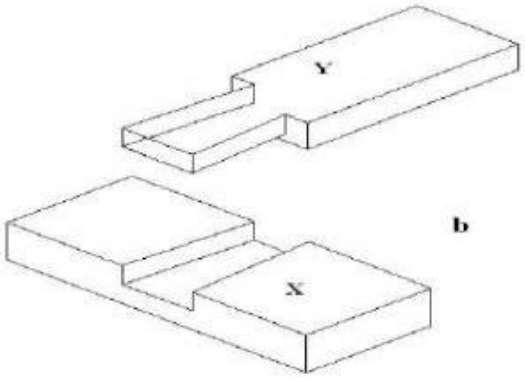
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mortise chisel
10. Mallet
11. Wood rasp file and smooth file

Material required: - Wooden pieces of size 50 x 35 x 250 mm–2 Nos.

Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for square ness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



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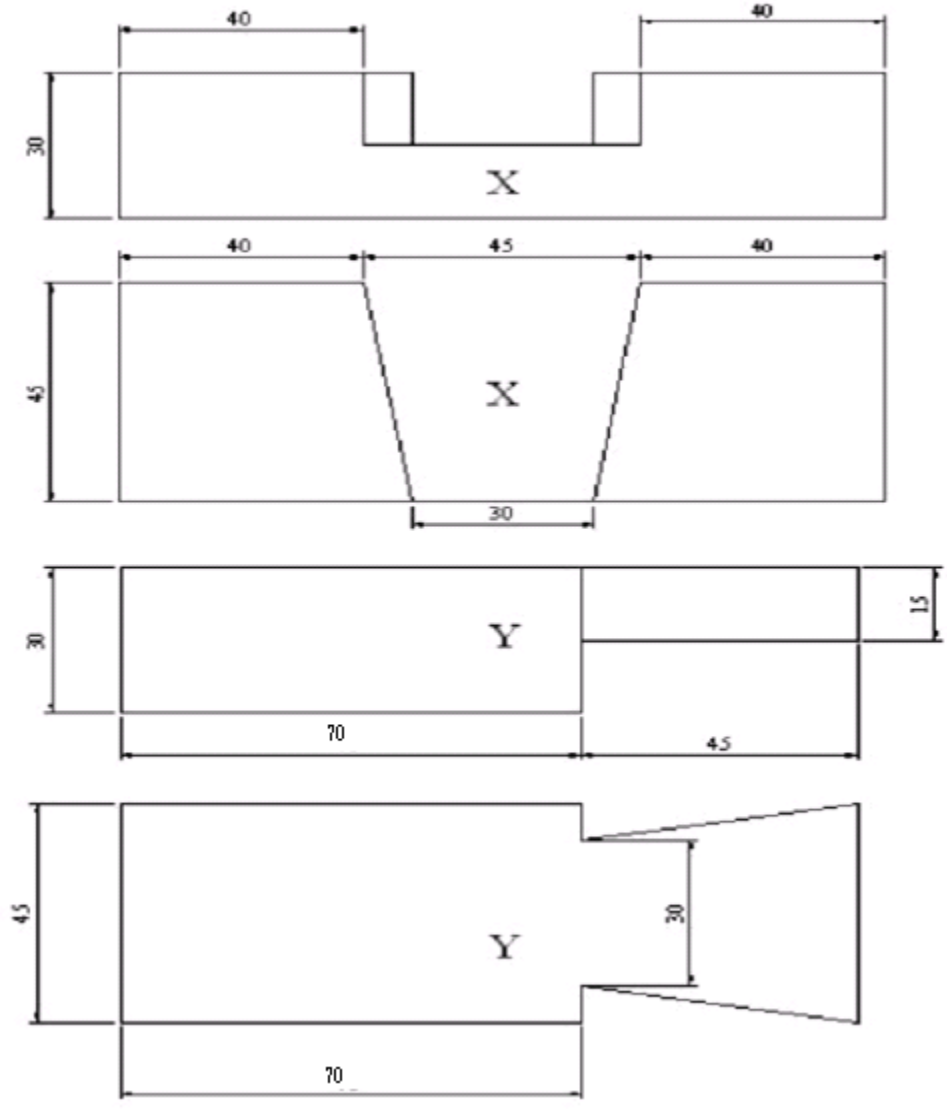
DOVETAIL LAP JOINT



Procedure: -

1. The given reaper is checked for dimensions.
2. They are planed with jack plane and checked for straightness.
3. The two surfaces are checked for square ness with a try square.
4. Marking gauge is set and lines are marked at 30 and 45 mm to mark the thickness and width of the model respectively.
5. The excess material is first chiseled with firmer chisel and then planned to correct size.
6. The mating dimensions of the parts X and Y are then marked using steel ruleand marking gauge.
7. Using the crosscut saw, the portions to be removed are cut in both the pieces, followed by chiseling.
8. The ends of both the parts are chiseled to the exact lengths.
9. The fine finishing is given to the parts, if required so that, proper fitting is obtained.
10. The parts are fitted to obtain a slightly tight joint.

Safety precautions: -

1. Loose cloths are to be avoided.
2. Tools to be placed at their proper placed.
3. Hands should not be placed in front of sharp edged tools.
4. Use only sharp tools.
5. Care should be taken, when thumb is used as a guide in cross cutting and ripping.
6. Handle while chiseling, sawing and planning with care.

Result: - Dovetail lap joint is made as per the required dimensions.

FITTING

INTRODUCTION:

Machine tools are capable of producing work at a faster rate, but there are occasions when components are processed at a bench. Sometimes it becomes necessary to replace or repair a component that must fit accurately with one another or reassemble. This involves a certain amount of hand fitting. The assembly machine tools, jigs, gauges etc., involves certain amount of bench work.

FITTING TOOLS:

Holding tools:-

- Bench vice
- V-block with clamp
- C-clamp

Bench vice:-

It is a work holding device, when vice handle is turned in a clockwise direction the sliding jaw forces the work against the fixed jaw, the greater the force applied to the handle, the tighter is the work held.

V-block with clamp:-

It is a rectangular (or) square block with v-groove on one or both sides, opposite to each other. It holds cylindrical work pieces.

C-clamp:-

This is used to hold work against an angle plate or v-block.

MARKING AND MEASURING TOOLS:

1. Surface plate
2. Try square
3. Angle plate
4. Scriber
5. Universal scribing block
6. Odd leg caliper
7. Divider
8. Calipers
9. Dot punch
10. Vernier caliper

Surface plate:-

It is used for testing flatness of work piece, for marking out small works.

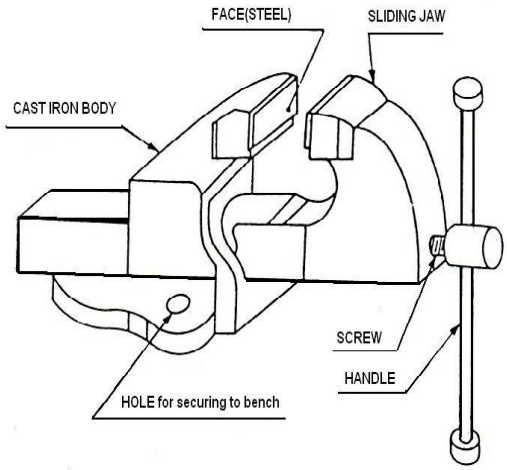


Fig: 1 Bench wise

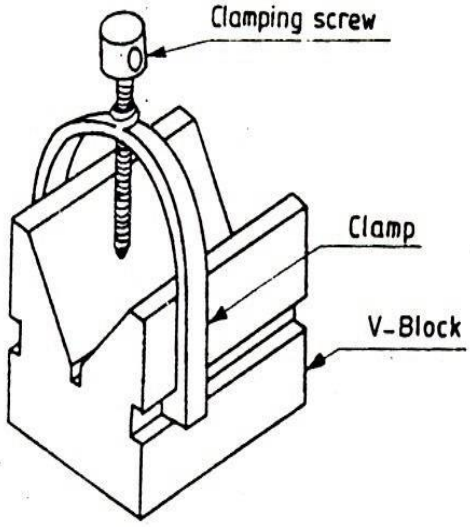


Fig: 2 V- Block

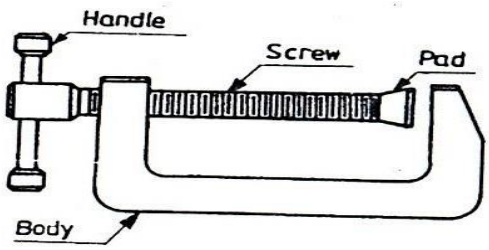


Fig: 3 C – Clamp

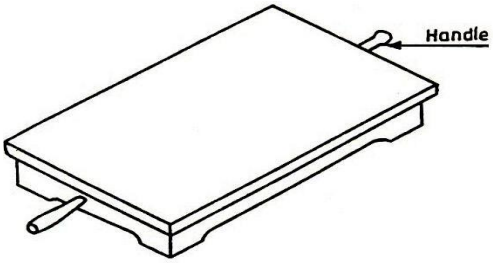


Fig: 4 Surface plate

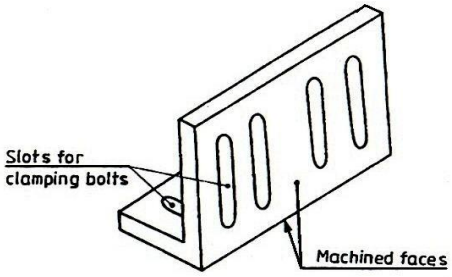


Fig: 5 Angle plate

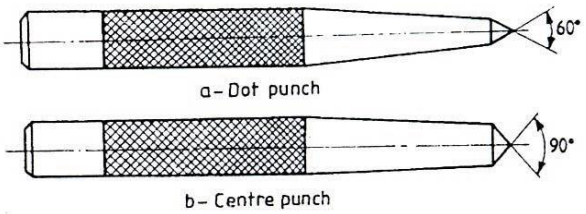


Fig: 6 Dot punch

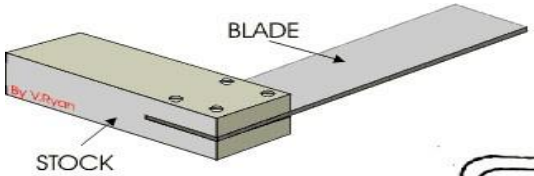


Fig: 6 try square

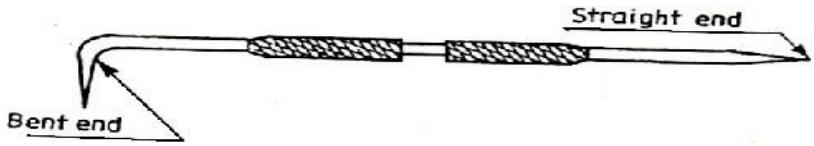


Fig: 7 scriber

Combination cutting pliers: -

This is made of tool steel and is used for cutting as well as for ripping work.

Taps and die holders: -

Tap and wrenches are used for cutting internal threads in a drilled hole.

Dies and die holders:-

They are used for making external threads. Dies are made either solid (or) split type.

TYPES OF FILES:

Hand file:-

It is a rectangular in section tapered in thickness but parallel in width.

Flat file:-

Rectangular in section and tapered for $1/3^{rd}$ length in width and thickness.

Square file:-

Square in section and tapered for $1/3^{rd}$ length on all sides.

Half round file:-

It has one flat face, connecting by a curved (surface) face & tapered for $1/3^{rd}$ length.

Round file:-

Circular in cross section and tapered for $1/3^{rd}$ length, it has double cut teeth.

MISCELLANEOUS TOOLS:

Ball peen hammer:-

It has a flat face, which is used for general work and a ball end is used for riveting.

Screw driver:-

It is designed to turn the screws. The blade is made of steel and is available in differentlengths and diameters.

Spanners:-

It is a tool for turning nuts and bolts. It is usually made of forged steel.

FITTING OPERATIONS:

Chipping:-

Removing metal with a chisel is called chipping and is normally used where machining isnot possible.

Fitting:-

1. Pinning of files:-
   Soft metals cause this; the pins are removed with a file card.

2. Checking flatness and square ness:-
   To check flatness across thickness of plate.

MARKING AND MEASURING:

Measurements are taken either from a center line, for visibility of the non-ferrous metalsand oxide coated steels are used.

