

# **SHEET METAL WORKSHOP WRITE-UP**

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## **INTRODUCTION:**

Sheet metal trade is a useful trade in engineering works to convert the job of sheet or plate into required shape of article by using various operations. If the layout of pattern is drawn properly it means saving of time and money.



## **Metals used in Sheet Metal Works:**

### **1. Black Iron Sheet:**

It is the cheapest type of metallic sheet. It has a bluish black appearance. The use of this sheet is limited to articles that are to be painted after fabrication work.

### **2. Galvanized Iron Sheet:**

The zinc coating resists rust and improves the appearance of the metal and permits it to be soldered easily. Welding work on this sheet is not as easy as zinc gives toxic fumes and residues. As it is coated with zinc, galvanized iron sheet withstands contact with water and exposure to weather.

### **3. Tin Sheet:**

Basically this is an iron sheet coated with the tin to protect it against rust. This is specially used for soldering work as it is the easiest metal to join by soldering process. It has very bright silvery appearance.

### **4. Stainless Steel Sheet:**

It is used in tin smithy shop can be worked as galvanized iron sheet, but is tougher than galvanized iron sheet. Stainless steel is an alloy of steel with chromium and nickel. It has good corrosive resistance and can be welded easily. It is costly metal.

### **5. Copper Sheet:**

This type of sheet has better appearance than other metals. Cost of copper sheet is higher in comparison to Galvanized iron sheet. It is resistant to corrosion.

### **6. Aluminium Sheet:**

Aluminium cannot be used in pure form, but is used with a small amount of silicon, manganese, copper and iron. It is highly resistant to corrosion and abrasion, whitish in colour and light in weight.

## **Hand Tools Used:**

### **a) Marking and Measuring Tools:**

1. Steel Rule
2. Folding Rule
3. Steel Circumference Rule
4. Thickness Gauge or Slip Gauge
5. Straight Edge
6. Sheet Metal Gauge
7. Scriber
8. Divider
9. Trammel
10. Punches: (i) Prick Punch or Dot Punch  
(ii) Centre Punch

### **b) Cutting Tools:**

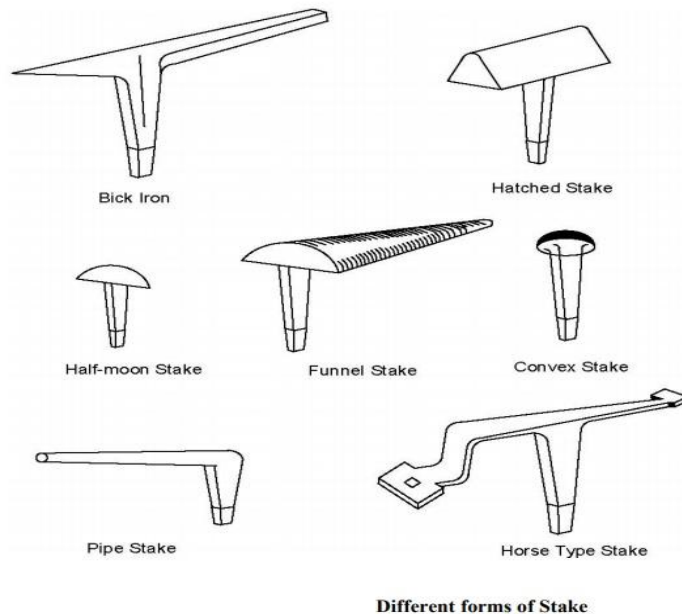
1. Chisels: Used for chipping & cutting operations & are made of high carbon steel.
2. Snip or Shears: Used for cutting soft metallic sheets & made of high carbon steel.

