**A Laboratory manual**
**For**

# WORKSHOP PRACTICE – II (PR- 3)

**In accordance to syllabus (2019-20)**
**By S.C.T.E & V.T, Odisha**

## Semester – 3rd

**DEPARTMENT OF MECHANICAL ENGINEERING**

**GOVERNMENT POLYTECHNIC, JAJPUR**
**ODISHA – 755019**
**Affiliated to S.C.T.E & V.T, Odisha and A.I.C.T.E, New Delhi**


# GOVERNMENT POLYTECHNIC, JAJPUR

## CERTIFICATE

This is to certify that Mr./Ms.:-…….....
Bearing registration no:-…….. ….of Fourth semester Diploma in Mechanical Engineering has completed the term work satisfactorily in course Workshop practice – II for the academic year:-…….as prescribed in the curriculum.

Place:-…….. Date:-…….

| Signature | Signature | Signature |
|---|---|---|
| Course Teacher | HOD/ Mechanical | Principal |

## Programme Outcomes (POs) to be achieved through Practical of this Course

Following POs and PSO are expected to be achieved through the practicals of the Workshop Practice course.

PO 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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 9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

PSO1: **Manage Safety measures and associated Hazards During processes:** Usage of different personal protective Equipment's(PPES) against associated hazards during work with different machine, methods, materials and their process.

PSO2: **Maintenance and selection of machines, equipment, instruments:** Maintain and select appropriate machine, equipment and instrument in the field of Mechanical Engineering.

PSO 3: **Manage Mechanical Process:** Manage the mechanical processes by selection and scheduling right type of machinery, equipment, substrates, quality control techniques, operational parameters.

## List of Industry Relevant Skills

The following industry relevant skills of the competency **will be gained from different types of shops like fitting ,smithy ,carpentry, welding for engineering applications**' are expected to be developed in you by undertaking the practices of this workshop manual.

1. Applicable in various industries like oil, gas, steel, construction, Heavy machineries sectors like carpentry applicable for packaging of goods and transportation
2. fittings works applicable for different child part processes by using different machine and their operational parameters.
3. Basic smith works applicable in heat treatments shops and forged industries.
4. Basic Welding engineering application used in different piping used in oil and gas sectors as well as Construction industries.

# Practical-Course Outcome Matrix

**Course Outcomes:**

**CO1:** Understanding the tools, equipment & Instruments used in the practices
**CO2:** Realize the time and resource utilization in the practices
**CO3:** Understanding the Different joints in Welding and carpentry.
**CO4:** Standard Operational procedure of lathe machine, drilling, welding machine & Basic smithy practices.
**CO5:** Understanding different safety and associated Hazards during work.

| S.no | Practical Outcome | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|---|
| 1 | Preparation of caliper | ✓ | ✓ | - | - | ✓ |
| 2 | Preparation of try square | ✓ | ✓ | - | ✓ | ✓ |
| 3 | Preparation of hammer, square , Hexagonal | ✓ | ✓ | - | ✓ | ✓ |
| 4 | Preparation of door ring with hook | ✓ | ✓ | - | ✓ | ✓ |
| 5 | Preparation of hexagonal head bolt | ✓ | ✓ | | ✓ | ✓ |
| 6 | Preparation of octagonal flat chisel | ✓ | ✓ | - | ✓ | ✓ |
| 7 | Cutting of slot, botch, mortise and Tenos Joint | ✓ | ✓ | ✓ | - | ✓ |
| 8 | Preparation of single dove tail joint | ✓ | ✓ | ✓ | - | ✓ |
| 9 | Lap & Butt Joint using Arc Welding | ✓ | ✓ | ✓ | - | ✓ |
| 10 | Lap Joint using Gas Welding | ✓ | ✓ | ✓ | - | ✓ |
| 11 | Joining Two non-ferrous parts through | ✓ | ✓ | ✓ | - | ✓ |