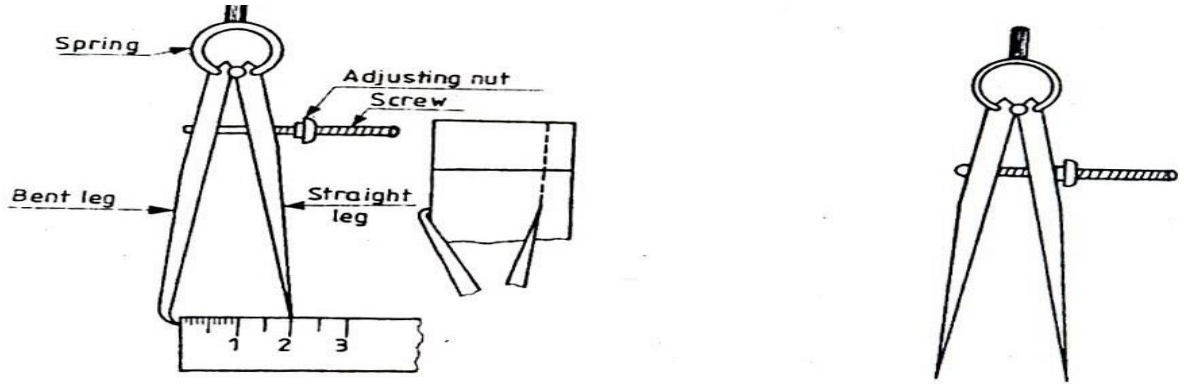


Fig: 8 odd leg clamp and divider

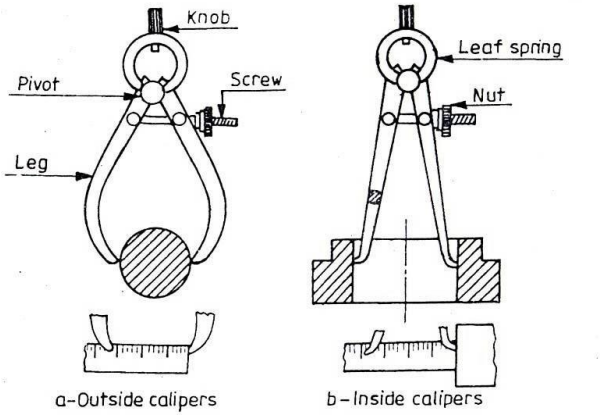


Fig: 9 calipers

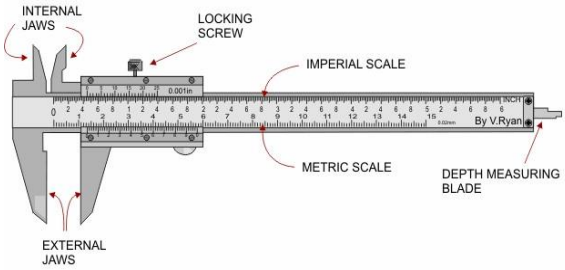


Fig: 10 Vernier caliper

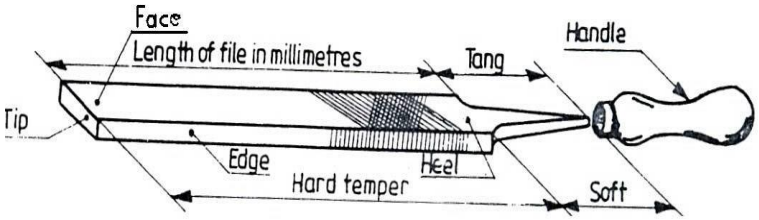


Fig: 11 Parts of hand file

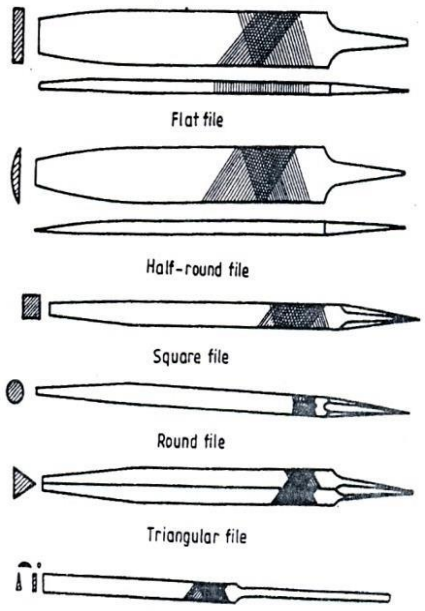


Fig: 12 Types of files

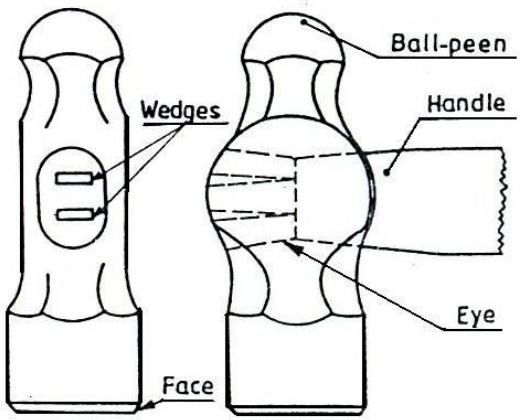


Fig: 13 ball peen hammer

FITTING SECTION

HALF ROUND FITTING

EXPERIMENT NO: **DATE:**

Aim: - To make M.S Plate into required model by Half round fitting.To make a Half round fitting from the given two M.S pieces.

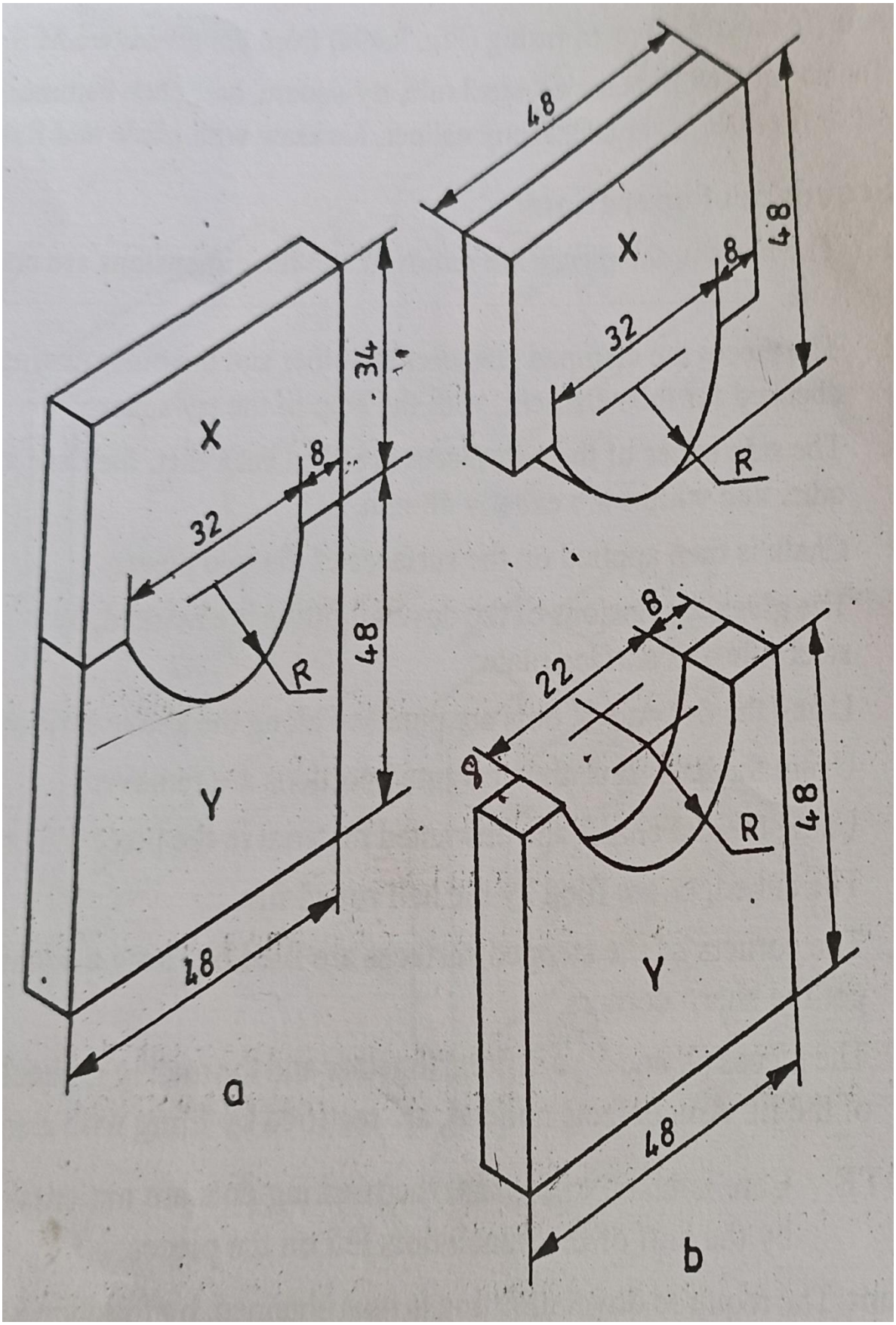
Tools required: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Venire height gauge
10. Rough and smooth flat files
11. Flat chisel and triangular file

Material required: - Mild steel (M.S) plate of size 48 x 48–2 Nos.

Sequence of Operations: -

1. Filing
2. Checking flatness and square ness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing


48
X
48
8
32
R
34
X
8
32
R
48
Y
48
a
8
22
8
R
48
Y
48
b

Procedure: -

1. The burrs in the pieces are removed and the dimensions are checked with asteel rule.
2. The pieces are clamped one after the other and the outer mating edges are filedby using rough and smooth files.
3. The flatness, straightness and square ness i.e. right angle between adjacentsides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the half round fitting are marked with help of vernier heightgauge carefully.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. Using the flat chisel, the unwanted material in the piece Y is removed.
9. The cut edges are filed by the half round file.
10. The corners of the stepped surfaces are filed by using a half rounf file to get the shape corners.
11. The pieces (X and Y) are fitted together and the mating is checked for the correctness of the fit.

Safety precautions: -

1. Care is taken to see that the marking dots are not crossed, which is indicated bythe half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.
6. Use precision instruments like vernier calipers and vernier height gauge carefully.
7. Files are to be cleaned properly after using.

Result: - Half round -fit is made as per the required dimensios

FITTING SECTION

V- FITTING

EXPERIMENT NO: **DATE:**

Aim: - To make M.S Plate into required model by V- fitting.To make a V- fitting from the given two M.S pieces.

Tools required: -

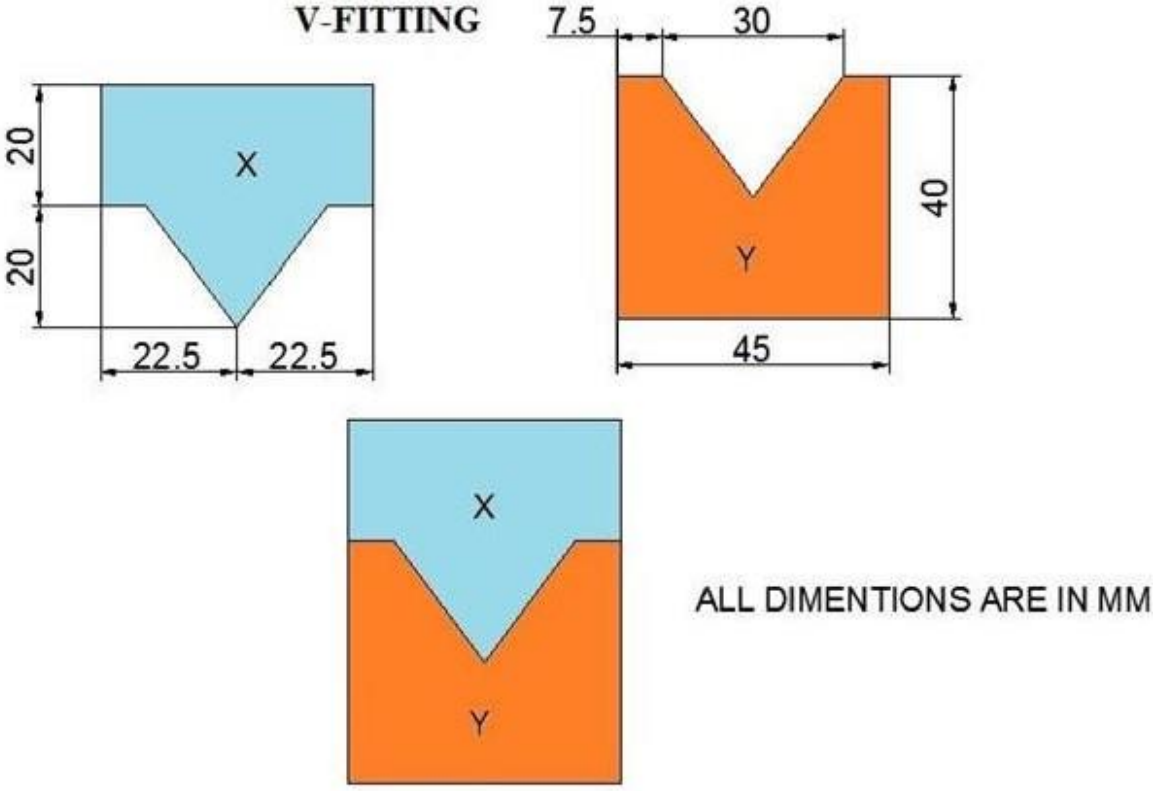
1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Vernier height gauge
10. Rough and smooth flat files
11. Flat chisel and triangular file

Material required: - Mild steel (M.S) plate of size 48 x 34–2 Nos.

Sequence of Operations: -

1. Filing
2. Checking flatness and square ness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing

V-FITTING



ALL DIMENTIONS ARE IN MM

Procedure: -

1. The burrs in the pieces are removed and the dimensions are checked with asteel rule.
2. The pieces are clamped one after the other and the outer mating edges are filedby using rough and smooth files.
3. The flatness, straightness and square ness i.e. right angle between adjacentsides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the V-fitting are marked with help of vernier heightgauge carefully.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. Using the flat chisel, the unwanted material in the piece Y is removed.
9. The cut edges are filed by the half round file.
10. The corners of the stepped surfaces are filed by using a square or triangular fileto get the sharp corners.
11. The pieces (X and Y) are fitted together and the mating is checked for the correctness of the fit.

Safety precautions:

1. Care is taken to see that the marking dots are not crossed, which is indicated bythe half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.
6. Use precision instruments like vernier calipers and vernier height gauge carefully.
7. Files are to be cleaned properly after using.

Result: - V- fit is made as per the required dimensions.

TIN SMITHY

INTRODUCTION:

Many engineering and house hold articles such as boxes, cans, funnels, ducts etc., are made from a flat sheet of metals. These process being known as tin smithy. For this, the development of the article is first drawn on the sheet metal then cut and folded to formthe required shape of the article. The edge of the articles are then secured through welding, brazing, soldering, riveting etc.,

Sheet metal materials:-

A variety of metals used in a sheet metal shop such as black iron, aluminum and stainless steel. A sheet of soft steel which is coated with molten zinc is known as galvanized iron. The zinc coat forms a coating that resists rust, improves the appearance of the metal and permits it to be solderised with greater care.

Hand tools:-

The common hand tools used in sheet metals work are steel rule, usually of 60 cm length, Vise gauge, dot punch, scriber, trammels, ball peen hammer, and straight peen hammer, cross peen hammer, mallets, snips and soldering iron.

Trammels:-

Sheet metals layouts require marking of arcs and circles. This may be done by using the trammels. The length of the beam decides the maximum size of the arc that can be scribed.

Wire gauge:-

The thickness of the sheet metal is referred in numbers known as standard wire gauge (SWG). The gaps in the circumstance of the gauge are used to check the gauge number.

Bench shears:-

Sheet metal may be cut by shearing action. In this the force is applied through a compound lever, making it possible to cut sheet metal up to 4mm thick. The chopping hole can shear a mild steel rod up to 10mm diameter.

Snips:-

Snips are hand shears, varying in length from 200mm to 600mm. 200mm to 250mmbeing the commonly used. The straight lines are curved snips or bent snips are for trimming along inside curves.

Hammers:-

Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:-

Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend,rivet sheet metal objects.

