

Basic Manufacturing Systems

[ME1083]

School Of Mechanical Engineering
KIIT Deemed to be University

Introduction to Sheetmetal Section

- **What is Sheetmetal?**
- Sheet metal work is a **deforming process**. In this process metal sheets are designed to **different shapes by applying pressure** with different tools, equipment's and machines.
- A **sheet** is usually specified with **less thickness and large size cross section area**.
- Sheet metals are applied in many industries like Auto mobile sector, Aircraft manufacturing, railway, ship, and fabrication work. (Machine cover, roof, tanks, container, boxes, furniture and utensil etc.)

Introduction to Sheetmetal Section

- **What are the different types of sheet metal operations?**
- Measuring and Marking
- Blanking
- Notching
- Bending
- Hemming -
- Seaming -
- Riveting
- Soldering
 - Hemming is the process in which the edge is rolled flush to itself, while a seam joins the edges of two materials.

Introduction to Sheetmetal Section

- **Types of Sheets**

Many types of materials are used for sheet metal work as per requirement. They are

1. Iron sheet
2. **G.I Sheet**
3. Aluminum Sheet
4. Copper sheet
5. Tin sheet
6. Lead sheet
7. Alloy sheet

Introduction to Sheetmetal Section

- **Sheet specifications**
- Metal sheets are specified by SWG (Standard Wire Gauge). SWG checks the thickness of sheets. Basically 10 gauge to 30-gauge numbers are applied on sheet

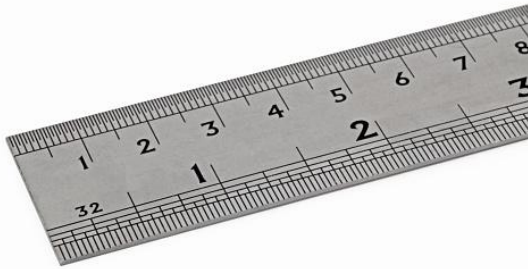
SWG conversion table

Gauge	Inch	M.M.	Gauge	Inch	M.M.	Gauge	Inch	M.M.
0	0.324	8.229	16	0.064	1.625	32	0.0106	0.274
1	0.300	7.620	17	0.056	1.422	33	0.0100	0.254
2	0.276	7.010	18	0.048	1.219	34	0.0092	0.233
3	0.252	6.400	19	0.040	1.016	35	0.0084	0.213
4	0.232	5.892	20	0.036	0.912	36	0.0076	0.193
5	0.212	5.384	21	0.028	0.811	37	0.0068	0.172
6	0.192	4.876	22	0.028	0.711	38	0.0060	0.152
7	0.176	4.470	23	0.024	0.609	39	0.0052	0.132
8	0.160	4.064	24	0.022	0.558	40	0.0048	0.121
9	0.144	3.657	25	0.020	0.508	41		0.112
10	0.128	3.251	26	0.018	0.457	42		0.102
11	0.116	2.946	27	0.0164	0.416	43		0.091
12	0.104	2.641	28	0.0148	0.375	44		0.081
13	0.092	2.336	29	0.0136	0.345	45		0.071
14	0.080	2.032	30	0.0124	0.314	46		0.061
15	0.072	1.828	31	0.0116	0.294			



Introduction to Sheetmetal Section

- What are the different types of tools that will be used for Sheetmetal operations?



Steel rule



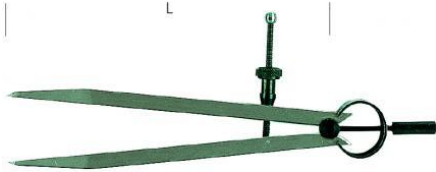
Measuring Tape: A tape measure or measuring tape is a flexible form of ruler. It consists of a ribbon of cloth, plastic, fiber glass, or metal strip with linear-measurement markings.



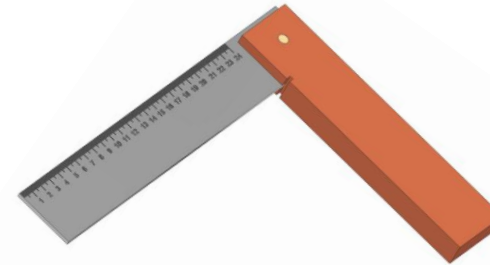
Scriber: A scriber is a hand tool used in metalworking to mark lines on work pieces, prior to machining. The process of using a scriber is called scribing

Introduction to Sheetmetal Section

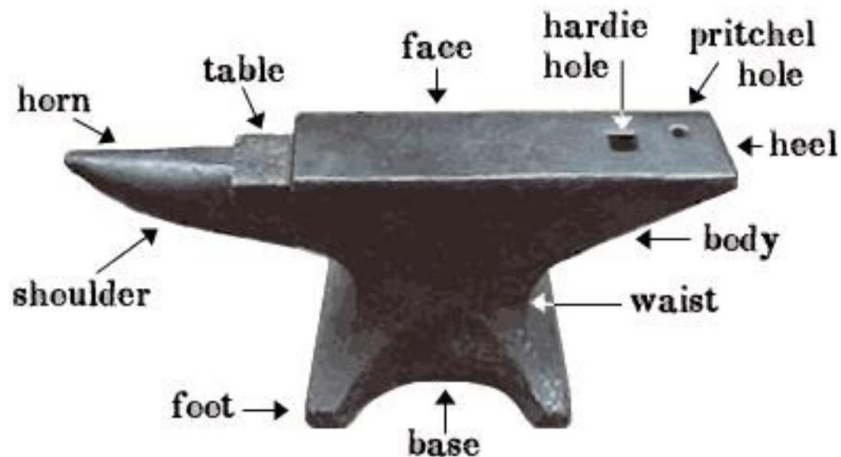
- What are the different types of tools that will be used for Sheetmetal operations?