## GUIDELINES TO TEACHERS

1. Teacher need to ensure that a dated log book for the whole semester, apart from the laboratory manual is maintained by every student which s/he has to submit for assessmentto the teacher in the next practical session.
2. There will be two sheets of blank pages after every practical for the student to report other matters(if any), which is not mentioned in the printed practical's.
3. For difficult practical's if required, teacher could provide the demonstration of the practical emphasizing of the skills which the student should achieve.
4. Teachers should give opportunity to students for hands-on after the demonstration.
5. Assess the skill achievement of the students and COs of each unit.
6. One or two questions ought to be added in each practical for different batches. For this teachers can maintain various practical related question bank for each course.
7. If some repetitive information like data sheet, use of software tools etc. has to be provided for effective attainment of practical outcomes, they can be incorporated in Appendix.
8. For effective implementation and attainment of practical outcomes, teacher ought to ensure that in the beginning itself of each practical, students must read through the complete write-up of that practical sheet.
9. During practical, ensure that each student gets chance and takes active part in taking observations/ readings and performing practical.
10. Teacher ought to assess the performance of students continuously according to the MSBTE guidelines.

## INSTRUCTIONS FOR STUDENTS

1. For incidental writing on the day of each practical session every student should maintaina dated log book for the whole semester, apart from this laboratory manual which s/he has to submit for assessment to the teacher in the next practical session.
2. For effective implementation and attainment of practical outcomes, in the beginning itself of each practical, students need to read through the complete write-up including the practical related questions and assessment scheme of that practical sheet.
3. Student ought to refer the data books, IS codes, Safety norms, Electricity act/rules, Technical manuals, etc.
4. Student should not hesitate to ask any difficulties they face during the conduct of practical.

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# Experiment No- 01

## Aim of the experiment:

To prepare a caliper.

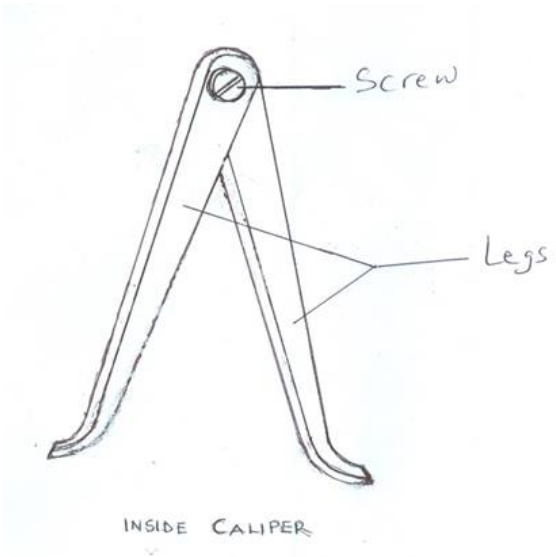
## Apparatus required :

| Sl. no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Hacksaw frame with blade | 300mm | 01 |
| **02** | Bastard File | 300mm | 01 |
| **03** | Smooth File | 250mm | 01 |
| **04** | Hammer | 0.25Kg | 01 |
| **05** | Punch | 150mm | 01 |
| **06** | Steel Rule | 300mm | 01 |
| **07** | Drill Bit | Ø6mm | 01 |
| **08** | Marking Media | | As per requirement |
| **09** | Drilling Machine | Bench Type | 01 |

## Raw material required:

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Flat | 2 (160X20X6)mm | 02 |
| **02** | M.S. Rivet | Ø6mmX10mm | 01 |

## Procedure:




(Take the according to suitable dimension)

- File the two adjacent edges of the M.S Flat to right angle.
- Apply the marking media to mark the job as per sketch and punch the marking line.
- Remove the extra material by sawing and chipping and then file the job

to therequired shape.

- Drill the holes on the two pieces and clean the burrs.
- Assemble the two parts by riveting.
- Finish all sides, edges and surfaces properly.

**Safety precautions :**

a. It is necessary that there is no play in its beam and movable jaw and it could be easily
b. After long use, the jaw-edges wear out. In such cases, it should be regrinded.
C. A job fixed on a machine in operation should not be Scale measured with it.
d. Is should always be kept away from the cutting tools.
e. It is difficult to see the part of scale. Therefore, it is advisable to use a magnifying glass.
f. After using it, we should clean it with thinner and keep it in the case.

**Conclusion:**

Hence the outside caliper is made and required dimension has prepared.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. Which Materials required for preparation of caliper?
2. What are the measuring instruments used during preparation of caliper?
3. Which equipment can be use for both measurement and and marking?
4. Describe process of metal removal during preparation of caliper.
5. Calipers are marking tools or measuring tool?