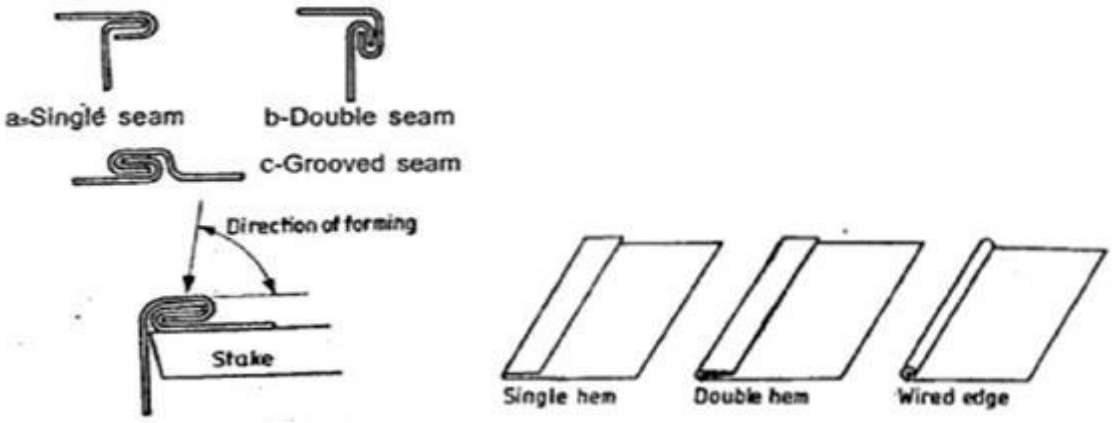
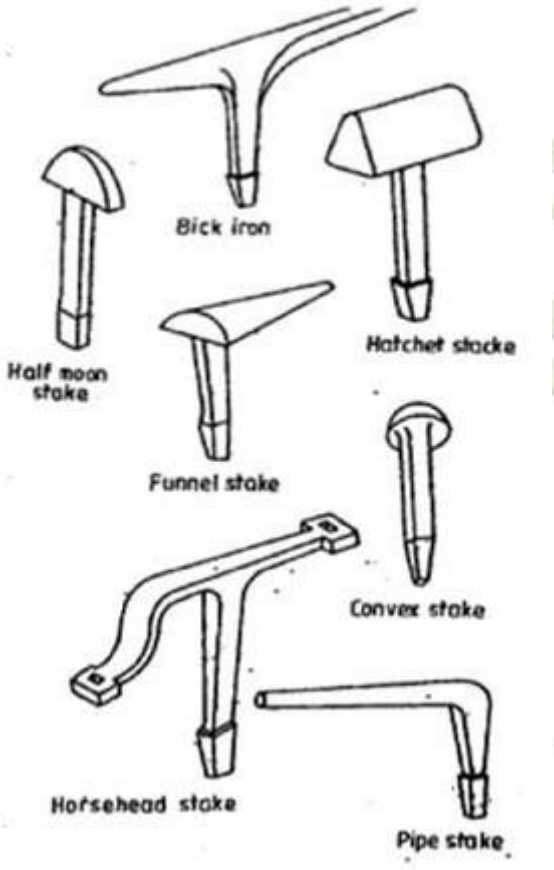


Fig: 1 Sheet metal joints



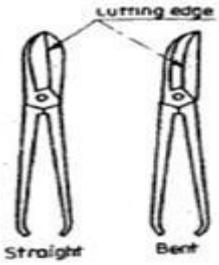


Fig. 10.4 Snips

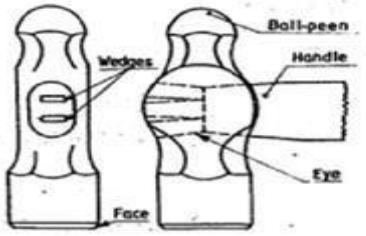


Fig. 8.34 Ball-peen hammer

Table 10.1

SWG No	Thickness, mm
10	3.20
12	2.60
14	2.30
16	1.60
20	1.00
22	0.70
24	0.65
26	0.45
30	0.30

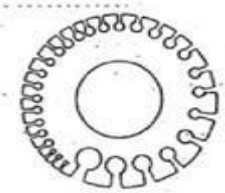


Fig. 10.2 Standard wire gauge

Fig: 2 Stakes

Snips:-

Snips are hand shears, varying in length from 200mm to 600mm. 200mm to 250mmbeing the commonly used. The straight lines are curved snips or bent snips are for trimming along inside curves.

Hammers:-

Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:-

Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend,rivet sheet metal objects.

SHEET METAL JOINTS:

Various types of joints are used in sheet metal work to suit the varying requirement. These are self-secured joints, formed by joining together two pieces of sheets metal and using the metal itself to form the joints. These joints are to be used on sheets of less than 1.6mm thickness.

Riveting:-

Rivets are used to fasten two of more sheets of metal together. It is the common practiceto use the rivets of the same material as that of the sheets having fastened.

Sheet metal screws:-

These are used in sheet metal work to join and install duct work for ventilation air conditioning etc. These screws are also known as self-tapping screws since they cut their own threads.

Soldering:

Soldering is one method of joining two pieces of metal with an alloy that melts at a lower temperature than the metals to be joined for a good job. The metals to be joined must be free from dirt, grease and oxide. Solder is made of tin and lead in equal proportions. It comes either in the form of wire and bar.

Soldering iron:-

Soldering requires a source of heating. A common method of transmitting heat of the metal surfaces is by using a soldering iron.

TINSMITHY SECTION

Rectangular tray

EXPERIMENT NO: **DATE:**

Aim: - To make a tray using the given G.I. Sheet.

Tools required: -

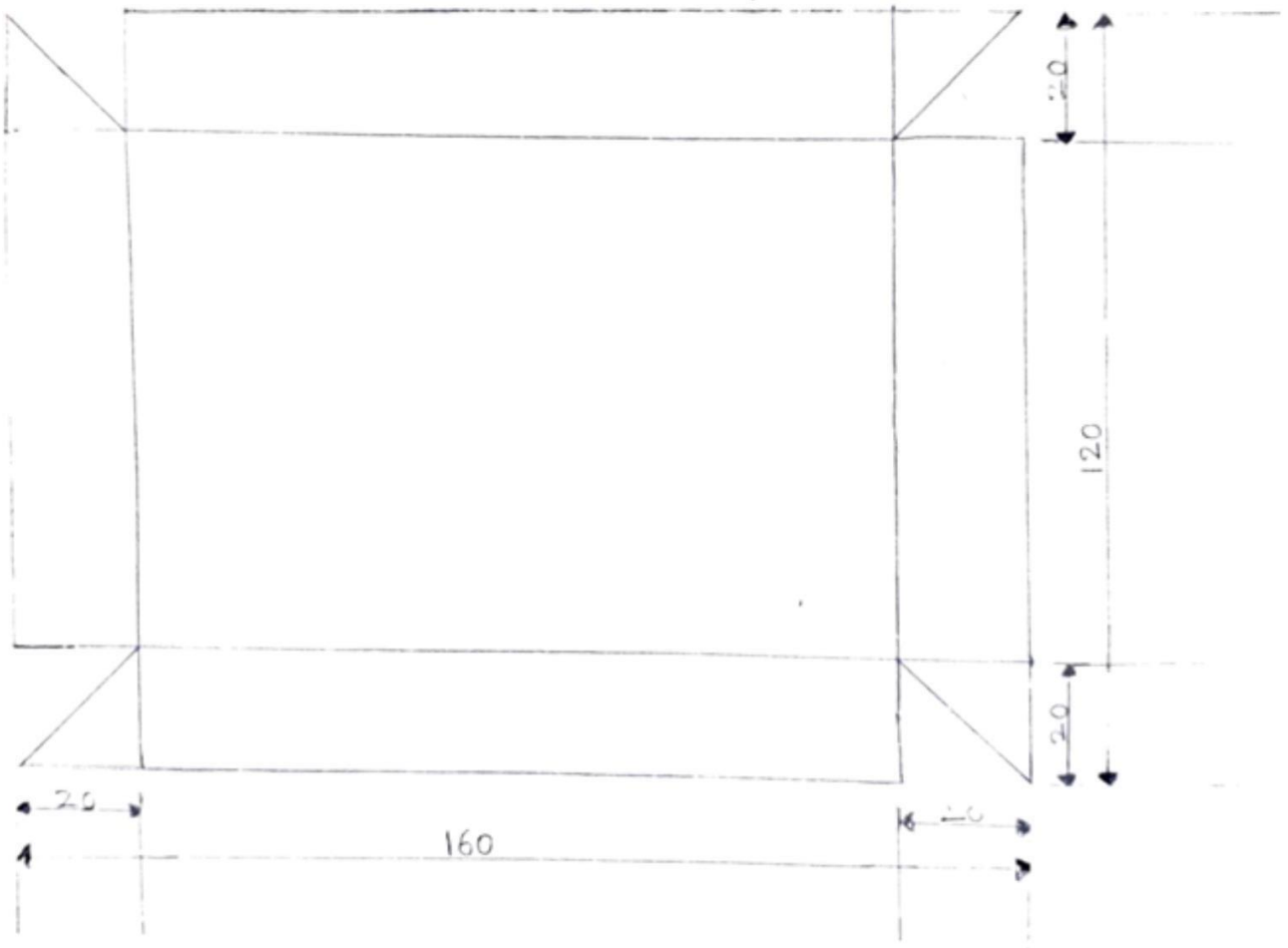
1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

Material required: - Galvanized Iron (G.I) sheet 110 x 125 mm size.

Sequence of operations: -

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding

RECTANGULAR TRAY



All DIMENSIONS ARE IN "mm"

Procedure: -

1. Clean the given sheet with cotton waste.
2. The size of the given sheet is checked with the steel rule.
3. Flatten the surface of the given sheet with wooden mallet.
4. Check the G.I. Sheet for dimensions and remove extra material, if any.
5. Mark all the measuring lines on the given sheet with scriber.
6. Cut the given sheet with straight snips as required.
7. Fold the given sheet by using stakes and ball peen hammer to the requiredshape.

Safety precautions:

1. For marking purpose use scriber only. Do not use pencil or pen.
2. Sufficient care is to be taken while cutting and folding of G.I. sheet.
3. Remove the waste pieces immediately from the work place.

Result: - Tray is prepared as per the required dimensions.

TINSMITHY SECTION

SQUARE TIN

EXPERIMENT NO: **DATE:**

Aim: - To make a Square Tin using the given G.I. Sheet.

Tools required: -

1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

Material required: - Galvanized Iron (G.I) sheet 160 x 80mm size.

Sequence of operations:

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding

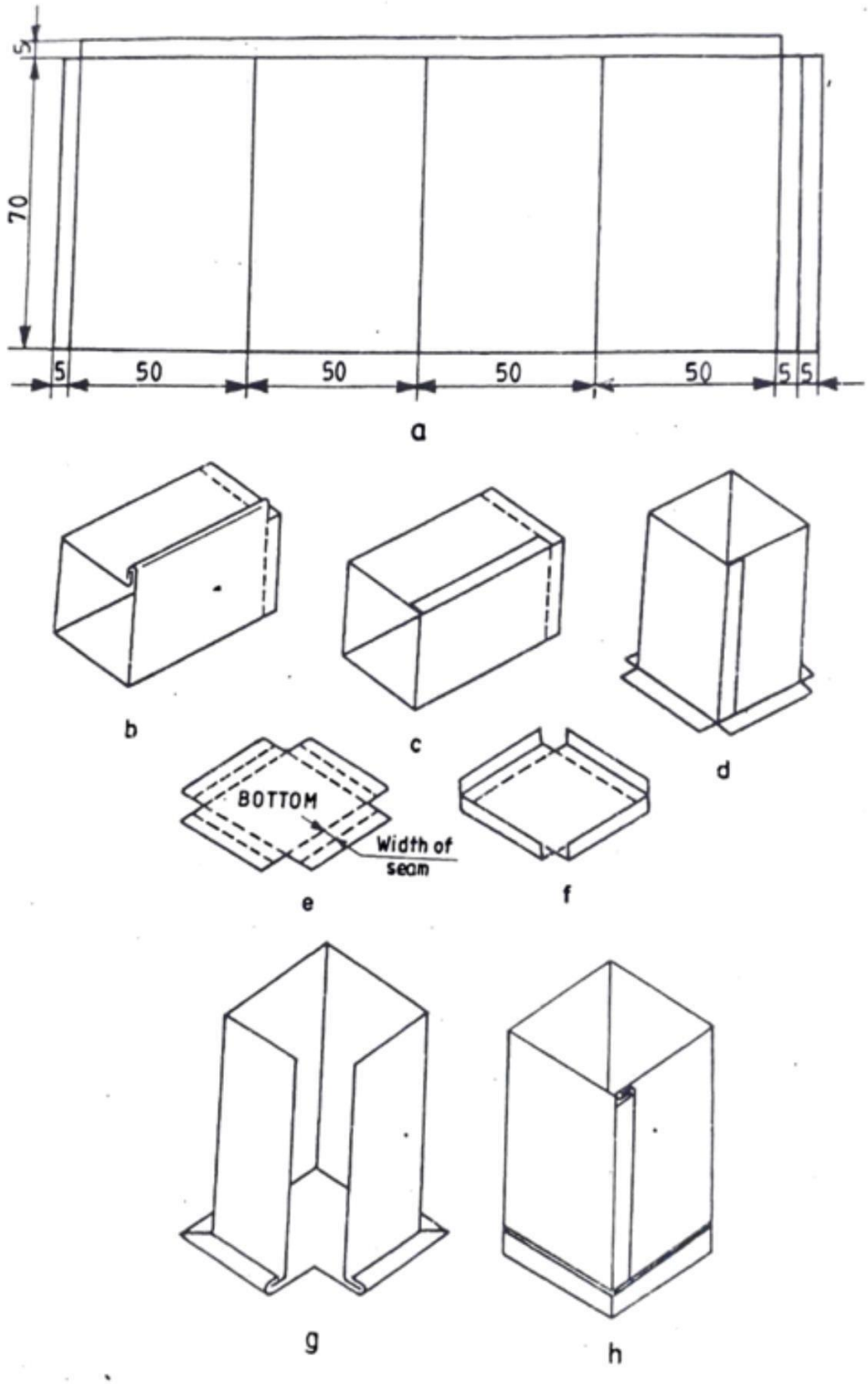


Fig. 10.12 Square tin

Procedure: -

8. Clean the given sheet with cotton waste.
9. The size of the given sheet is checked with the steel rule.
10. Flatten the surface of the given sheet with wooden mallet.
11. Check the G.I. Sheet for dimensions and remove extra material, if any.
12. Mark all the measuring lines on the given sheet with scriber.
13. Cut the given sheet with straight snips as required.
14. Fold the given sheet by using stakes and ball peen hammer to the required shape.

Safety precautions: -

1. For marking purpose use scriber only. Do not use pencil or pen.
2. Sufficient care is to be taken while cutting and folding of G.I. sheet.
3. Remove the waste pieces immediately from the work place.

Result: - Square tin is prepared as per the given dimensions.

HOUSE WIRING

Introduction:

Power is supplied to domestic installations through a phase and a neutral, forming a single phase. A.C 230V, 2- wire system for industrial establishments. Power is supplied through three phase four wire system to give 440V. Fig.Shows the power tapping for domestic and industrial purposes. The neutral is earthed at the distribution sub-station of the supply.

When supplied to domestic utilizes power is fed to a kilowatt meter and then to a distribution panel. The panel distributes power along several circuits' breakers. The panel also serves as a main switch.

Electrical wiring is defined as a system of electrical conductors, components and apparatus for conveying electrical power from the source to the point of use. The wiring system must be designed to provide a constant voltage to the load.

Elements of house wiring:

Fuses & circuit Breakers:

These are the devices to provide protection to a circuit against excess current. Open link fuses are not in safe in operations, even though they are cheaper and reliable. It consistsof a thin strip of metal (or) wire.