### **c) Striking Tools:**

1. Hammer
2. Mallet

#### **d) Holding Supporting and Forming Tools:**

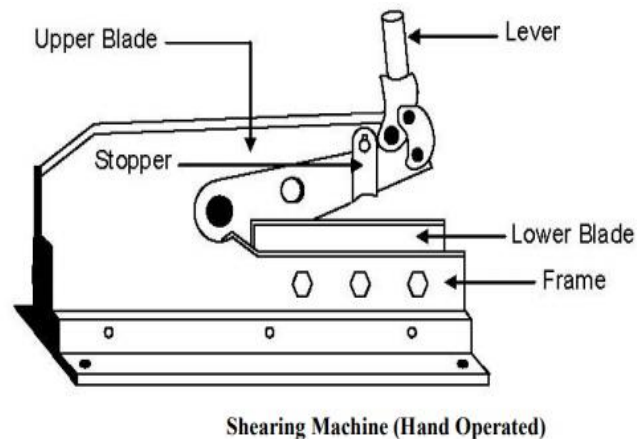
1. **Stakes:** Used for seaming, bending or forming operations.
2. **Pliers:** Used for holding and forming various shapes and patterns.
3. **Rivet Set:** Used to shape the end of rivet into round and smooth head.



#### **Machines Used:**

##### **a) Shearing Machine:**

It is used to cut or shear the sheet in many ways. The selection of particular method depends upon the size and shape of the parts required and the numbers needed.



##### **b) Forming Machine:**

Pipes, cans, stoves etc. are formed out of flat sheet blank on this forming machine.

##### **c) Bar Folder:**

It is used for folding and bending the side edges of the metallic sheet blank to form the joint at the seam. Normally, it is used for shaping metal sheet into cylindrical shape.

##### **d) Burring Machine:**

The burring machine is used to make a burr on the bottom edges of a cylinder.

#### **e) Setting down Machine:**

As the burrs have been made by a burring machine, the seams are closed or set down on a machine called as setting down machine.

#### **f) Turning Machine:**

Turning machine is similar to the burring machine but it is used for producing rounded edges for bodies of cylinders and in double seaming.

### **Sheet Metal Operations:**

#### **a) Shearing:**

Word of shearing is a general name for most sheet metal cutting operation in a specific sense. It designates a cut in a straight line across a sheet, bar or strip. It shows clean edges on the metallic job that is to be sheared or cut.

##### **1. Cutting-off:**

To divide a piece from a strip with a cut along a single line.

##### **2. Blanking:**

To cut a whole piece from given metallic sheet just sufficient scrap is left all around the opening to ensure that the punch has to cut the metal along its entire edge.

##### **3. Parting:**

It signifies that scrap is removed between the two pieces to part them.

##### **4. Punching:**

It is the operation of producing circular holes on a metallic sheet by using punch and die. The punched out metal is removed as a scrap or waste.

##### **5. Piercing:**

It is the process of producing holes of any desired shape.

##### **6. Notching:**

To remove the metal in desired shape from the side or edge of a metallic strip or sheet is known as notching.

#### **b) Bending and Forming:**

Bending occurs when forces are used to localize areas, such as in bending case, a piece of metal into a right angle while for forming, it occurs when complete parts or items are shaped.

#### **c) Drawing Operations;**

It is defined as a process for making of cup or thin walled hollow shaped parts from flat blank of metallic sheet.

#### **d) Squeezing:**

Squeezing means to press closely. It is normally a quick and widely used way of forming for ductile metals.

### 1. Sizing:

To finish the job of forged steel, aluminium and other ductile non-ferrous metals in thickness is called as sizing operations.

### 2. Coining:

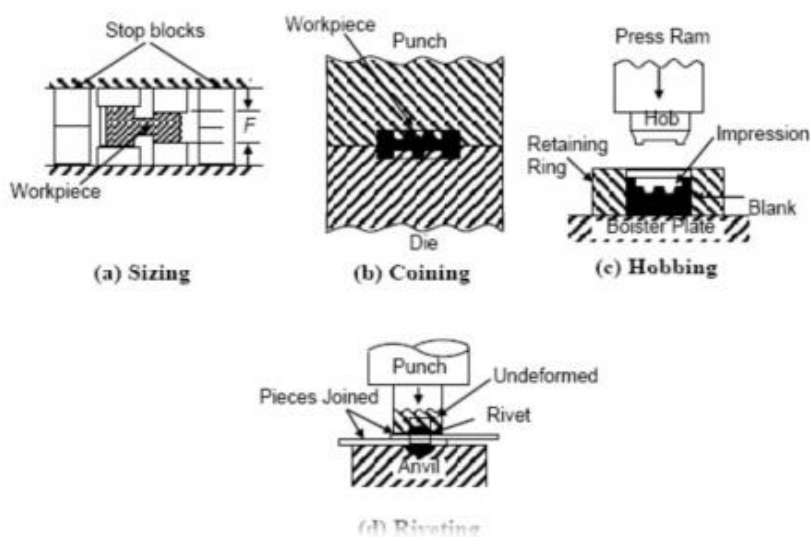
Process of forming designs on both side of a blank at the same time.