**Space for answer**

# Experiment No - 02

**Aim of the experiment :**

To prepare a Try Square.

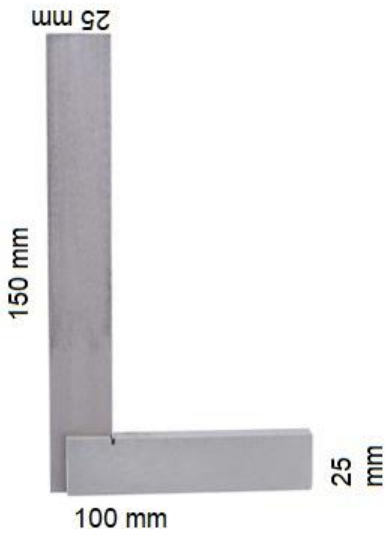
**Apparatus required :**

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Hacksaw frame with blade | 300mm | 01 |
| **02** | Bastard File | 300mm | 01 |
| **03** | Smooth File | 250mm | 01 |
| **04** | Hammer | 0.25Kg | 01 |
| **05** | Punch | 150mm | 01 |
| **06** | Steel Rule | 300mm | 01 |
| **07** | Drill Bit | Ø6mm | 01 |
| **08** | Bench Vice | 125mm | 01 |
| **09** | Vernier Height Gauge | 300mm | 01 |
| **10** | Try Square | 150mm | 01 |
| **11** | Drilling Machine | Bench Type | 01 |
| **12** | Marking Media | | As per requirement |

**Raw material required:**

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Flat | (80x30)mm Beam | 01 |
| **02** | M.S. Flat | (130X30)mm (Blade) | 01 |
| **03** | M.S. Rivet- | Ø6mmX10mm | 01 |

**Procedure:**




Thickness of stock – 10 mm

Thickness of blade – 3 mm

- File the two adjacent edges of the M.S Flat to right angle.
- Apply the marking media to mark the job as per sketch and punch the marking line.
- Remove the extra material by sawing and chipping and then file the job to the required shape.
- Make small hole on each flat by drilling machine.
- File the holes on the two pieces and clean the burrs.
- Assemble the two parts by riveting.
- Finish all sides, edges and surfaces properly.

**Safety precautions:**

a. We should not use try square as a hammer i.e. we should not use it to hit any job otherwise it accuracy is spoiled.

b. Try square should be kept away from cutting tools.

c. It should be cleaned properly before use.

d. After making its use, it should be kept after applying grease.

## Conclusion :

Finally a Try Square of required dimension has been prepared.

## Resources used (with major specifications)

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

## Actual procedure followed:

## Precautions followed:

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What are the parts of try square?
2. What is the right process to use a try square and why we use try square?
3. What are the materials used during preparation of try square?
4. How to find out error by a try square.
5. What are the measuring instruments used?

**Space for answer**

# Experiment No- 03

**Aim of the experiment :**

To prepare a Hammer

**Apparatus required :**

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Hacksaw frame with blade | 300mm | 01 |
| **02** | Bastard File | 300mm | 01 |
| **03** | Smooth File | 250mm | 01 |
| **04** | Hammer | 0.25Kg | 01 |
| **05** | Scriber | 150mm | 01 |
| **06** | Lathe Machine | Centre Lathe | 01 |
| **07** | Vernier Caliper | 200mm | 01 |
| **08** | Bench Vice | 125mm | 01 |
| **09** | Lathe Cutting Tool | HSS 4” | 02 |
| **10** | Chuck Key | - | 01 |
| **11** | Drilling Machine | Bench Type | 01 |

**Raw material required:**

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Rod | (Ø40X60)mm | 01 |
| **02** | M.S.Rod | ((Ø10X200)mm | 01 |

**Take suitable dimension**

**Procedure:**

- At first fit the job in chuck of the lathe with the help of chuck key.
- Then fit the cutting tool on the tool post.
- Then test whether the job is properly fixed or not on the lathe machine.
- After that start all operations to prepare a hammer.
- At last complete all the operation and produce a hammer

**Conclusion:**

Hence a hammer is prepared as per the given dimension.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What is the industrial way to manufacture a hammer.
2. What are the different types of hammer.
3. What are the application of various types of hammer?
4. Which metal is used to prepare a hammer in the workshop.
5. What are the machining process done for preparation of hammer.