Electric switch:

This is a device that makes and breaks or changes the course of electric circuit. It consistsof 2 or more contacts mounted on an insulating structure and arranged such that they maybe moved in to and out of contact with each other by a suitable operating mechanism.

Plug:

It is a device carrying 2 or 3 contact, designed for engagement with corresponding plugs pins and arranged for connection to fixed wiring and arranged for attachment to appliances such as radio, T.V, table, fan etc.,

Socket outlet:-

It is a device carrying 2 or 3 contacts, designed for engagement with corresponding plug pins and arranged for connection to fixing wiring.

Lamp hlder:-

These are designed to hold lamps & connect them in the circuit. Both bay one cap and screw lamp holders are available up to 200 watts lamps.

Ceiling rose:-

A ceiling rose consists of a circular base & cover made of Bakelite. The base has 2 or 3 terminal plates. One end of the plate is connected to supply wire connected to pendent lamp, ceiling fan, exhaust fan, etc.

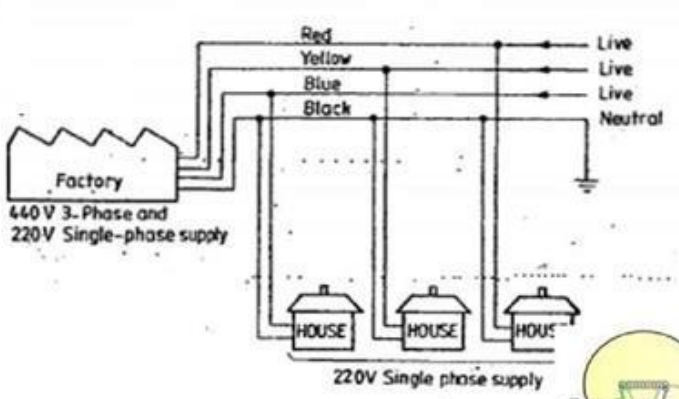
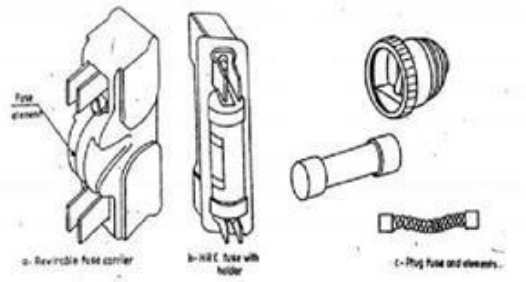


Fig. 3.1 3 phase-4 wire supply



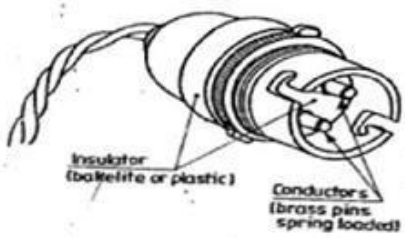
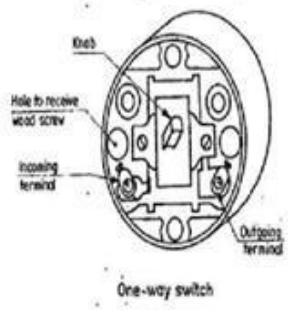


Fig. 3.6 Pendant lamp holder



One-way switch

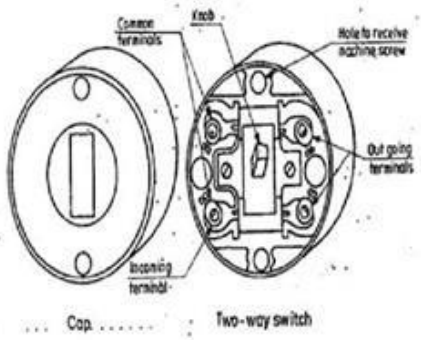


Fig. 3.4 Electric switches

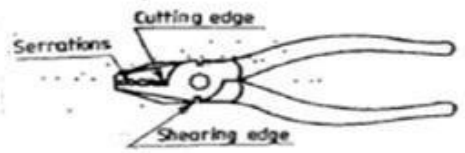


Fig. 8.22 Combination plier

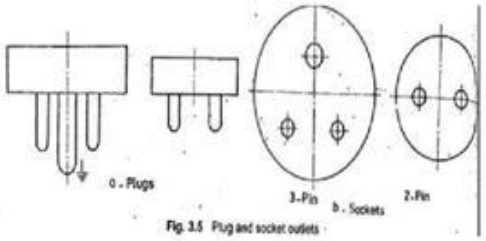


Fig. 3.5 Plug and socket outlets

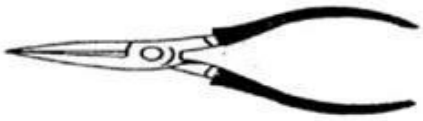


Fig. 8.23 Nose plier

NOTE: Parts of bulb
1) Glass bulb 2) Low-pressure inert gas 3) Tungsten-filament 4) Contact wire (out of stem) 5) Contact wire (into stem) 6) Support wires7) Stem Glass mount 8) Contact wire (out of stem) 9) Cap (Steeve) 10) Insulation 11) Electrical contact.

Main switch:-

This is a switch intended to connect or cut-off the supply of electrical to the whole of an installation. It is generally of metal clad type. The metal clad gives greater strength and safety. The main switch contains one or more fuses, single phase, and A.C. circuits.

Incandescent light:-

Incandescent means 'glowing at white heat'. A lamp actually works like heating elements that it gives off light by becoming white hot, the amount of power it consume is stamped on the bulb. Higher the wattage, brighter the light. The bulbs have filaments made of tungsten.

Interior wiring:-Wires & wire sizes:-

A wire is defined as a bare or insulated conductor consisting of one (or) several strands. An insulating wire consists of a conductor with insulating material made of Vulcanized Indian Rubber (VIR) (or) Poly Vinyl Chloride (PVC). The wire may consist of 1 or several twisted strands. A multi sore conductor consists of several cores insulated from one another and enclosed in a common seating. Wire sizes are specified by the diameter of the wire, using a standard wire gauge (SWG), which also gives an idea of the current carrying capacity. The specification consists of the both the number of strands and the diameter of the each wire in it

HOUSE WIRING SECTION

ONE LAMP CONTROLLED BY TWO TWO-WAY SWITCHES (STAIR CASE CONNECTION)

EXPERIMENT NO: **DATE:**

Aim: - To give connections to one lamp controlled by two two-way switches.

Tools required: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester

Material required: -

1. Wooden wiring board
2. Silk wire
3. Electrical bulb - 1 No
4. Two -way switches - 2Nos
5. Wooden round block - 1 No
6. Batten lamp holder - 1 No
7. Wire clips
8. Nails
9. Screws

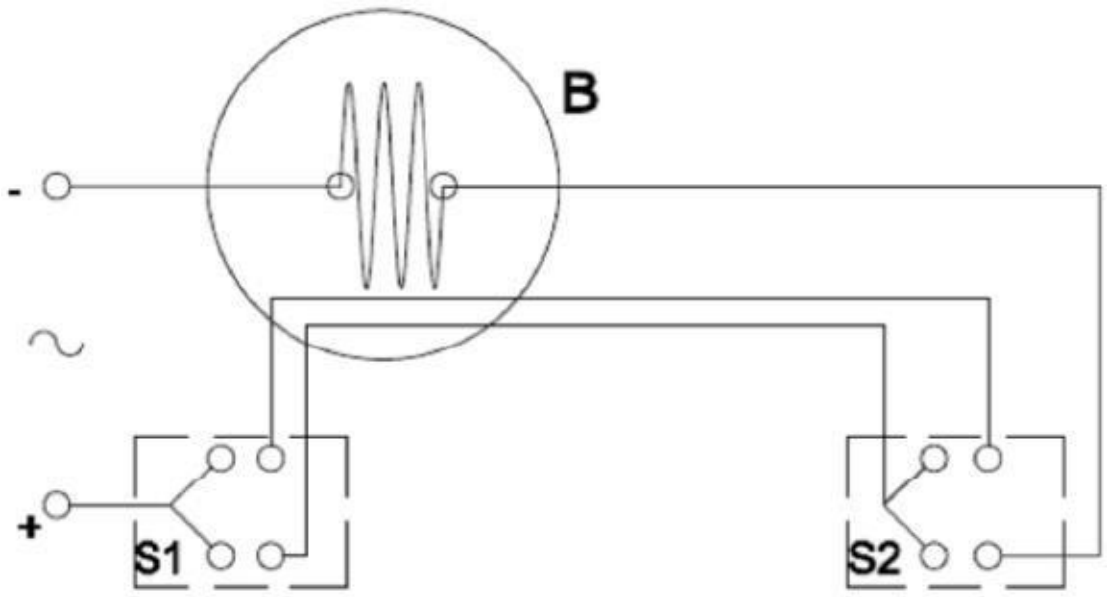


Fig:1 One lamp controlled by 2 two – way switches

Procedure: -

1. The outline of the wiring diagram is marked on the wooden wiring board.
2. Clips are nailed to the board, following the wiring diagram.
3. Wires are stretched and clamped with the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are then screwed onto the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

Safety precautions: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on any device until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

Result: - Connections are given to one lamp controlled by two two-way switches andtested.

HOUSE WIRING SECTION

Wiring For Two Lamps (Bulbs) With Independent Switch Controlswith or Without Looping

EXPERIMENT NO: **DATE:**

Aim: - To give connection to two lights, controlled With Independent Switch Controlswith or Without Looping.

Tools required:

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester

Material required: -

1. Wooden wiring board
2. Silk wire
3. Electrical bulbs - 2 No
4. One-way switch - 1No
5. Wooden round blocks - 1 No
6. Batten lamp holders - 1 No
7. Wire clips
8. Nails
9. Screws

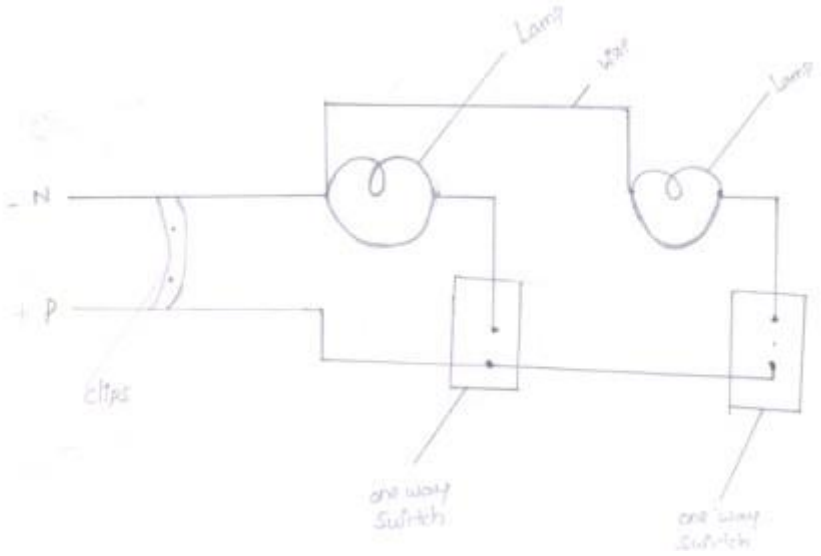


Fig: Two lights controlled by two independent switchs

Procedure: -

1. The outline of the wiring diagram is marked on the wooden wiring board.
2. Clips are nailed to the board, following the wiring diagram.
3. Wires are stretched and clamped with the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are then screwed onto the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

Safety precautions: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on anydevice until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

Result: - Connections are given to two bulbs controlled by the two independent switchesand Tested

FOUNDRY

Introduction: -

Foundry practice deals with the process of making casting in moulds, formed in either sand or other material. This is found to be the cheapest method of metal shaping. The process involves the operations of pattern making, sand preparation, molding, melting of metals, pouring in moulds, cooling, shake out, fettling, heat treatment, finishing, and inspection.

Mould is a cavity in a molding core, formed by a pattern. It is similar in shape and size that of the actual casting plus some allowance for shrinkage, machining etc., molding is the process of making molds.

Moulds are classified as: -

- Temporary moulds
- Permanent moulds

Temporary mould are made of sand and other binding materials and may be produced eitherthrough hand molding (or) machine molding.

Permanent moulds are made of ferrous materials and alloys i.e., cast iron, steel etc.,

Molding Sand: -

Sand is the principle material used in foundry. The principle ingredients of molding sands are

1) Silicon sand 2) Clay 3) Sand

Clay imparts the necessary bonding strength to the molding sand, moisture when added to correct preparation provides the bonding action to the clay sand can withstand high temperature and doesn't react with molten metal.

Natural molding sand is either available in river beds are dug from pits. It possesses and appreciable amount of clay and are used as received with the addition of water. Synthetic sands are prepared by adding clay. Water and other materials to silica sand so that the desirable strength and banding properties are achieved.

Most of molding is done with green sand i.e.; sand containing 6 to 8%, moisture and 10% clay content to give it sufficient bond. Green sand moulds are used for pouring the molten metal – immediately after preparing the moulds. Green sand moulds are cheaper and take less time to prepare. These are used for small and medium size casting.

Parting sand, which is clay tree, fence grained silica sand, is used to keep the green sand from sticking to the pattern and also to prevent the cope and drug from cleaning. Core sand is used for making cores. This is silica missed with core oil and other oddities.

