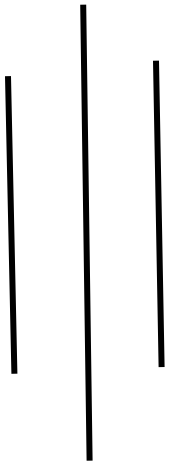
TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

PULCHOWK CAMPUS

DEPARTMENT OF CIVIL ENGINEERING

Workshop Technology



SUBMITTED BY

SURENDRA SHARMA (078BCE178)

SUBMITTED TO

DEPARTMENT OF CIVIL ENGINEERING

PULCHOWK CAMPUS

PULCHOWK,LALITPUR

Acknowledgement

At first, I would like to thank all the teachers associated to workshop technology for both theory and practical session offered us knowledge on the techniques, precautions and descriptive discipline in using various tools and workshop technology such as metal work using different machines which was previously conceptualized by theory session.

In addition to this, as civil engineering student, this is our core subject and is brief introduction for us in the world of machines. It helps in practical field work and constructing different tools, in the workshop we manufactured / constructed hammer head, hammer handle and dust pan. The workshop session offered by T.U. Syllabus provides the general methodological concepts regarding Workshop and its various operations.

Thank You!

Sheet Metal Work : Dust Pan

Objective:-

i) To be familiar with the concept and practice involved in sheet metal work and utilize them to build a dust pan out of supplied metal sheet.

ii) To be familiar with tools and machinery involved in sheet metal work like holding tools, striking tools, marking tools, measuring tools, drilling tools, riveting tools, folding tools their operation, proper handling and care.

iii) To understand and adopt the various safety measures related to sheet metal work.

Theory:-

The sheet metal is very important for every engineering concern. It deals with the working of metal sheets. It requires a through knowledge of projective geometry particularly the development of surfaces, because the laying out pattern and cutting of metal sheets to correct shapes and sizes entirely depends upon the knowledge of the workman. The various operations performed in a sheet metal shop are cutting, shearing bending etc.

The operations and practices involved with sheet metal work was used to build a dustpan out of plane GI sheet metal. Some of operation required are:-

- Marking:- The operation that consists of scratching of lines on the surface of a sheet metal is known as marking or scratching operation. This is essential to obtain correct dimension.
- Cutting:- As name suggests, this operation is carried out to cut sheet metal to desired dimensions, sheet metals upto 18S width can be cut with hand, while cutting machines are used for high SWG sheets.
- Notching: In bent section, having folded edges there should be a way so no overlapping of metal where corner meets. In order to present bulging, it is necessary to slit or clip the metal. The slit or opening are called notches and process is called notching.