### 3. Riveting:

Riveting is a process of joining two metallic pieces by compressing an auxiliary joining component.

### 4. Hobbing:

Hobbing is a method of making different types of moulds for the plastic and die casting industries.



**Squeezing Operation**

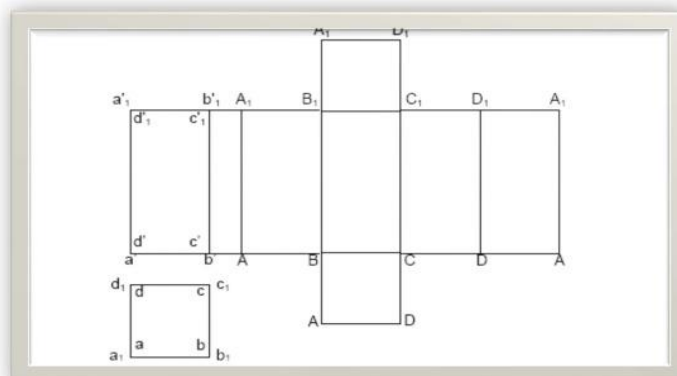
### Layout of Pattern:

For the fabrication of different shapes of jobs in sheet metal work, the projective geometry forms the basis of successful layout of patterns. The pattern is nothing but simply a flat outline of the job.

1. Parallel Line Method: Development in case of prism and cylinders.

2. Radial Line Method: Development of surfaces of pyramids and cones surfaces.

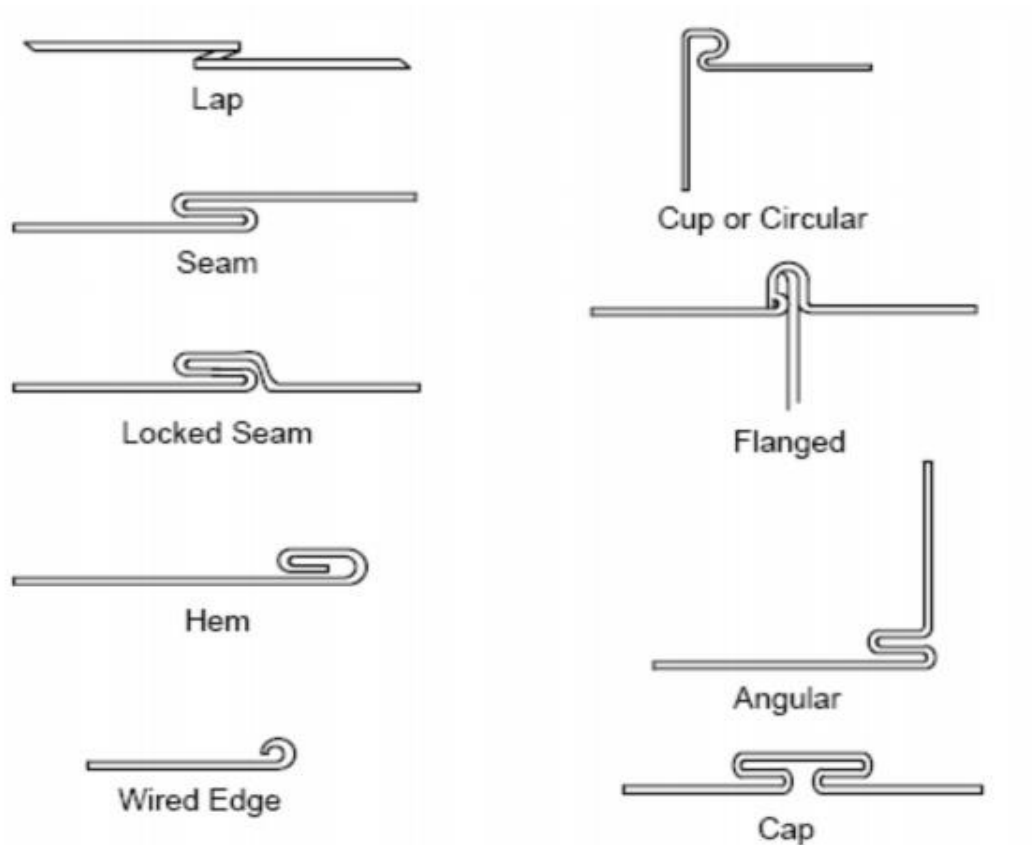
3. Triangulation Method: Development of surfaces of the transition pieces.