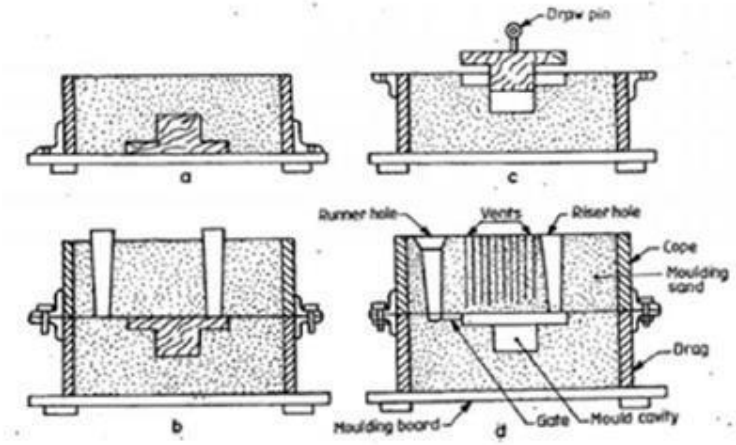
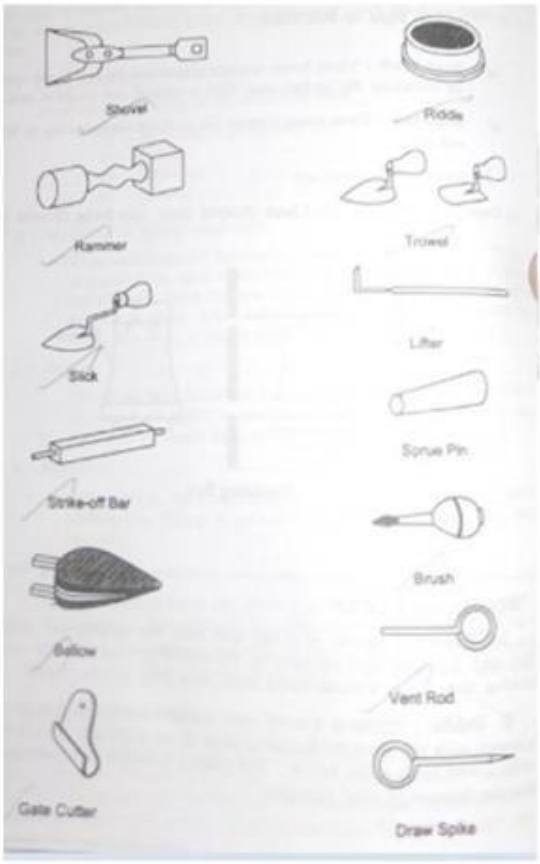


Fig. 11.6 Mold for a solid flange



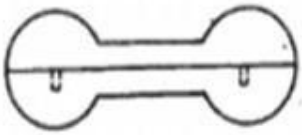


Fig. 11.14 Split pattern

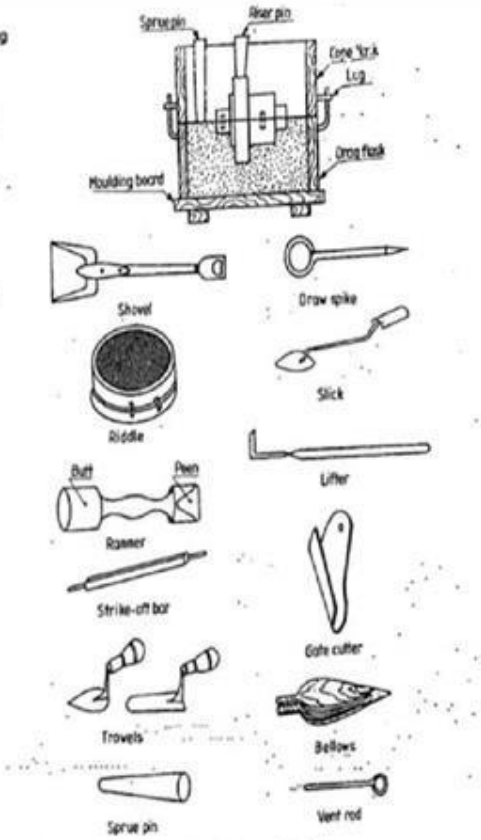


Fig. 11.3 Moulder's tools and equipment

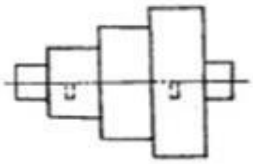


Fig. 11.9 Split pattern

Pattern; -

A pattern is the replica of the desired coasting, which when packed in a suitable materials produces a cavity called mould. This cavity when filled with molten metals, produces their desired coasting of the solidification.

Types of pattern; -

Wood are metal patterns are used in foundry practice, single piece, split loose piece and cored patterns are some of the common types.

Tools and equipment; -

The tools are equipment needed for molding are; -

Molding board: -

It is wooden board with smooth surfaces. It supports the flasks and the pattern, while the mould is being made.

Molding Flask: -

It is a base, made of wood or metal, open at both ends. The sand is rammed in after placing the pattern to produce a mould it is made of 2 parts; cope is the top half of the flask, having guides for the aligning paints to enter. Drag is the bottom half of the flask having aligning pins.

Shovel: -

It is used for mixing and tempering molding sand and for transferring the sand into the flask. It is made of steel blade with a wooden handle.

Rammer: -

It is used for pocking or ramming the sand, around the pattern one of its ends called the peen end, is wedge shaped and is used for packing sand in spaces, pockets and corners in the early stages of ramming. The other end called the But – end has a surface and is used for computing the sand towards the end of molding.

Strike of edge / strike of bar: -

It is a piece of metal or wood with straight edge. It is used remove the excess sand from the mould after ramming to provide a level surface.

Spruce pin: -

It is tapered wooden pin used to make a hole in the cope sand through which the molten metal is poured into the mould.

Riser pin: -

It is tapered wooden pin used to make a hole in the cope sand over the mould cavity for the molten metal to rise and feed the casting to compassable the shrinkage that take place during solidification.

Trowel: -

It is used to smoothen the surface of the mould. It may also be used for reproducing the damaged portion of the mould. A trowel is made in many different styles and sizes each one recallable for a particular hole.

FOUNDRY

ONE STEPPED PATTERN
(SINGLE PIECE PATTERN)

EXPERIMENT No: **DATE:**

Aim: - To prepare a sand mould cavity using One Stepped Shaft (single piece pattern).

Tools required: -

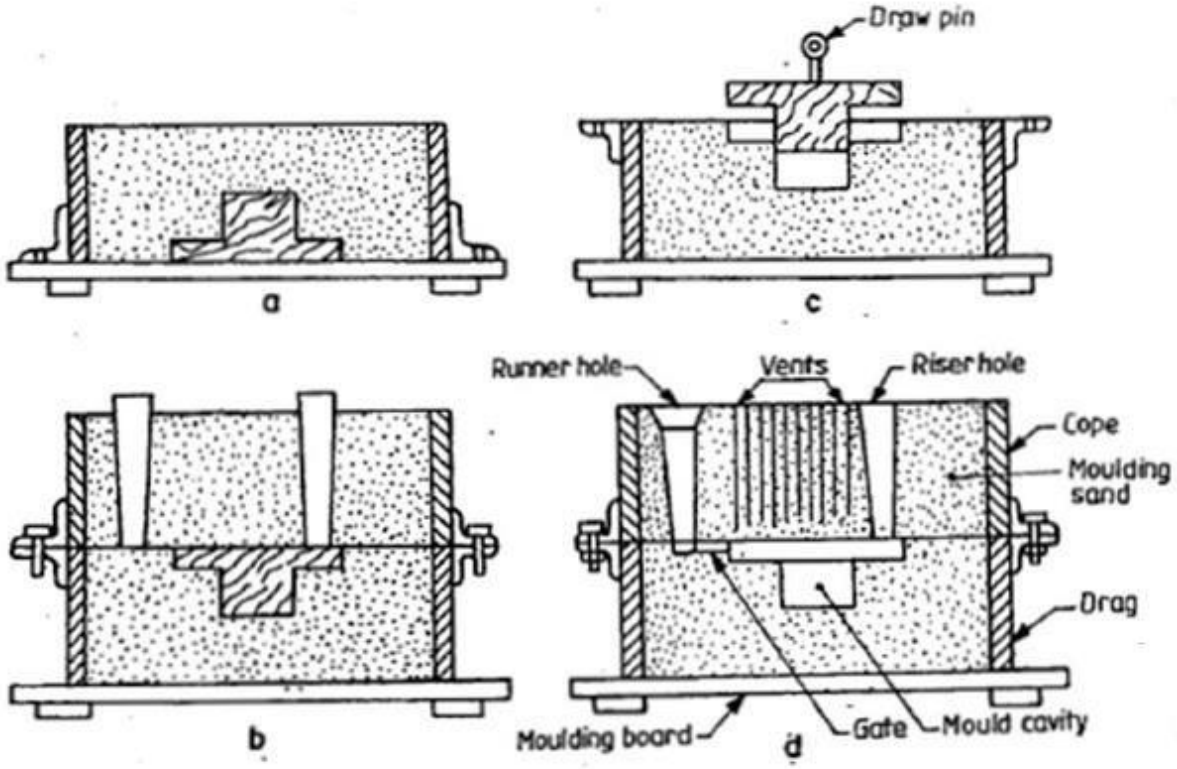
1. Molding board
2. Molding flask
3. Shovel
4. Riddle
5. Rammer
6. Strike-off bar or Strike Edge
7. Sprue pin
8. Riser pin
9. Trowel
10. Spike or Draw pin
11. Slick
12. Lifters
13. Gate cutter
14. Bellows
15. Vent rod

Material required: -

1. Molding sand
2. Parting sand
3. Dum-Bell

Sequence of operation: -

1. Sand preparation
2. Sandmixing
3. Pouring
4. Finishing



Mold for a solid flange

Procedure: -

1. Place the pattern on the molding board, with its flat side on the board.
2. Place the drag over the board, after giving a clay wash inside.
3. Sprinkle the pattern and molding board, with parting sand.
4. Allow loose sand, preferably through a riddle over the pattern, unit it iscovered to a depth of 2 to 3 cm.
5. Pack the molding sand around the pattern and into the corners of the flask, with fingers.
6. Place some more sand in the flask and pack the pattern with a rammer, usingfirst the peen end and then butt end.
7. Strike-off the excess sand from the top surface of the drag with the strike-off bar.
8. Turn the drag upside down.
9. Blow-off the loose sand particles with the bellows and smoothen the upper surface.
10. Place the cope on to the drag in position. Locate riser pin on the highest pointof the pattern.
11. Place the sprue pin at about 5 to 6 cm from the pattern on the other side of theriser pin.
12. Sprinkle the upper surface with parting sand.
13. Repeat steps 3 to 7, approximately.
14. Make holes with the vent rod to about 1 cm from the pattern.
15. Remove the sprue and riser pins by carefully drawing them out. Funnel shapedhole is made at the top of the sprue hole, called the pouring cup.
16. Lift the cope and place it aside on its edge.
17. Insert the draw pin into the pattern. Wet the edges around the pattern. Loosenthe pattern by rapping. Then draw the pattern straight up.
18. Adjust and repair the mold by adding bits of sand, if necessary.
19. Cut gate in the drag from the sprue to the mold. Blow off any loose sand particles in the mold.
20. Close the mold by replacing the cope and placing weights on it.

Precautions:-

1. Do not get the sand too wet. Water is an enemy of molten metals.
2. Provide adequate ventilation to remove smoke and fumes.
3. Never stand near or look over the mold during the pouring because of the molten metal might be too hot.
4. Do not shake out a casting too hastily, which may result in second and third degree burns.

Result: - A sand mold cavity is prepared by using one–Stepped Shaft.

FOUNDRY

DUM-BELL

(SPLIT PIECE PATTERN)

EXPERIMENT No: **DATE:**

Aim: - To prepare a sand mould cavity using Dum-Bell (split piece pattern).

Tools required: -

1. Molding board
2. Molding flask
3. Shovel
4. Riddle
5. Rammer
6. Strike-off bar or Strike Edge
7. Sprue pin
8. Riser pin
9. Trowel
10. Spike or Draw pin
11. Slick
12. Lifters
13. Gate cutter
14. Bellows
15. Vent rod

Material required: -

1. Molding sand
2. Parting sand
3. Dum-Bell

Sequence of operation: -

1. Sand preparation
2. Sand mixing
3. Pouring
4. Finishing

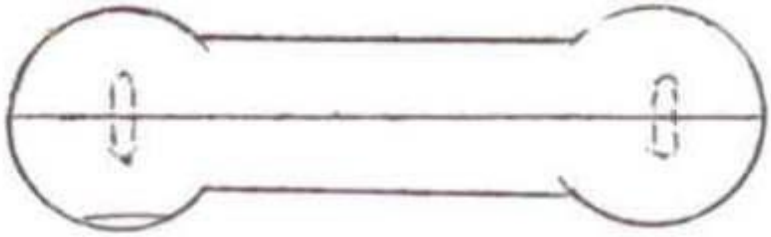


Fig: 1 Dum – Bell pattern

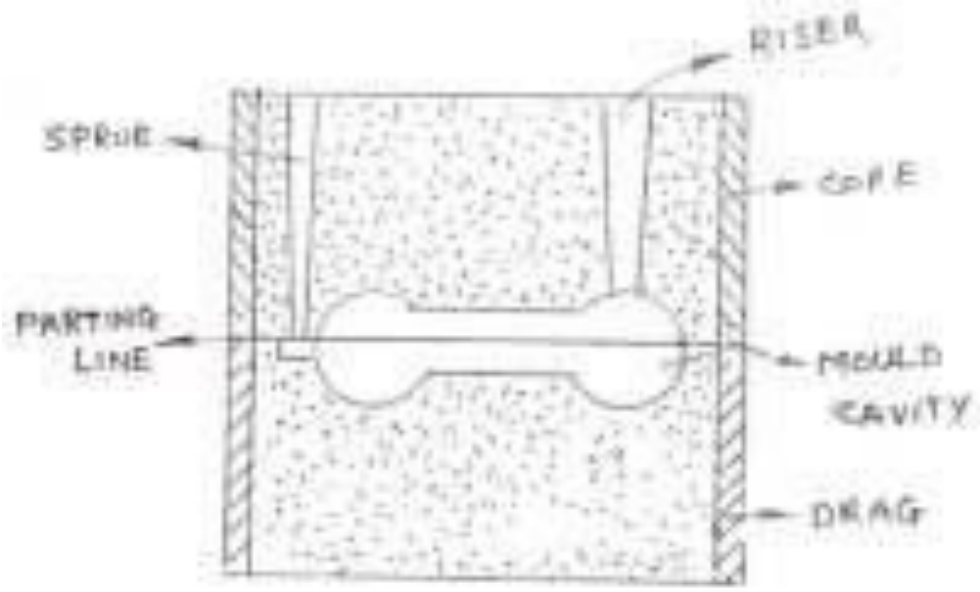


Fig: 2 mould of two piece pattern

Procedure: -

1. Place the pattern on the molding board, with its flat side on the board.
2. Place the drag over the board, after giving a clay wash inside.
3. Sprinkle the pattern and molding board, with parting sand.
4. Allow loose sand, preferably through a riddle over the pattern, unit it is covered to a depth of 2 to 3 cm.
5. Pack the molding sand around the pattern and into the corners of the flask, with fingers.
6. Place some more sand in the flask and pack the pattern with a rammer, using first the peen end and then butt end.
7. Strike-off the excess sand from the top surface of the drag with the strike-off bar.
8. Turn the drag upside down.
9. Blow-off the loose sand particles with the bellows and smoothen the upper surface.
10. Place the cope on to the drag in position. Locate riser pin on the highest point of the pattern.
11. Place the sprue pin at about 5 to 6 cm from the pattern on the other side of the riser pin.
12. Sprinkle the upper surface with parting sand.
13. Repeat steps 3 to 7, approximately.
14. Make holes with the vent rod to about 1 cm from the pattern.
15. Remove the sprue and riser pins by carefully drawing them out. Funnel shaped hole is made at the top of the sprue hole, called the pouring cup.
16. Lift the cope and place it aside on its edge.
17. Insert the draw pin into the pattern. Wet the edges around the pattern. Loosen the pattern by rapping. Then draw the pattern straight up.
18. Adjust and repair the mold by adding bits of sand, if necessary.
19. Cut gate in the drag from the sprue to the mold. Blow off any loose sand particles in the mold.
20. Close the mold by replacing the cope and placing weights on it.