**Space for answer**

# Experiment No: 04

## Aim of the experiment:

Cutting of slot, botch, mortise and tenon.

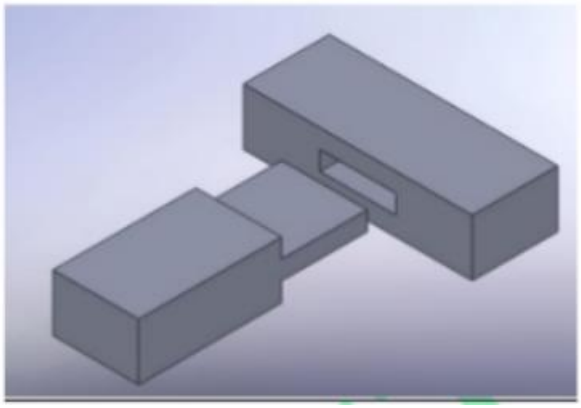
## Tools and equipment required:

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| 01 | Carpenter's Vice | 600mm | 01 |
| 02 | Steel Rule | 300mm | 01 |
| 03 | Jack Plane | 250mm | 01 |
| 04 | Try Square | 150mm | 01 |
| 05 | Marking Gauge | 150mm | 01 |
| 06 | Firmer Chisel | 25mm | 01 |
| 07 | Mortise Chisel | 6mm | 01 |
| 08 | Cross Cut Saw | 300mm | 01 |
| 09 | Tenon Saw | 250mm | 01 |
| 10 | Scriber | 150mm | 01 |
| 11 | Mallet | 0.25Kg | 01 |

## Raw material required:

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| 01 | Wood Size | (50X50X250) mm | 02 |

## Figure:



Take suitable dimensions

## Procedure:

- The given raw material is checked to ensure its correct size.
- The material is firmly clamped in the carpenter's vice and one of its faces are planned bythe jack plane and checked for straightness.
- The adjacent face is then planed and the faces are checked for square ness with the

trysquare.

- Marking gauge is set and lines are drawn at 30 and 45mm to mark the thickness andwidth of the model respectively.
- The excess material is first chiseled out with the firmer chisel and then planned to correct size.
- The matching dimension of the part X and Y are then marked using the scale and markinggauge.
- Using the cross cut saw the portions to be removed in part Y (Tenon) is cut followed by chiseling.
- The material to be removed in Part X (Mortise) is carried out by using the mortise andfirmer chisel.
- The part X and Y are separated by cross cutting with the tenon saw.
- The ends of both the part are chiseled to exact length.
- Finish chiseling is done where ever needed so that the parts can be fitted to obtain a neartight joint.

## CONCLUSION:

The mortise and tenon joint is thus made by following the abovesequence of operations

## Resources used (with major specifications)

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

## Actual procedure followed:

**Precautions followed:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What are the different types of saw?
2. What are the different types of chisel?
3. What is Carpentry  joint ?
4. What are the marking tools used for carpentry operation?
5. What are the measuring tools used for joint?