Working Diagram

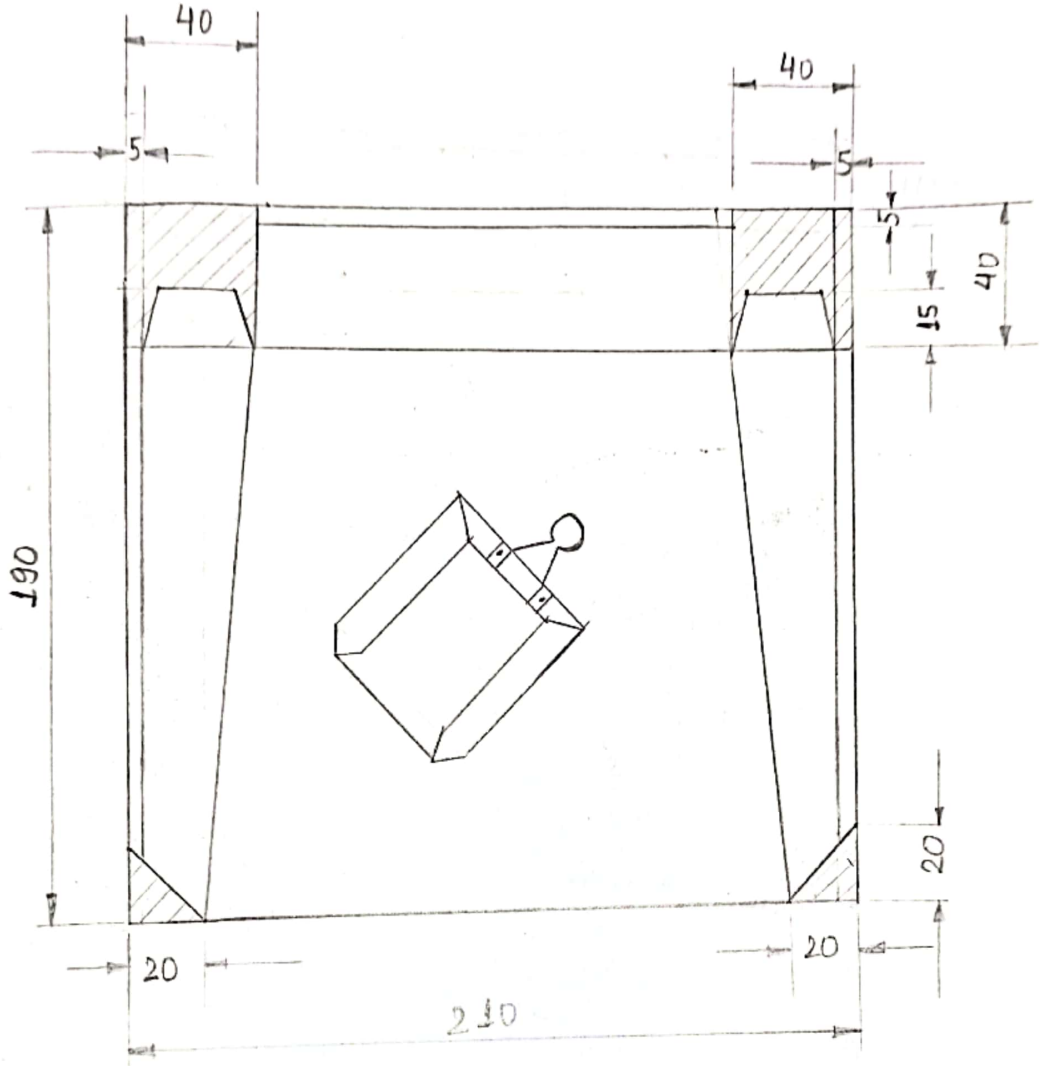


Fig: Dustpan

Procedure:

i) The 26 SWG GI sheet was cut into the required dimension i.e (210x190)mm with help of cutting machine.

ii) The workpiece was marked as per dimension.

iii) With the help of hand shear, unwanted parts of workpiece were cut out.

iv) Edges were folded to create hems with the help of

hammer and bench vice.

v) Work piece was bended by aid of bending machine with help of layout drawing. Stakes and mallets were used to finish press.

vi) Workpiece was bended by aid of bending machine with help of layout drawing to obtain desired surface depelopment.

vii) Seams were inserted in bended part centre punch was done and finally drilled with drilling machines to make hole of 3mm diameter for riveting purpose.

viii) Flat aluminium rivet of 3mm was riveled with help of ball peen hammer and riveting set in the upper drill holes.

ix) Uneven surfaces were hammered to flatten and make surface smooth with help of mallets.

x) Sharp edges were filed to remove risk of wounds.

Thus, the dust pan of desired dimension was created out of 26 SWG GI sheet by application of various operation involved with sheet metal work.

Safety Measures:-

i) Lose clothing, necklaces, wrist watches, rings etc should be avoided and apron should be worn.

ii) Careful handling of workpiece should be adapted.

iii) Any cutting material should be handled carefully.

iv) Drilling machine should be operated at required speed and made sure all guards of machinery are inproper place.

v) Marking should be precise and centre punch should be done properly.

vi) Hard hammers should not be used to flatten the workpiece as it may ruin surface. Only mallets should be used.

vii) Bending and folding as well as notching should be done carefully as error in these are hard to fix.

viii) Workpiece should be clamped properly.

ix) Chips should be disposed carefully.

x) First aid should be available immediately if any accident were to happen.