Precautions:-

1. Do not get the sand too wet. Water is an enemy of molten metals.
2. Provide adequate ventilation to remove smoke and fumes.
3. Never stand near or look over the mold during the pouring because of the molten metal might be too hot.
4. Do not shake out a casting too hastily, which may result in second and third degree burns.

Result: - A sand mold cavity is prepared by using Dum-Bell.

WELDING

INTRODUCTION

Welding is the process of joining similar metals by the application of heat, with or without application of pressure or filler metal, in such a way that the joint is equivalent in composition andcharacteristics of the metals joined. In the beginning, welding was mainly used for repairing all kinds ofworn or damaged parts. Now, it is extensively used in manufacturing industry, construction industry(construction of ships, tanks, locomotives and automobiles) and maintenance work, replacing rivetingand bolting, to a greater extent.

The various welding processes are:

1. Electric arc welding,
2. Gas welding
3. Thermal welding
4. Electrical Resistance welding and
5. Friction welding

However, only electric arc welding process is discussed in the subject point of view.

Electric arc welding

Arc welding is the welding process, in which heat is generated by an electric arc struck between an electrode and the work piece. Electric arc is luminous electrical discharge between two electrodes

through ionized gas.

Any arc welding method is based on an electric circuit consisting of the following parts:

a. Power supply (AC or DC);

b. Welding electrode;

c. Work piece;

d. Welding leads (electric cables) connecting the electrode and work piece to the power supply.

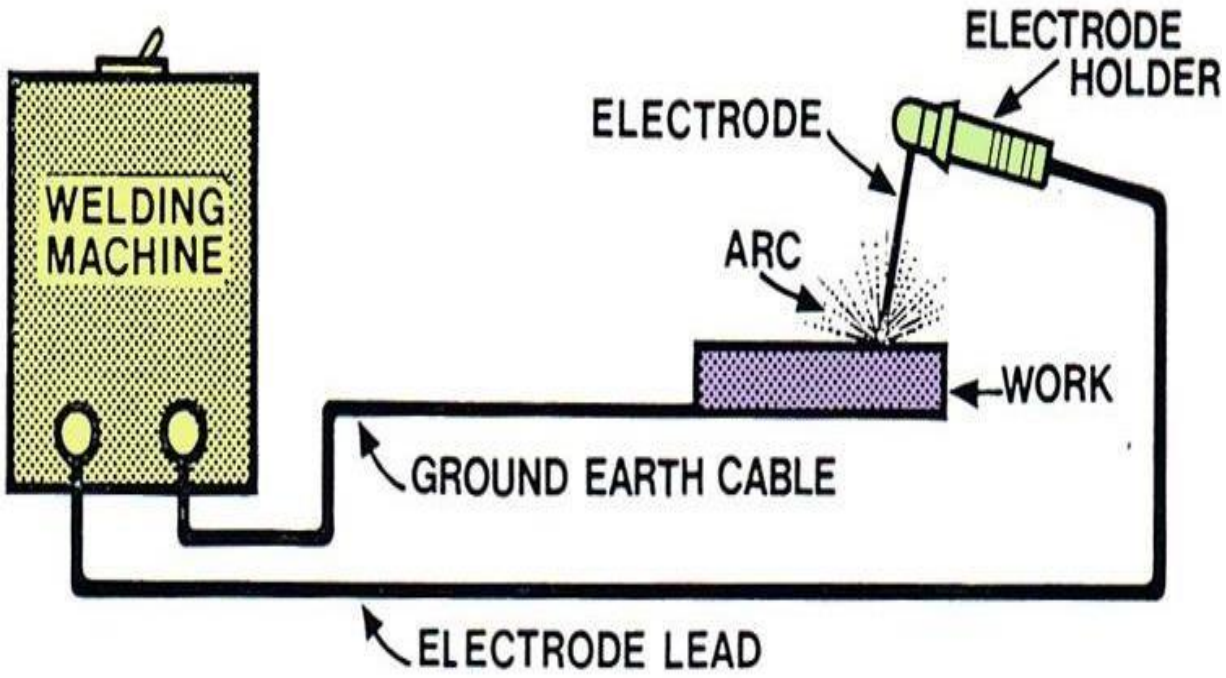


Fig:1 Arc welding set up

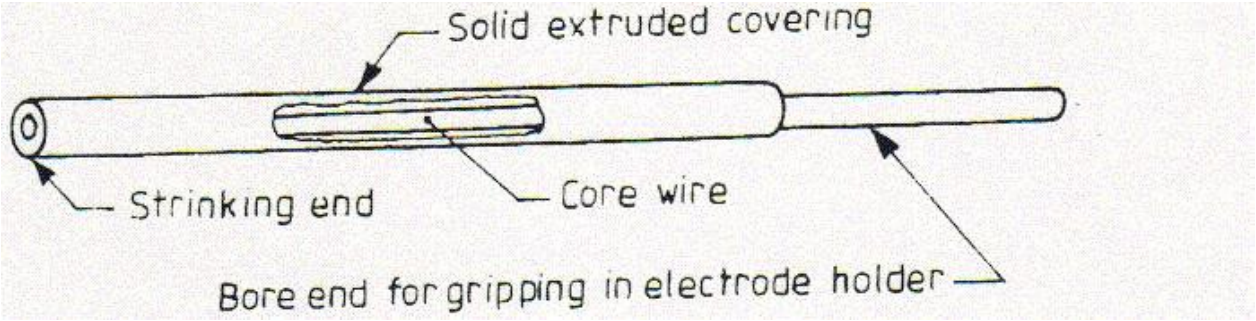


Fig :2 parts of an electrode

Electric arc between the electrode and work piece closes the electric circuit. The arc temperature may reach 10000°F (5500°C), which is sufficient for fusion the work piece edges and joining them. When a long joint is required the arc is moved along the joint line. The front edge of the weld pool melts the welded surfaces when the rear edge of the weld pool solidifies forming the joint.

Transformers, motor generators and rectifiers' sets are used as arc welding machines. These machines supply high electric currents at low voltage and an electrode is used to produce the necessary arc. The electrode serves as the filler rod and the arc melts the surface so that, the metals to be joined are actually fixed together.

Sizes of welding machines are rated according to their approximate amperage capacity at 60% duty cycle, such as 150,200,250,300,400,500 and 600 amperes. This amperage is the rated current output at the working terminal.

Transformers

The transformers type of welding machine produces A.C current and is considered to be theleast expensive. It takes power directly from power supply line and transforms it to the voltage required for welding. Transformers are available in single phase and three phases in the market.

Motor generators

These are D.C generators sets, in which electric motor and alternator are mounted on the same shaft to produce D.C power as pert the requirement for welding. These are designed to produce D.C current in either straight or reversed polarity. The polarity selected for welding depends upon the kind of electrode used and the material to be welded.

Rectifiers

These are essentially transformers, containing an electrical device which changes A.C into D.C by virtue of which the operator can use both types of power (A.C or D.C, but only one at a time).In addition to the welding machine, certain accessories are needed for carrying out the welding work.

Welding cables

Two welding cables are required, one from machine to the electrode holder and the other, from the machine to the ground clamp. Flexible cables are usually preferred because of the case of usingand coiling the cables. Cables are specified by their current carrying capacity, say 300 A, 400 A, etc.

Electrodes

Filler rods are used in arc welding are called electrodes. These are made of metallic wire called core wire, having approximately the same composition as the metal to be welded. These are coated uniformly with a protective coating called flux. While fluxing an electrode; about 20mm of length is left at one end for holding it with the electrode holder. It helps in transmitting full current from electrode holder to the front end of the electrode coating. Flux acts as an insulator of electricity. In general, electrodes are classified into five main groups; mild steel, carbon steel, special alloy steel, cast iron and non-ferrous. The greatest range of arc welding is done with electrodes in the mild steel group. Various constituents like titanium oxide, potassium oxide, cellulose, iron or manganese, Ferro silicates, carbonates, gums, clays, asbestos, etc., are used as coatings on electrodes. While welding, the coating or flux vaporizes and provides a gaseous shield to prevent atmospheric attack. The size of electrode is measured and designated by the diameter of the core wire in SWG andlength, apart from the brand and code names; indicating the purpose for which there are most suitable

Electrodes may be classified on the basis of thickness of the coated flux. As

1. Dust coated or light coated
2. Semi or medium coated and
3. Heavily coated or shielded

Electrodes are also classified on the basis of materials, as

1. Metallic and
2. Non-metallic or carbon

Metallic arc electrodes are further sub-divided into

1. Ferrous metal arc electrode (mild steel, low/medium/high carbon steel, cast iron, stainless steel, etc)
2. Non-ferrous metal arc electrodes (copper, brass, bronze, aluminum, etc).

In case of non-metallic arc electrodes, mainly carbon and graphite are used to make the electrodes.

Fig :3 Electrode holder

Fig :4 Ground Clamp

Fig :5Wire brush

Fig :6Chipping hammer

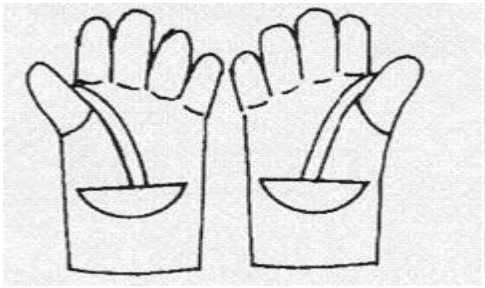


Fig :7Hand gloves

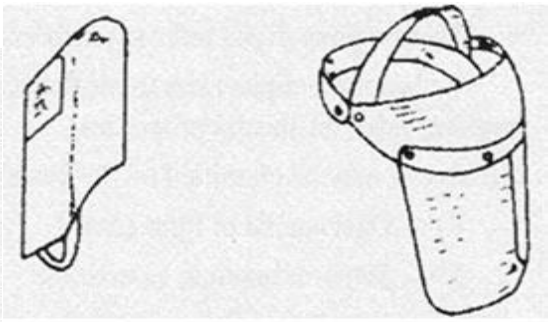


Fig :8Face shield

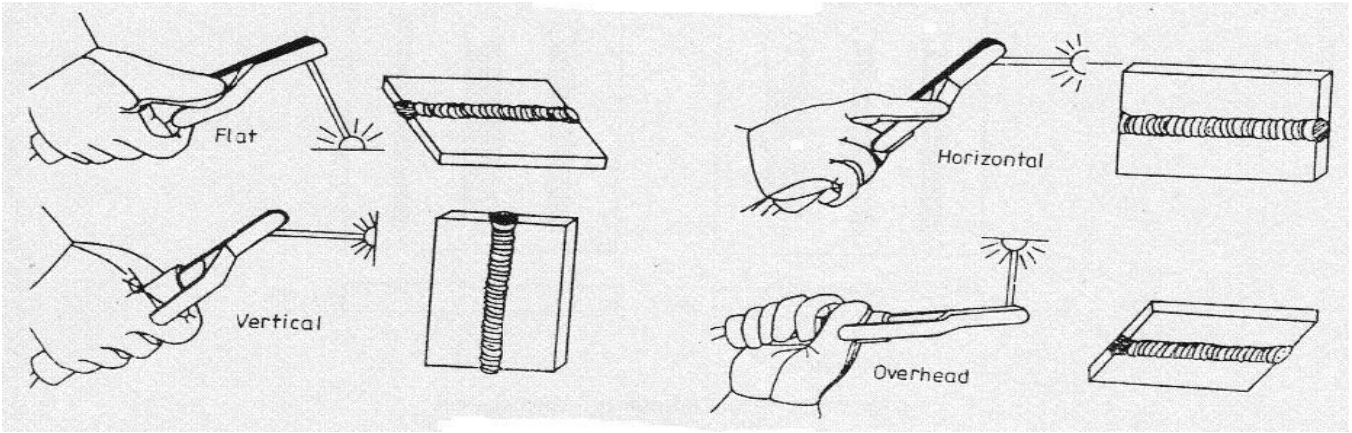


Fig :9Weld positions

WELDING TOOLS

Electrode holder

The electrode holder is connected to the end of the welding cable and holds the electrode. Itshould be light, strong and easy to handle and should not become hot while in operation. Figure shows one type of electrode holder. The jaws of the holder are insulated, offering protection from electric shock.

Ground clamp

It is connected to the end of the ground cable and is clamped to the work or welding table to complete the electric circuit. It should be strong and durable and give a low resistance connection.

Wire brush and chipping hammer

A wire brush is used for cleaning and preparing the work for welding. A chipping hammer is used for removing slag formation on welds. One end of the head is sharpened like a cold chisel and the other, to a blunt, round point. It is generally made of tool steel. Molten metal dispersed around the welding heads, in the form of small drops, is known as spatter. When a flux coated electrode is used in welding process, then a layer of flux material is formed over the welding bead which contains the impurities of weld material. This layer is known as slag. Removing the spatter and slag formed on and around the welding beads on the metal surface is known as chipping.

Welding table and cabin

It is made of steel plate and pipes. It is used for positioning the parts to be welded properly.

Welding cabin is made-up by any suitable thermal resistance material, which can isolate the surrounding by the heat and light emitted during the welding process. A suitable draught should also be provided for exhausting the gas produced during welding.

Face shield

A face shield is used to protect the eyes and face from the rays of the arc and from spatter or flying particles of hot metal. It is available either in hand or helmet type. The hand type is convenient to use wherever the work can be done with one hand. The helmet type though not comfortable to wear, leaves both hands free for the work.

Shields are made of light weight non-reflecting fiber and fitted with dark glasses to filter out the Harmful rays of the arc. In some designs, a cover glass is fitted in front of the dark lens to protect it from spatter.

Hand gloves

These are used to protect the hands from electric shocks and hot spatters

TECHNIQUES OF WELDING

Preparation of work

Before welding, the work pieces must be thoroughly cleaned of rust, scale and other foreign material. The piece for metal generally welded without beveling the edges, however, thick work pieceshould be beveled or veed out to ensure adequate penetration and fusion of all parts of the

weld. But, in either case, the parts to be welded must be separated slightly to allow better penetration of the weld. Before commencing the welding process, the following must be considered

a) Ensure that the welding cables are connected to proper power source.

b) Set the electrode, as per the thickness of the plate to be welded.

c) Set the welding current, as per the size of the electrode to be used.

WELDING POSITIONS

Depending upon the location of the welding joints, appropriate position of the electrode and hand movement is selected. The figure shows different welding positions.

Flat position welding

In this position, the welding is performed from the upper side of the joint, and the face of the weld is approximately horizontal. Flat welding is the preferred term; however, the same position is sometimes called down hand.