**Space for answer**

# Experiment: 05

## AIM OF THE EXPERIEMNET:

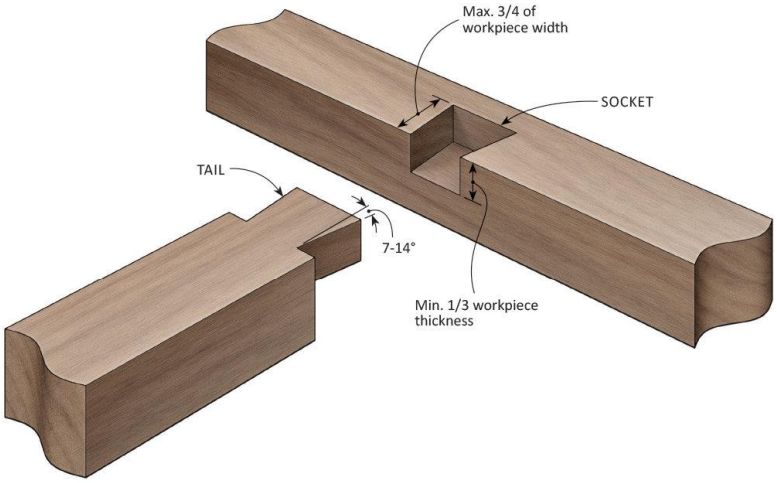
To prepare a single Dove Tail joints

### Tools and equipment required:

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| 01 | Carpenter's Vice | 600mm | 01 |
| 02 | Steel Rule | 300mm | 01 |
| 03 | Jack Plane | 250mm | 01 |
| 04 | Try Square | 150mm | 01 |
| 05 | Marking Gauge | 150mm | 01 |
| 06 | Firmer Chisel | 25mm | 01 |
| 07 | Mortise Chisel | 6mm | 01 |
| 08 | Cross Cut Saw | 300mm | 01 |
| 09 | Tenon Saw | 250mm | 01 |
| 10 | Scriber | 150mm | 01 |
| 11 | Mallet | 0.25Kg | 01 |

### Raw material required:

| Sl No | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Wood Size | (50X50X250)mm | 02 |




### Procedure:

- The give raw material is checked to ensure its correct size.
- The material is firmly clamped in the carpenter's vice and any two adjacent faces are planned by the jack plane and checked for straightness.
- The adjacent face is then planed and the faces are checked for squareness withthe try square.
- Marking gauge is set and lines are drawn at 30 and 45mm to mark

the thickness and width of the model respectively.

- The excess material is first chiseled out with the firmer chisel and then planned to correct size.
- The matching dimension of the part X and Y are then marked using the scaleand marking gauge.
- Using the cross cut saw the portions to be removed in part Y (Tenon) is cutfollowed by chiseling.
- The part X and Y are separated by cross cutting with the tenon saw.
- The ends of both the part are chiseled to exact length.
- A fine finishing is given to the parts if required so that proper fitting is obtained.
- The parts are fitted to obtain a slightly tight joint.

**CONCLUSION: -**The single Dove Tail joint is thus made by following the above sequence of operations

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What are the procedure of cutting by saw?
2. What are the procedure of chiseling?
3. What are the different types of timber for carpentry job?
4. Methods of sharpening cutting tool used in carpentry?

**Space for answer**

# Experiment no- 06

**Aim of the experiment:-**

To Prepare a Door ring with Hook.

**Apparatus required:-**

| Sl. No | Name of the items | Specification | Quantity |
|---|---|---|---|
| 01 | Round Nose Tong | 300mm | 01 |
| 02 | Hammer | 2Kg and 1.25Kg | 02 |
| 03 | Anvil | 50Kg | 01 |
| 04 | Swage Bock | 80Kg | 01 |
| 05 | Forge or Hearth | - | 01 |

**Raw material required:-**

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Rod | Ø10X100mm | 01 |
| **02** | M.S. Rod | Ø6X100 mm | 01 |

**Figure:**

(Take suitable dimension)

**Procedure:-**

- At first maintain the required size of the M.S. Rod.
- Now put the two M.S. Rods in the previously burning hearth.
- The M.S. Rod takes heat from the hearth and its temperature begins to increase.

- When its temperature reaches $1000^0$C to $1200^0$C approx., it comes to red hot stage.
- Now remove the M.S. Rod from the hearth and hammering it on the anvil to the required shape.
- Then fitted the hook with the ring.

**Conclusion:-**

Finally a door ring with hook as shown in figure is prepared.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. Which types of coal can be used in smithy furnaces?
2. Which metal is suitable for preparation of ring and hook.
3. What are the striking tools used during preparation of hook and ring?
4. Use of anvil in smithy shop and during preparation of hook and ring.
5. What are the holding tools used during preparation of door ring and hook.