**Parallel Line Method**

## Types of Sheet Metal Joints:

1. Lap Joint: Simplest and common type of joint.
2. Seam Joint: Made by fastening 2 edges to each other.
3. Hem Joint: Edge or border made by folding.
4. Wired Joint: Prepared by folding the edges along a piece of wire.
5. Flang Joint: Commonly used in making pipes.
6. Angular & Cup Joint: Used for joining 2 pieces at an angle of 90 degrees.
7. Cap Joint: Useful form of locked-seam.



Sheet Metal Joints

## Soldering:

It is a method of joining or uniting two or more pieces of metals, particularly when they are in the form of thin sheets or wires, by using a fusible alloy or metal which has fairly low melting point as compared to the metals to be joined.

## Classification of Soldering:

### a) Soft Soldering:

Soft soldering is preferred in sheet metal work for joining parts that are not exposed to the action of high temperature and are not subjected to excessive loads.

### b) Hard Soldering:

It employs solder which has high temperature range of about 600 to 900 degree celcius and are stronger than those used in soft soldering.

## **Flux:**

Fluxing agents are non-metallic materials which remove the oxides from the soldering surface and prevent oxidation. Generally, fluxes are available in powder, paste or liquid forms.

### **Function of Flux:**

Fluxing agents or fluxes remove the oxide layer which forms on the metal and also prevents its formation anymore.

### **Types of Flux:**

- a) **Corrosive type:** Used for soldering work on iron, steel, copper and its alloys surfaces.
- b) **Non Corrosive type:** Used for soldering work on tin sheet and lead surface.

### **Some Important fluxing agents and their applications:**

1. **Hydro Chloric Acid:** Used for soldering work on zinc or zinc coated surfaces.
2. **Zinc Chloride:** Used for soldering work on ferrous or non-ferrous metal.
3. **Sal Ammoniac:** Used for soldering work in powder, crystal or liquid form.
4. **Borax:** Used in brazing work on copper brass and silver metal surfaces.
5. **Resin:** Non corrosive type of flux used for soldering purpose of electric joints.
6. **Soldering Paste:** Combination of zinc chloride and starch.

### **Selection of Fluxing Agents:** Selection of appropriate flux depends upon:

- a) Working temperature of the filler metal.
- b) Material to be joined.
- c) Corrosive properties of the filler metal.
- d) Use of solder either soft or hard.

## WRITE UP / EXPERIMENT-II

### AIM:

To Prepare an Open Box as per dimensions using Sheet Metal.