Horizontal position welding

In this position, welding is performed on the upper side of an approximately horizontal surface and against an approximately vertical surface.

Vertical position welding

In this position, the axis of the weld is approximately vertical as shown in figure.

Overhead position welding

In this welding position, the welding is performed from the underside of a joint

WELDING

Corner joint

EXPERIMENT No: **DATE:**

Aim: To make a corner joint, using the given two M.S pieces and by arc welding.

Material Supplied:

Mild steel plate of size 100X50X5 mm – 2 No's

Welding Electrodes: M.S electrodes 3.1 mm X350 mm

Welding Equipment: Air cooled transformer

Voltage-80 to 600 V 3 phase supply, amps up to 350

Tools and Accessories required:

1. Rough and smooth files.
2. Protractor
3. Arc welding machine (transformer type)
4. Mild steel electrode and electrode holder
5. Ground clamp
6. Tongs
7. Face shield
8. Apron
9. Chipping hammer.

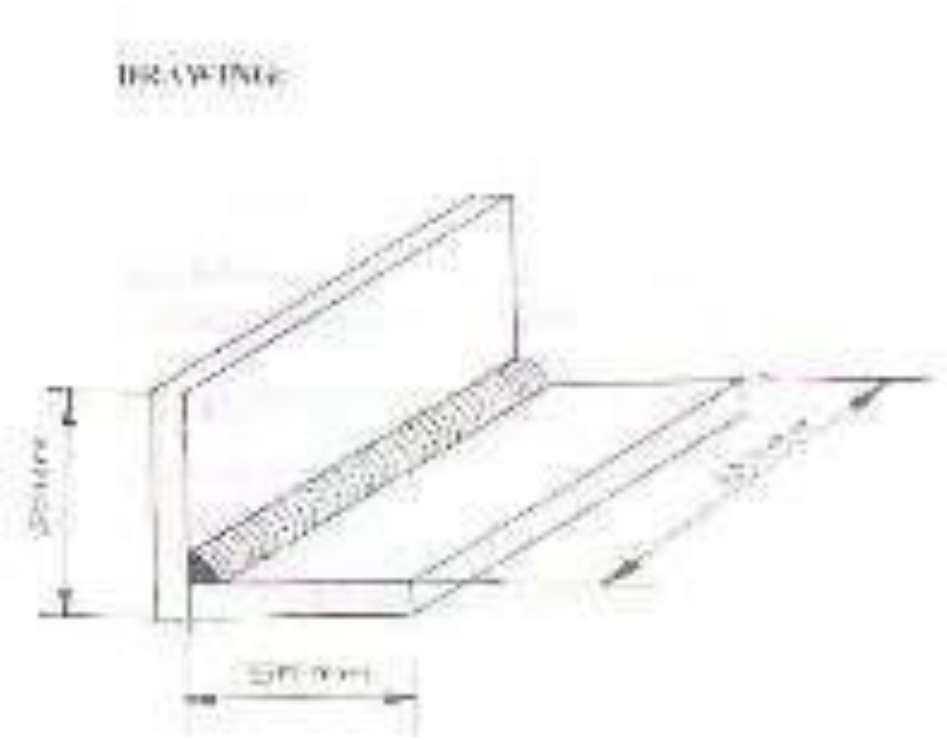
Sequence of operations:

1. Marking
2. Cutting
3. Edge preparation (Removal of rust, scale etc.) by filling
4. Try square leveling
5. Tacking
6. Welding
7. Cooling
8. Chipping
9. Cleaning

Procedure:

1. The given M.S pieces are thoroughly cleaned of rust and scale.
2. The two pieces are positioned on the welding table such that, the L shape is formed. The tongsare made use of for the purpose.
3. The electrode is fitted in the electrode holder and the welding current is ser to be a proper value.
4. The ground clamp is fastened to the welding table.

5. Wearing the apron and using the face shield, the arc is struck and the work pieces are tack-welded at both the ends and at the centre of the joint.
6. The alignment of the corner joint is checked and the tack-welded pieces are required.
7. The scale formation on the welds is removed by using the chipping hammer.
8. Filling is done to remove any spanner around the weld.



Result: The corner joint is thus made, using the tools and equipment as mentioned

Welding

Model no: 2

T-JOINT

Date:

Aim: To make a T-joint ,using the given two m.S pieces and by Arc Welding

Tools And Equipment Required: **Arc Welding Madchine(transformer type),Mild steel electerode and electrode holder,apron,Ground clamp,tongs face shield and chipping hammer**

Sequence of operations :

1.The given M.s picese are thoroughly cleaned of rust and scale

2. The Work piece are positioned on the welding table such that ,the T shape is formed .The Tongs are made use offor the puropose

3.The electrode is fitted in a electrode holder and the welding current is set to prpper vale

4.The Ground clamp is Fastened to the welding table

5.Wearing the Apron .and Using the face shield ,the arc is strunk and the work pieces are tack welded at both ends and at the centre of the joint

6.The alignment of the T-joint is checked and the tack welded pieces are reset,if required

7.The welding is carriedoutthroughout the length of the T-joint

8.The scale formation on the welds is removed by using chipping –hammer

9.Filing is done to remove any spatter around the weld

Result:

The T-joint is thus made,using the tools and equipment as mentioned above

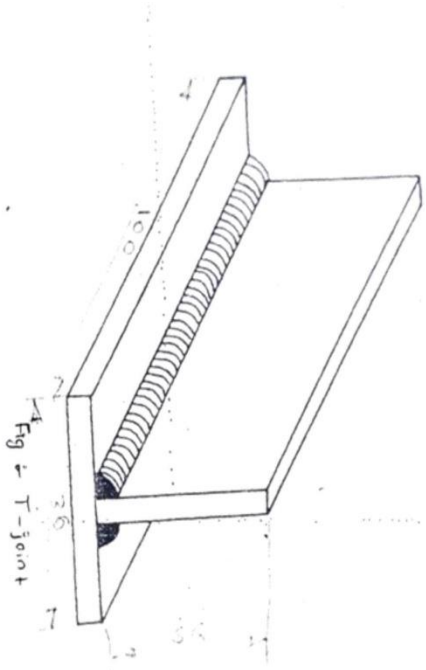


Fig :- T-joint

BLACKSMITHY

Introduction:

Blacksmithty may be defined as the plastic flow of heated metal by the application ofcompressive forces in which a metal is altered in **a** shape permanently without rupture. Smithing is understood to handle relatively small jobs. The shop in which the work is carried out is known as the smithy or smith's shop. The various operations are performed by means of hand hammers or small power hammers. The jobs of smithy shop can be heated in an open fire or hearth.

Forging refers to the production of those parts which must be heated in a closed furnace.

Forgeable Materials:

Forgeability of a material is the capacity of a material to undergo deformation under compression, without rupture. Any metal or alloy which can be brought to plastic stage through heating can be forged.

Some forgeable materials, in order of forging difficulties are listed below.

1. Pure Aluminum
2. Pure copper
3. Most of the pure metals.
4. Aluminum alloys
5. Magnesium alloys
6. Carbon and low alloy steels.
7. Stainless steels

Hand forging tools:

Principal tools used in forging of metals are:

1. **Anvil:** Forging of hot metal piece is done by supporting the piece on the anvil.
2. **Swage block:** It is a solid rectangular block, used for giving finishing to a workpiece.
3. **Hammers:** Hammers are the principal forged tools made up from forging steel.Forging hammers are classified according ***to*** size and weight of the hammers.

    (i) Hand hammers or smith's hammers.

    (ii) Sledge hammer: Heavier than smith's hammer.

    (iii) Power hammer.
4. **Tongs:**- Tongs are used by the smith for holding and turning the hot metal workpieces.
5. **Chisels**:- In forging ,chisels are also known as hot setts or cold setts.Hot sett isused for cutting hot material and a cold sett is used for cutting cold materials

Black Smith's Forge:

The simplest furnace used by the black smith is an open hearth Coal fired forced draft furnace. It consists of robust cast iron or steel structure erected on four legs. It has an iron bottom known as hearth, a chimney for escape of flue gases at top and a tuyer. The hearth is provided with fire bricks lining and carries coke. Air under pressure is supplied form theblower through the tuyer opening in the hearth. Both hand operated and power operated blowers are used for creating the blast of air.

To ensure uniform temperature and proper burning of coal the supply of air should be properly regulated and controlled. The amount of heat produced in the hearth largely depends upon the supply of air.

Coal, coke, charcoal, pulverized coal and lignite are the most commonly used fuel in a smith's furnaces.

Smithy Operations:

Smith forging operations are carried out to manufacture comparatively light weight components. The following operations are used, for giving desired shapes to the products.

1. **Drawing:** Drawing is the process in which a red hot metal piece is beaten up by a hammer. The thickness or diameter is decreased but length increases. The hammering is done by placing the hot piece on the anvil.
2. **Upsetting:** It is the process in which the diameter of the hot work piece is increased and length is reduced. Hot metal piece is placed on the anvil in vertical position. It is struck with a hand hammer. The hot work piece is held in a tong.
3. **Punching:** Punching is the process in which a rough hole is made into the hot work piece. The job is heated to a desired temperature and then it is placed on the anvil. Punch is placed on the hot metal piece. With the help of a sledge hammer, the punch is forced to piece the metal up to half of the metal thickness. Then the punching is done from the second side by inverting the work piece. A rough hole isproduced.
4. **Drafting:** It is a process of finishing and enlarging the hole. The process is similar to punching.
5. **Swaging:** Swaging is a process used to form or finish different shapes such as circular, hexagonal and square etc. The hot piece is held between the upper and lower part of the swages. With the help of a hammer, blows are given to the upper part of the swage.
6. **Fullering:** Fullering process is done on an anvil. Lower part of the fuller set is kept in the hole of the anvil. Hot work piece is placed in the groove of the lower fuller. Upper fuller is placed on the job and hammering is done on the upper portion. Fullering is done for drawing and grooving.
7. **Bending:** The process of giving desired angles or curvature to hot pieces is known as bending. The process is done on the edge of the anvil or on chipping block. Circular shapes, eye bolts hooks or any other types of bent shape can be prepared with this operation. The hammering is done on hot work piece with a hand hammer. Hot work piece is held in a tong.
8. **Forge Welding:** The process of joining two metal pieces by heating and hammering is knows as forge welding. The metal pieces to be welded are cleaned
9. and heated in a furnace up to the welding temperature. Both pieces are picked fromthe furnace with

the help of the tongs. Work pieces are placed on each other and hammering is done on them and both the pieces get welded.

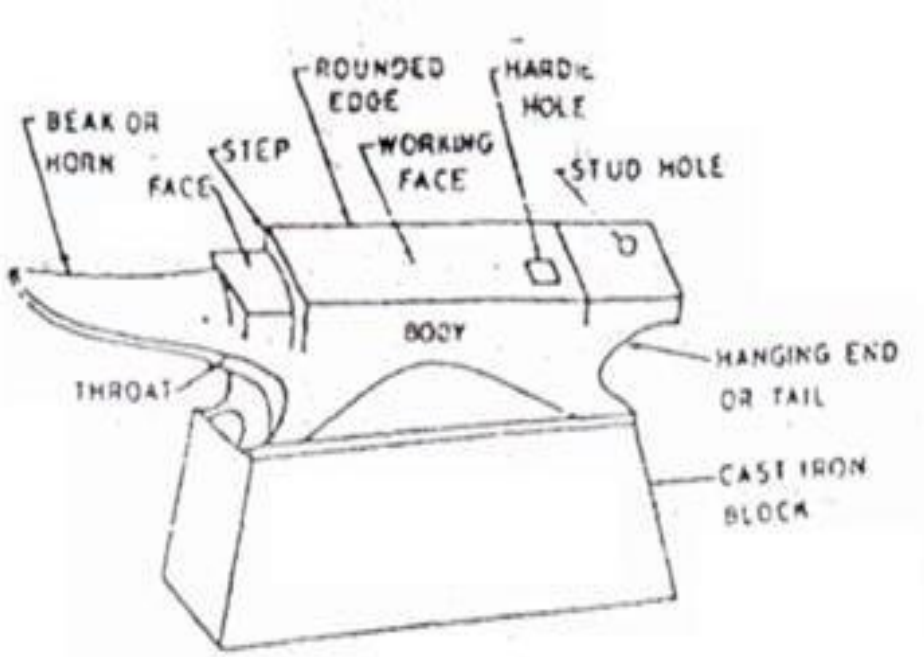
10.

11. Smith forging examples:

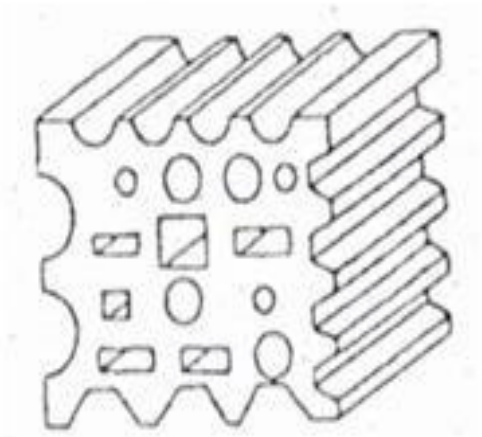
12.

13. Smith forging examples are making of bolt head, cold chisel, chain, flat drill etc.

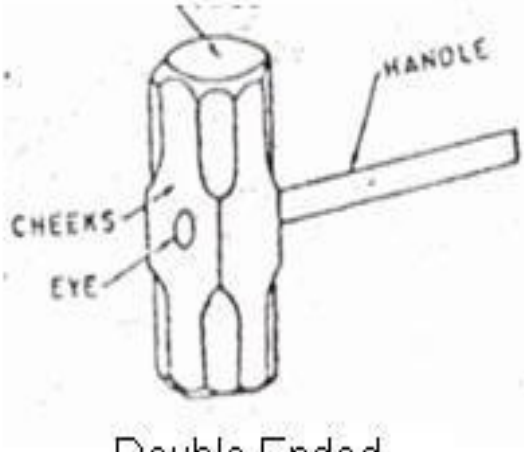
14.