**Space for answer**

# Experiment no- 07

## Aim of the experiment:-

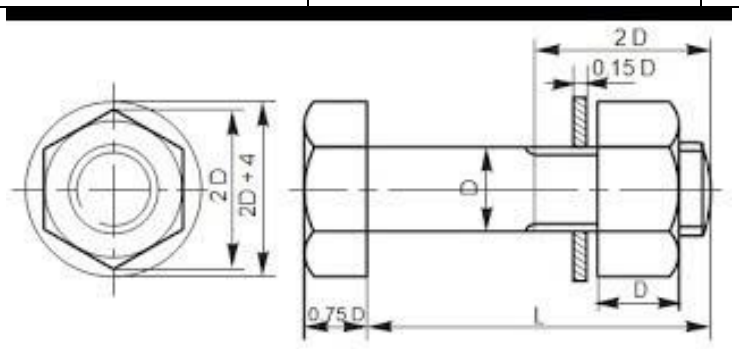
Preparation of hexagonal head bolt

## Apparatus required:-

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Round Nose Tong | 300mm | 01 |
| **02** | Hammer | 2Kg and 1.25Kg | 02 |
| **03** | Anvil | 50Kg | 01 |
| **04** | Swage Bock | 80Kg | 01 |
| **05** | Forge or Hearth | -- | 01 |
| **06** | Char coal | -- | As per requirement |

## Raw material required:-

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Rod | (Ø16X150)mm | 01 |



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

## Procedure:-

- At first cut the M.S. Rod to the required size.
- Now the rod put on the burning hearth to make it red hot stage.
- The M.S. Rod takes heat from the hearth and its temperature begins to increase.
- When its temperature reaches $1000^0$C to $1200^0$C, it comes to red hot stage.
- Now remove the M.S. Rod from the hearth and hammering it on the swage block/anvil to the required shape.

- Repeat the above process till we get exact Octagonal shape.
- Then quenching the job in the water

**Conclusion:-**

Finally we got a hexagonal head bolt by following the above procedure.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Observations:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. Which metal to be use for preparation of hexagonal head bolt.
2. Which types of hammer is used during preparation of hexagonal head bolt?
3. What is the use of swage block.
4. Describe the process of marking a hexagonal head bolt.
5. What is the nominal diameter of bolt?

**Space for answer**

# Experiment no- 08

**Aim of the experiment:-**

To Prepare Octagonal Flat Chisel.

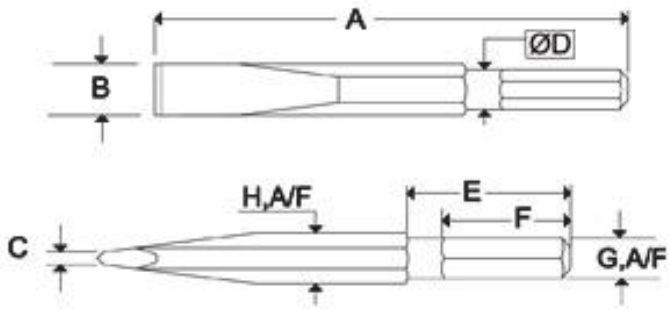
**Apparatus required:-**

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | Round Nose Tong | 300mm | 01 |
| **02** | Hammer | 2Kg and 1.25Kg | 02 |
| **03** | Anvil | 50Kg | 01 |
| **04** | Swage Bock | 80Kg | 01 |
| **05** | Forge or Hearth | -- | 01 |
| **06** | Char coal | -- | As per requirement |

**Raw material required:-**

| Sl no | Name of the items | Specification | Quantity |
|---|---|---|---|
| **01** | M.S. Rod | (Ø16X150)mm | 01 |

**Figure:**




(Take suitable dimension)

**Procedure:**

- At first cut the M.S. Rod to the required size.
- Now the rod put on the burning hearth to make it red hot stage.
- The M.S. Rod takes heat from the hearth and its temperature begins to increase.
- When its temperature reaches $1000^0$C to $1200^0$C, it comes to red hot stage.

- Now remove the M.S. Rod from the hearth and hammering it on the swage block tothe required shape i.e. octagonal shape.
- Repeat the above process till we get exact Octagonal shape.
- Then quenching the job in the water.

**Conclusion:**

Finally we got an Octagonal Flat Chisel by following the above procedure

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. Which furnace is used to prepare the job?
2. What are different types of tongs used?
3. What is the use of anvil?
4. What is hardening?