### TOOLS REQUIRED:

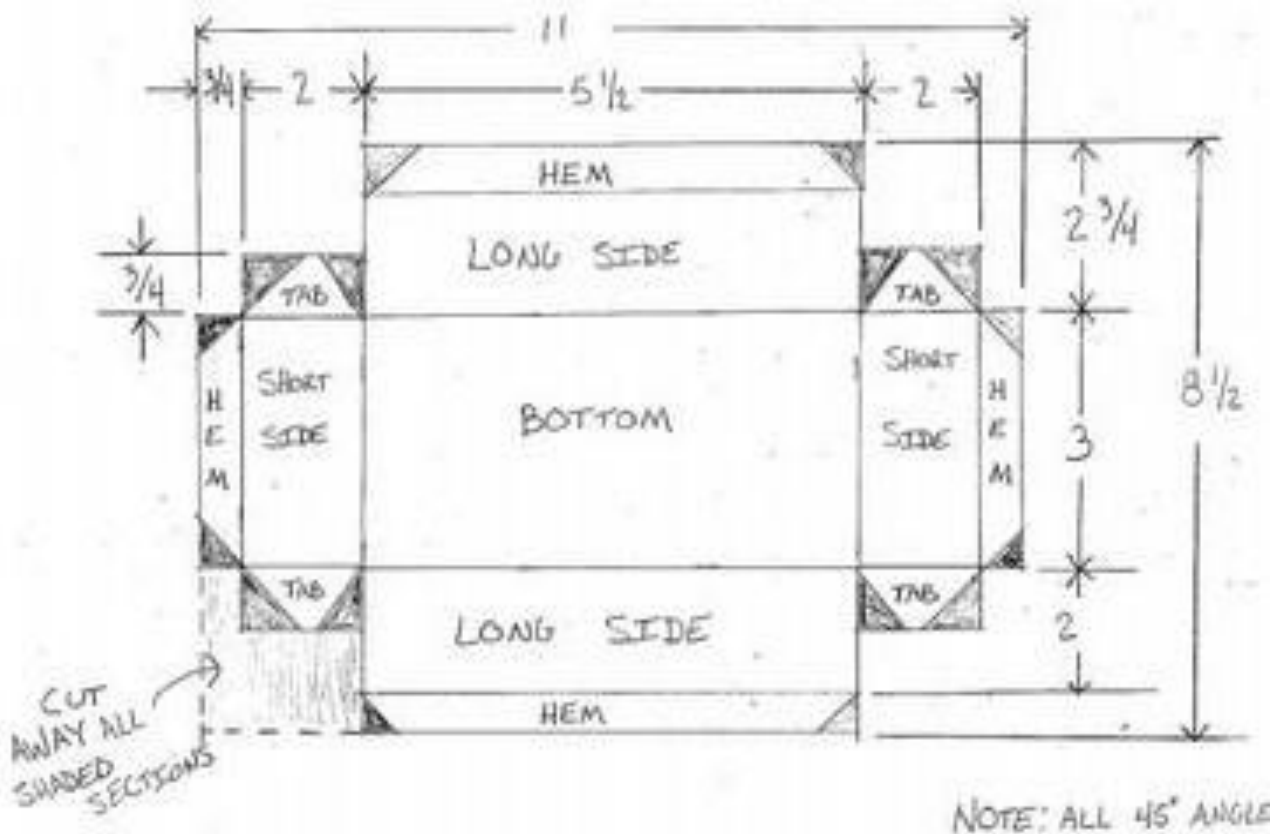
Shears, Stakes, Mallet and sheet metal Hammers, Marking Tools and Measuring Tools, Sheet metal Machines.

### MATERIAL:

24 Gauge Galvanized Iron Sheet.

### STEPS FOR THE PREPARATION:

1. Making pattern as per Dimensions with allowances.
2. Cutting the Sheet.
3. Notching the ends/corners of sheet.
4. Folding/Bending.
5. Making the Joints as per shape required.





## PROCEDURE(IN OWN WORDS):

1. Take a piece of paper with ruler and pencil.
2. A template is made on that piece of paper as per the sketch with proper allowances taken in account.
3. Sheet metal is taken on which rectangular tray is to be made.
4. The template is taken and placed on the sheet metal which is placed against the anvil for the support that is it should not slip when we mark on the sheet metal.
5. Take dot punch and the mallet.
6. Marking is done on the sheet metal as per the template.
7. Scriber (for marking on the sheet metal) and ruler are being used for drawing lines on the metal sheet as per the template.
8. Snip (for cutting purpose) is taken and cutting is made on the sheet metal along the lines.
9. The template is put on the sheet metal.
10. Cutting is made according to the template design.
11. Sheet metal has been cut according to the required dimensions with proper allowances.
12. After acquiring the required dimensions put the sheet metal on the stakes for the further process.
13. With the help of tri-square the sides are checked that is whether sides have proper 90 degree angle or not.
14. Bend the sides of sheet metal on bench vise so that we can avoid errors as much as possible with proper care.
15. Then the sheet metal sides are bent with the help of mallet.
16. It is turned until all the sides are bent and enclosed to form the tray.
17. Avoid any injury may be caused due to sharp edges of metal sheet.
18. The rectangular tray of sheet metal is now ready.

**THANKS FOR READING !!!!!**