Anvil

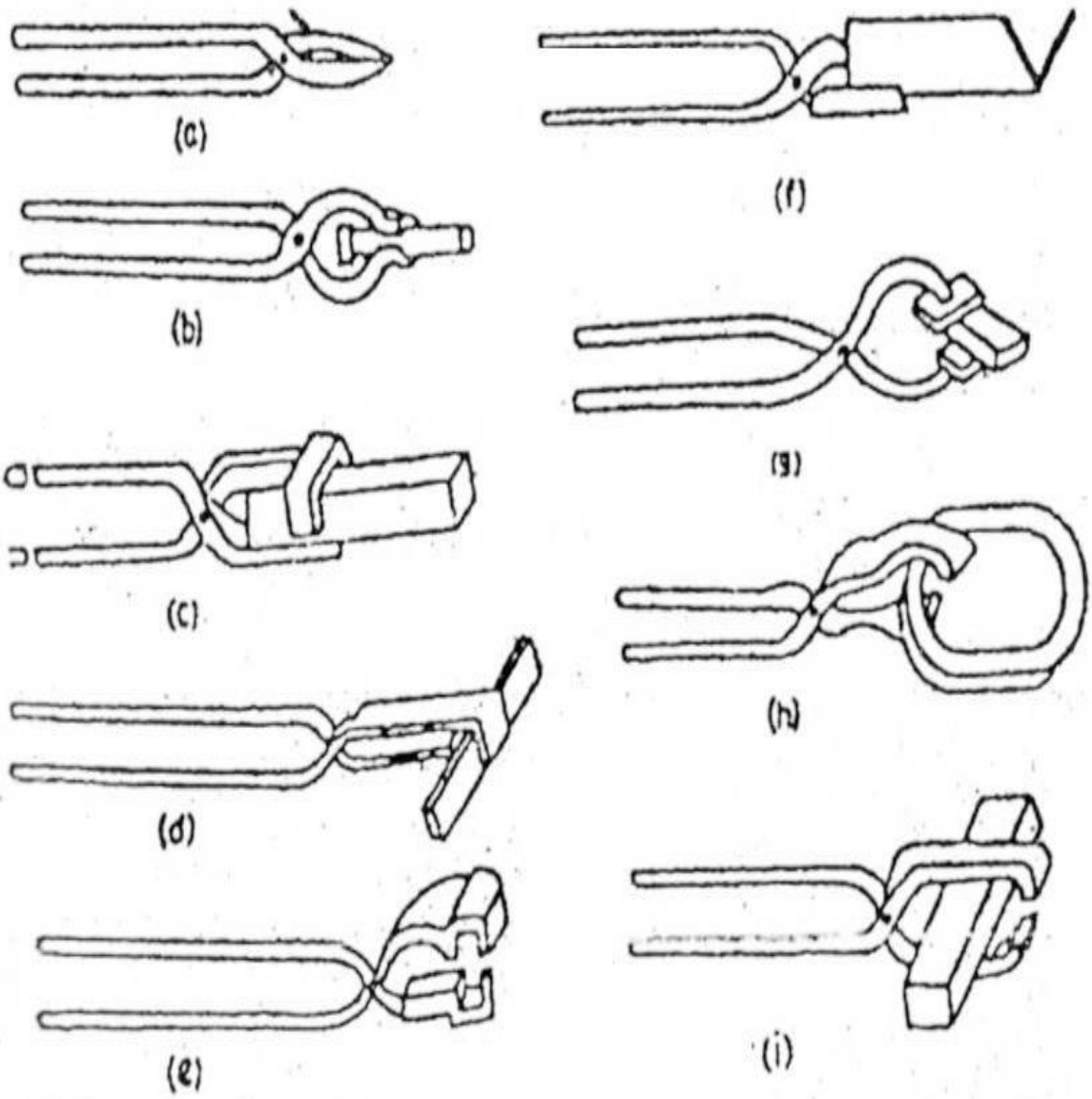


Swage Block



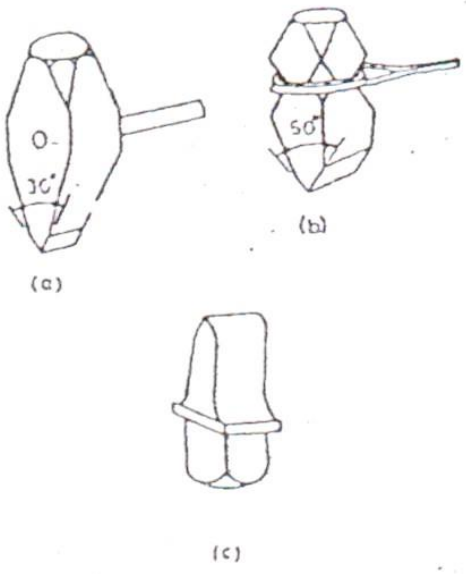
Double Ended Sledge Hammer

15.

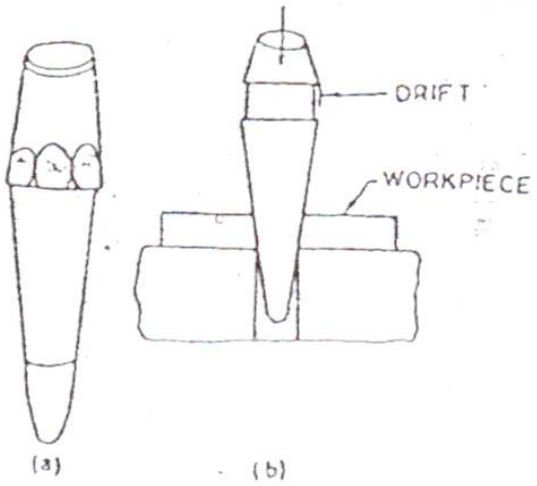


Different types of tongs

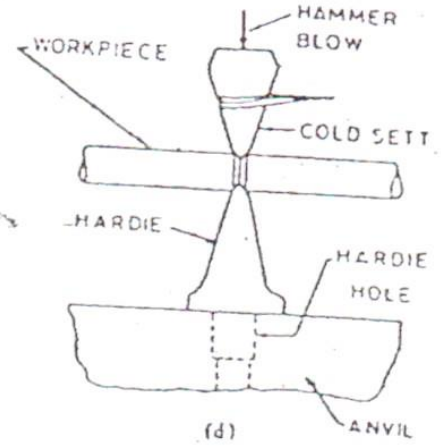
(a) close flat tong (b) hollow bit tong (c) pincer tong (d) duck neck tong
(e) hoop tong (f) angle tong (g) pick tong (h) flank tong mild
(i) elongating tong

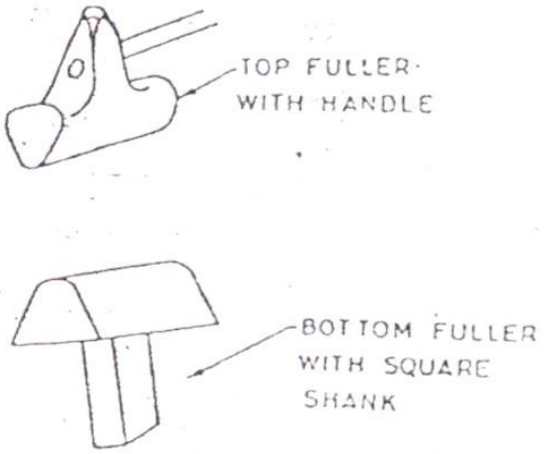


(a) and (b) chisels
(c) and (d) hardie

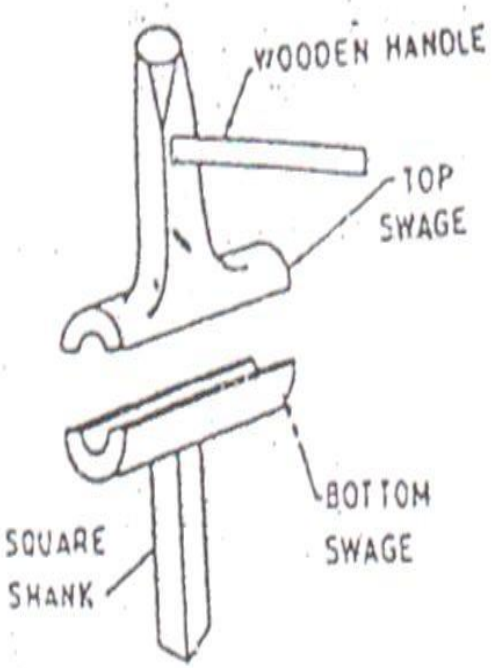


Punch and drift

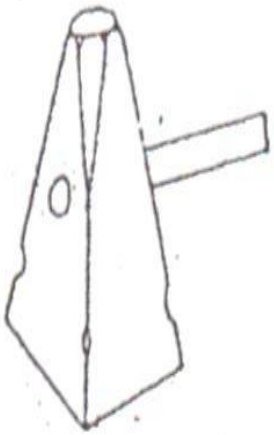




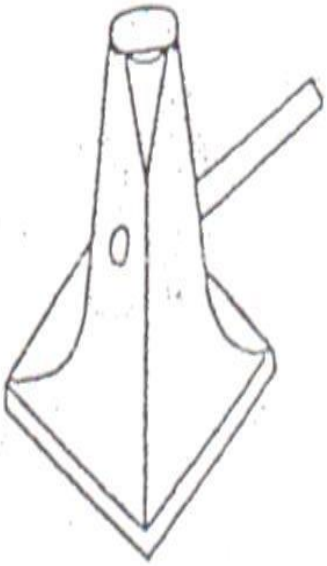
Fullers



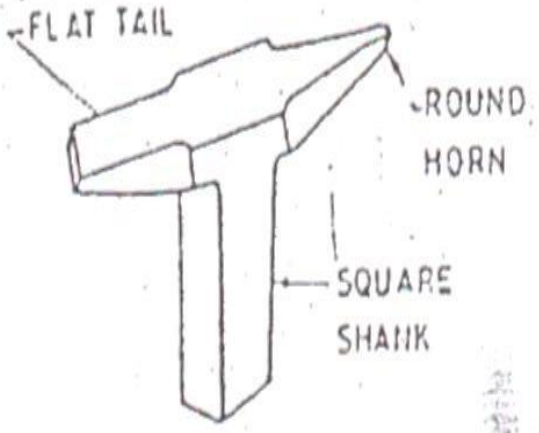
Swages



Sett hammer



Flatter



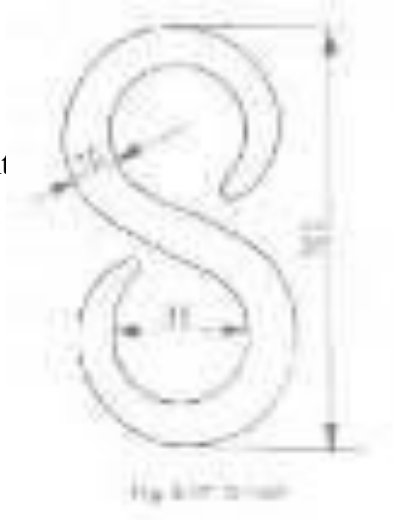
Blck Iron

EXP: 1 **S-HOOK** **Date**

Aim: To make an S-hook from a given round rod, by following hand forging operation.

Tools required:

Smith's forge**,** Anvil**,** 500gm and I kg ball-peen hammers, Flatters, Swage block, Half round tongs, Pick-up tongs, Cold chisel.



Sequence of operations:

1. One end of the bar is heated to red hot condition in the smit forge for the required length.
2. Using the pick-up tongs; the rod is taken from the forge, and holding it with the half round tongs, the heated end is forged intoa tapered pointed end.
3. The length of the rod requires for S-hook is estimated and the excess portion is cut-off, using a cold chisel.
4. One half of the rod towards the pointed end is heated in the forge to red hot condition and then bent into circular shape as shown.
5. The other end of the rod is then heated and forged into a tapered pointed end.
6. The straight portion of the rod is finally heated and bent into circular shape as required.
7. Using the flatter, the S-hook made as above, is kept on the anvil and flattened so that, the shape of the hook is proper.

NOTE: In-between the above stage, the bar is heated in the smith's forge, to facilitate forging operations.

Result:

The S-hook is thus made from the given round rod; by following the stages mentioned above.

Precautions:

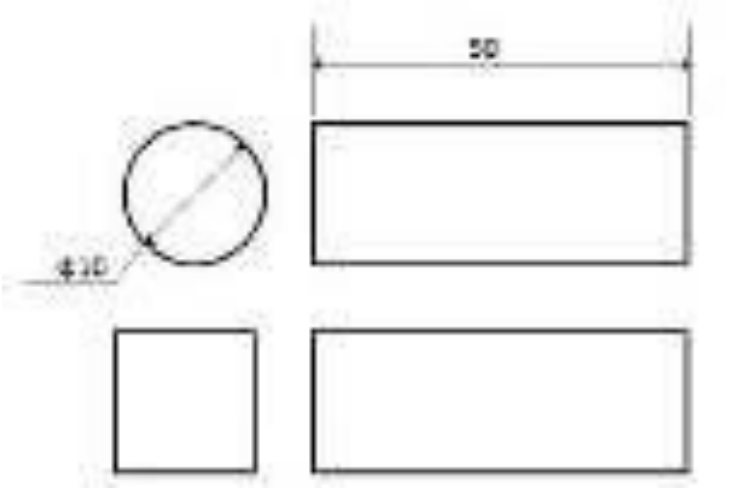
1. Hold the job carefully while heating and hammering
2. Job must be held parallel to the face of the anvil.
3. Wear steel-toed shoes.
4. Wear face shield when hammering the hot metal
5. Use correct size and type of tongs to fit the work.

XP: 2 **SQUARE ROD** **Date**

Aim: To make a Square rod from a given round rod, by following hand forging operation.

Tools required:

Smith's forge**,** Anvil**,** 500gm and I kg ball-peen hammers, Flatters, Swage block, Half round tongs, Pick-up tongs, Cold chisel.



Sequence of operations:

1. Take the raw material from stock i.e., mild steel 10 mm round shaped, cut the length of 50 mm.
2. Handle specimen with round tong and heat in blacksmith's forge upto the part appears as red cherry color code.
3. The required piece heated upto it gets the recrystalization temperature.
4. The part is taken out from the forge and blow with sledge hammer for obtaining the square shape on all edges.
5. The hammering is done on the anvil.
6. The above mentioned all steps are done, after the specimen bent in required shape.
7. Check the dimensions after cooling the job by quenching process.

NOTE: In-between the above stage, the bar is heated in the smith's forge, to facilitate forging operations.

Result:

The square rod is thus made from the given round rod.

Precautions:

1. Hold the job carefully while heating and hammering
2. Job must be held parallel to the face of the anvil.
3. Wear steel-toed shoes.
4. Wear face shield when hammering the hot metal
5. Use correct size and type of tongs to fit the work.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH I YEAR – I SEMESTER

DEPARTMENT OF MECHANICAL ENGINNERING

Academic Year: 2022-2023

(R22MED1124) ENGINEERING WORKSHOP LAB

LAB MASTER TIME TABLE

SUBJECT: ENGINEERING WORKSHOP LAB (R22MED1124)

TIME / DAY	09:40am To 10:30am	10:30am To 11:20pm	11:20am To 12:10pm	LUNCH	12:40pm To 1:45pm	1:45pm To 2:50pm	2:50pm To 4:00pm
	1	2	3		4	5	6
MON	AI&ML-A				AI&DS-A		
TUE	IOT						
WED	ME & ECE-A						
THU					CE & ECE-B		
FRI	AI&ML-B				AI&DS-B		
SAT							

HOD PRINCIPAl