Conclusion:-

Thus using the operations involved in sheet metal work, a dustpan was made out of provided G.I sheet metal. By following safety measures the project was completed. This project concentrated on use of projective geometry especially surface development and can be used in future engineering projects.

Bench work: Hammer Head

Objectives:-

i) To be familiar with the concept and principles of bench work and fitting and use them to make hammer head of a cross-peen hammer.

ii) To be familiar with the tools used in fitting practice, like holding tools, striking tools, cutting tools, scripting tools, drilling tools measuring and marking tools etc, their proper handling and care.

iii) To understand and adopt the various safety measures related with bench work.

Theory:-

The work carried out by hand at the bench is called bench work, whereas fitting is the assembling of parts together by filing, chipping, sawing, scraping, tapping etc necessary after machine operation. The bench work and fitting plays an important role in every engineering workshop to complete and finish the job to the desired accuracy. Though today in industries most of the work is done by automatic machines and finished to a very good degree of accuracy, still they require some operations to be done by hand to finish them to desired accuracy.

Some of the basic and indispensible operations related to bench work are as follows:-

1. Filing:- Filing is the process of removing burrs and cleaning the face of the cuts and finishing the final shape of the work piece. Tool used for this purpose is a file, which is a hardened piece of high grade steel with slanting rows of teeth. The three common method of filing are: cross-filing, straight filing and draw filing.

2. Sawing:- It is cutting and slotting operation performed by the filler for cutting rods, bars and pipes into desired lengths. Hacksaw is the chief tool used in this operation.

3. Measuring/Markings:- Measuring and marking on a work piece are two most important operations in the bench work in order to obtain an accurately finish

product. It consists of setting out dimensions on a work from working drawing or transferring them from a similar part. Engineers steel rule and tri-square are chiefly used for measuring purpose while scribers and punchers are used for marking purpose.

. Drilling:- The operation of making round holes in metal piece is known as drilling. It is done with the help of drilling machine.

. Tapping: The process of cutting internal threads into a drilled hole by using a tap is known as tapping. A tap is provided with cutting edge and hardened so that when it is screwed into a hole it cuts an internal thread to fit an external thread of same size.

. Countersinking: It is process of enlarging the rim of the drilled hole so that screw, nail or bolt can be inserted in the flush with the surface. It is achieved with the help of drilling machine and suitable drill fit.

Using the above mentioned operations, the head of a cross-peen hammer was made. A cross peen has its peen in the shape of a wedge and the peen is perpendicular to the handle. It is used for bending, stretching, hammering into shoulders, inside curves etc. According to IS:841-1957, the size of cross-peen hammer may vary from 0.22 kg to 0.91 kg.

Materials Required:-

1) Workpiece: 1 metal bar of Mild steel (16mm x 16mm x 93mm)
2) Holding tools: Bench vice
3) Striking tools: Hammer
4) Cutting tools: a) Files: (i) Rough file (8 cuts per cm)
(ii) Second cut file (17 cuts per cm)
(iii) Smooth file (24 cuts per cm)

b) Hacksaw: (i) Hacksaw blade (18 mm pitch and 7 teeth per cm)
(ii) Hacksaw frame