**Space for answer**

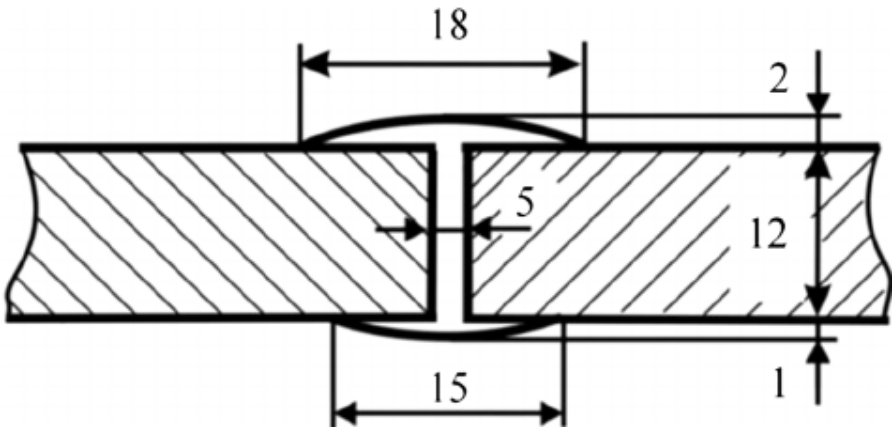
# Experiment no- 09

## Aim of the experiment:

To prepare a Butt Joint through Arc welding.

## Apparatus required:

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | Rough File | 300mm | 01 |
| 02 | Arc welding Machine | 350 amperes | 01 |
| 03 | Electrode Holder | 300 amp/800 amp | 01 |
| 04 | Ground Clamp | 100 mm | 01 |
| 05 | Tongs | 300 mm | 01 |
| 06 | Welding Hand Screen | (108 x 82) mm | 01 |
| 07 | Hammer | Chipping Type | 01 |
| 08 | Apron | Lather | 01 |
| 09 | Gloves | lather | 01 pair |




## Raw material required:

Two number of M.S Flat with dimension (80x40x6)mm.

## Procedure:

- The given M.S Flats are thoroughly cleaned .
- The two pieces of M.S Flat positioned on the welding table (as shown in figure) such that they are separated slightly for better weld joints and well penetration of the weld.
- Then electrode is fitted in the electrode holder and the welding current is to be set with

proper value according to the requirement.

- Before welding operation some precaution has to be taken. These are wearing apron, using hand gloves and hand screen.
- The welding process is done with proper selection of welding parameters (accelerating voltage, welding current, welding speed) on the welding machine.
- Then welding is done by the help of electrode holder with filler metals, then arc is created by the contact with electrode and work piece.
- During the process of welding the electrode is kept at 15 to 25 degree angle from vertical and the direction of welding respectively.
- After welding operation is completed the scale formation on the welding zone is removed by the help of chipping hammer.

## **Conclusion:**

The Butt Joint is thus made using above procedure.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

## Practical related questions:

1. What do u mean by lap joint?
2. How many types of lap joints are there?
3. What do you mean by arc welding?
4. What are the types of welding process available?
5. What do u call the deposit of filler metal?

**Space for answer**

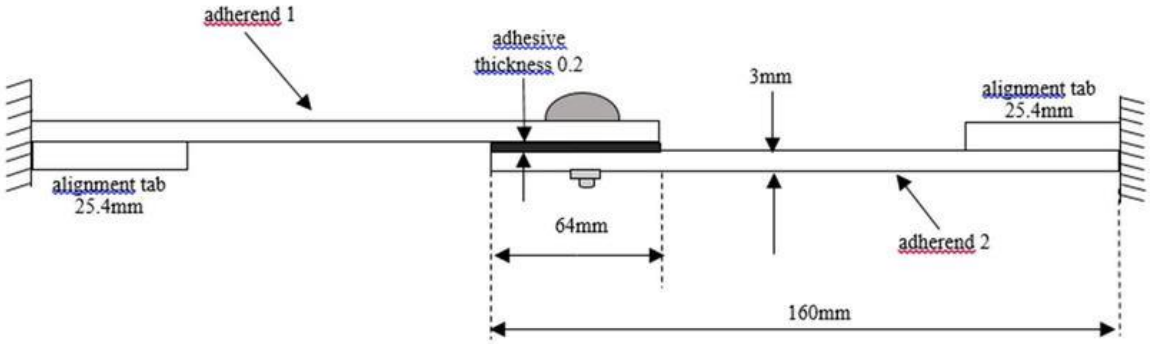
## Experiment no- 10

**Aim of the experiment:**

To prepare a Lap Joint through Gas welding

**Apparatus required:**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | Oxygen cylinder | 7 $m^3$/120-150 $Kg/cm^2$ | 01 |
| 02 | Acetylene Cylinder | 6 $m^3$/15-16 $Kg/cm^2$ | 01 |
| 03 | Hand Screen | (108 x 82) mm | 01 |
| 04 | Hammer(Chipping) | 200 gm | 01 |
| 05 | Tongs | 300 mm | 02 |




**Raw material required:**

Two number of M.S Flat with dimension (75x40x6)mm.