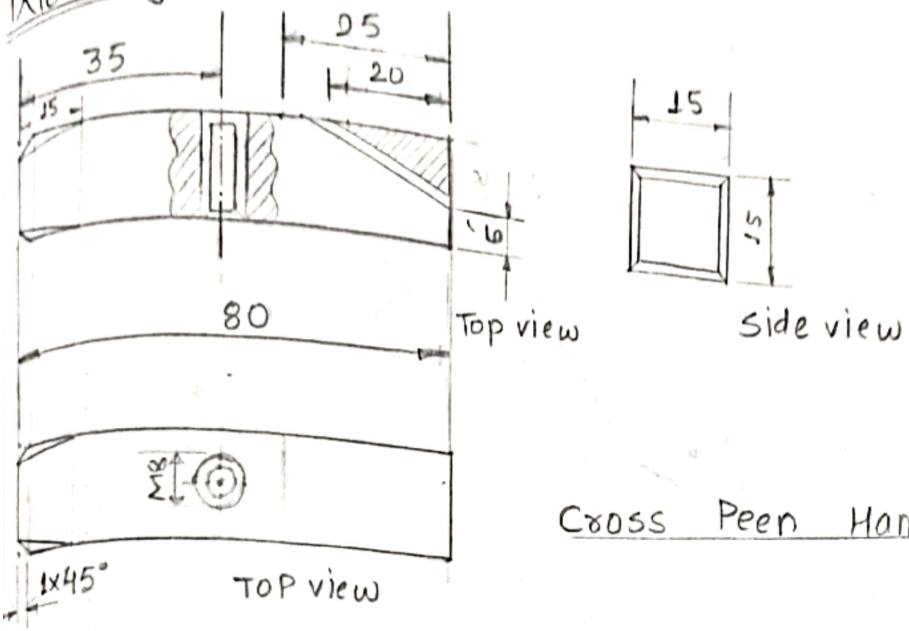
5) Measuring tools: (a) steel-Ruler
(b) tri-square

6) Tapping tools: (a) Taper tap, second tap and bottom tap
(b) Tap-wrench

3) Drilling tools: (a) Drilling machines
(b) Drill bit
(c) Counter sink bit

2 Marking tools: (a) scribers
(b) Center punch
(c) Number punch

Working diagrams:-



Cross Peen Hammer Head

Procedure:-

i) The workpiece was obtained by cutting the 15mm x 15mm square mild steel up to length of 80mm with the help of power hacksaw
ii) The workpiece was clamped securely in a bench vice with striking face of hammed head facing upwards. It was smoothened by rough file. Tri-square was used to check flatness.
iii) The required lines and points were marked as per working diagram with marking tools.
iv) The inclined surface was acheived by sawing unwanter parts as per marking with the help of hacksaw.
v) Filing was done on inclined surface to achieve smooth surface.
vi) From the flat striking at distance of 35mm a line was marked which was intersected by line bisecting the side of square. The center of intersection was punched.
vii) A hole of diameter 8mm was drilled through

workpiece.
viii) Countersinking was done on both sides of hole.
ix) Workpiece was clamped on vice and internal threads were tapped using tapper tap.
x) Filing was done to get correct dimension followed by smooth filing to give smooth surface.
xi) Edges were filed to get 1x45° to bur sharped edges.
xii) Oil was spread to prevent rusting.

Safety Measures:-

i) Personal safety:-
Loose clothes and necklace should be avoided.
Heavy work should not be lifted by hands.
The bench vice and machines should be kept clean as chips can cause cuts and wounds.
Sharp tools should be handled carefully.
Machines should not operated until properly instructed.

ii) Machine Safety:-
Before operating machine workpiece should be clamped properly.
Machine should cleaned and lubricated before operating.
Machines should be operated at safe speed.

Conclusions:-
Thus using operation involved in bench work practice the hammer head of cross-peen hammer was made of required slope and dimension. The project was finished by applying safety measures and without any injury. By the end of this project operations, tools and machines used were properly studied, observed and exercised which would be useful in future engineering practices.

Lathe Work: Hammer Handle

objectives:

i) To be familiar with concept of lathe work, priciples of it and general practices used in it.
ii) To be familiar with working principles of lathe, its application and utilize them to create hammer handle for cross-peen hammer.
iii) To understand and adapt the various safety measures related to lathe work.

Theory:-

Lathe is one of the most important machines in any workshop. Its main objective is to remove material from outside by rotating the work against a cutting tool. Though a lathe is used to produce cylindrical work, yet it may also be used for many other purposes such as drilling, threading grinding, milling etc.