**Procedure:**

- The given M.S Flats are thoroughly cleaned.
- Before welding operation some precaution has to be taken. These are wearing apronusing hand gloves, hand screen and Goggles.
- Oxygen and acetylene are supplied through the different cylinder. Oxygen cylinder ispainted in Black color and acetylene cylinder is Marked in Maroon colour
- The work pieces are positioned(as shown in figure) on the welding table to form a lapjoint with the required overlapping.
- Then welding flame is required to fuse the metal by combination of acetylene andoxygen with proper value. Acetylene and oxygen are mixed together.

- The alignment of the lap joint is checked and the tack-welded pieces are reset ifrequired.

**Conclusion:**

The Lap Joint is thus made using above procedure.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What is gas welding.
2. What is the chemical composition of gas used for oxy-acetylene gas welding?
3. What is filler rod?
4. Describe the process of gas welding.
5. What is the use of oxygen and acetylene in gas welding?
6. What are the types of flame in gas welding?

**Space for answer**

# EXPERIMENT NO- 11

## Aim of the experiment:

Joining two non-ferrous parts through TIG /MIG.

## Apparatus required:

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | MIG welding Transformer | 50-80 amp | 01 |
| 02 | $CO_2$ cylinder | 7 $m^3$ | 01 |
| 03 | Hand screen | (180 x 80) mm | 01 |
| 04 | Hammer(Chipping) | Chipping type | 01 |
| 05 | Tongs | 300 mm | 02 |

## Raw material required:

Two number of Aluminum Plates with dimension (75x40x6)mm.

## Procedure:

- The given Aluminum Plates are thoroughly cleaned.
- Before welding operation some precautions has to be taken. These are Wearing apron, usinghand gloves, hand screen and Goggles.
- The work pieces are positioned (as shown in figure) on the welding table to form a properjoining.
- The alignment of the weld joint is properly checked.
- The welding operations are performed by using D.C with reverse polarity (Electrode +ve andWork piece -ve).
- A control unit is required which objective is to supply the power, wire drive, movement ofthe Gun and regulates the gas supply.
- This welding process uses consumable electrode which is fitted through the electrode holderinto the arc and the same speed of the electrode is maintained in the welding process.
- A small adjustable speed motor is used to remove wire from a spool and feed it into the arc.
- In some cases various shielding gases ($CO_2$, He, Ar) for welding various types of carbon sheet.
- In this case the metal transfer occurs by heating both the consumable filler electrode andthe work piece so that proper joining of aluminum plate takes place.

**Conclusion:**

By using TIG or MIG, we can join two non-ferrous parts.

**Resources used (with major specifications)**

| Sl no. | Name of the apparatus | Specification | Quantity |
|---|---|---|---|
| 01 | | | |
| 02 | | | |
| 03 | | | |
| 04 | | | |
| 05 | | | |
| 06 | | | |
| 07 | | | |

**Actual procedure followed:**

**Precautions followed:**

**Results:**

**Interpretation of results:**

**Conclusions and recommendations if any:**

**Practical related questions:**

1. What are the welding processes to perform on non-ferrous materials?
2. Can a non ferrous metal weld by arc welding process?
3. Which welding process is preferable for weld a non ferrous metal?
4. Name some non ferrous metal and their alloys.
5. Why it's important to use same filler rod for same metal during welding process?

**Space for answer**

| Marking scheme | Safety measured followed (3) | Preparation of expt. Set up(5) | Following procedures and observations (5) | Interpretation of result(3) | Record and neatness (5) | Viva(5) | Attendance (2) | Full mark(25) |
|---|---|---|---|---|---|---|---|---|
| Marks obtained | | | | | | | | |

**Assessment scheme:**

**Faculty in charge** **Head of the department**