In a lathe, a workpiece is held in a chuck or between centres and rotated about its axis at uniform speed the speed can be varied to suit various work piece material. The cutting tool is held in the tool post which is fed into workpiece for a desired depth and in desired direction. Since there exists a relative motion between workpiece & cutting tool, the material is ~~me~~ removed in form of chips and desired shape is obtained.

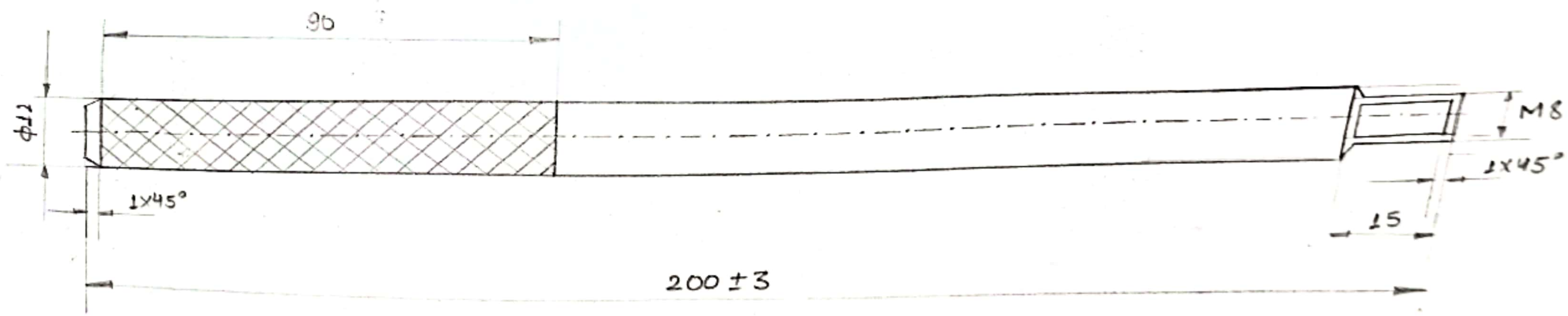
In this project, lathe is used to cut workpiece into a cylindrical of cross-section area of 11mm diameter, cut one end into 8mm diameter for external threading. Chamfering is done on both end. Then dieing (external threading) is done with with the help of circular die and stock for circular die to match the tapping in hammer head.

Materials required:-

i) Workpiece material:- Mild steel rod ϕ12mm X 205mm
ii) Lathe machine: (a) Central drill
(b) Tail stock centres
(c) Facing tool
(d) Chamfering tool
(e) Knurling tool
(f) Turning tool

(iii) Hammer

Diamond Knurling



Dimensions are in mm

Material: MS Rod ϕ12x205

Handle

iv) Steel ruler
v) Vernier Calliper
vi) Circular Die stock
vii) Circular die
viii) Bench vice

Procedure:-

i) Three jaw chuck was used and workpiece was loaded into it from one end.
ii) Using facing tool one end was smoothened.
iii) Using turning tool any presence of irregulaties were checked which was fixed by hammer strikes and central drill was used to bore hole on one end.
iv) Workpiece's diameter was reduced to 11mm and its length to 200mm as per working diagram.
v) Using knurling tools, diamond knurling was added to the sides having drilled hole.
vi) The other end was reduced to 8mm diameter upto 15mm length.
vii) Chamfering of 1X45° was added to both sides using chamfering tool.
viii) Circular die and stock was used to cut external thread on side of 8mm.

Thus, the handle for cross-peen hammer head was built.

Safety Measures:-

- No loose clothing and necklaces should be worn.
- The workpiece should only be touched after machine fully stop.
- One should stand from the direction in which chips are thrown.

Conclusion:-

By using the process involved handle for cross-peen hammer was made. By the completion of project, every process, tools and machinery were studied properly. The project was finished applying safety measures. The knowledge gained from this project can be utilized in future engineering practices.