Divider: A divider is used for the drawing of circle, arc, and check the distance between two points



Try Square: A try square is a tool used for marking and measuring the accuracy of a right angle



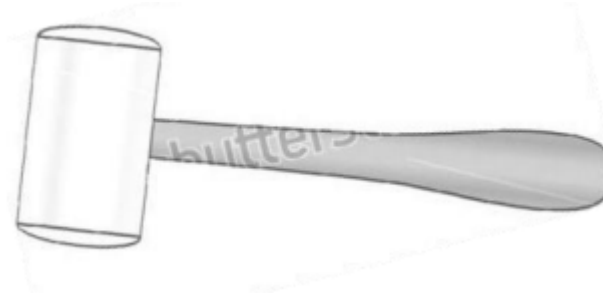
Anvil: An anvil is a basic tool, a block with a hard surface on which another object is struck. The block is as massive as is practical, because the higher the inertia of the anvil, the more efficiently it causes the energy of the striking tool to be transferred to the work piece.

Introduction to Sheetmetal Section

- What are the different types of tools that will be used for Sheetmetal operations?



Snip: This tool used for cutting thin metal sheet, before or after marking according to the job. It is made of steel and its cutting blade are hardened and tampered



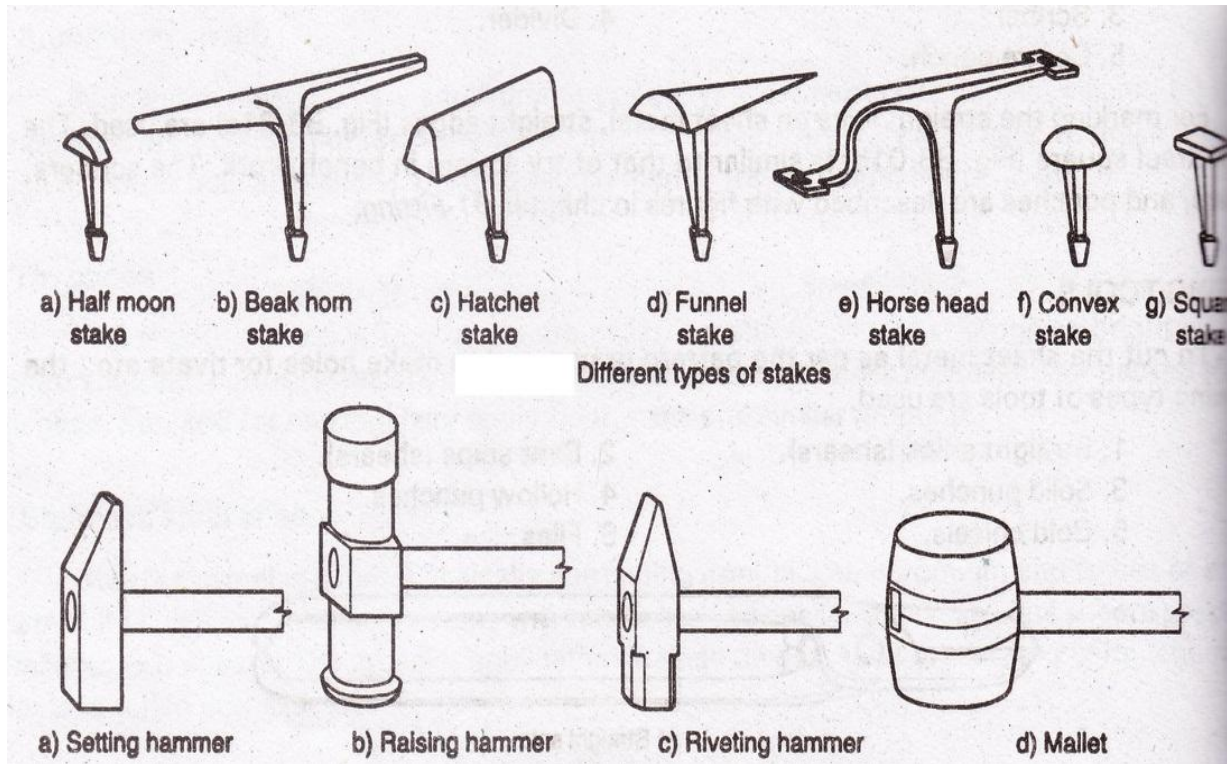
Mallet: A mallet is a kind of hammer, often made of wood; it is use d for light blow to a metal sheet



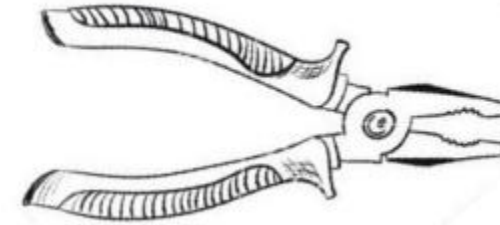
Hammer: A hammer is a tool meant to deliver an impact to an object. The most common uses for hammers are to drive nails, fit parts, forge metal and break apart objects. Different types of hammer are there ball pane hammer, cross pane hammer, straight pane hammer, claw hammer

Introduction to Sheetmetal Section

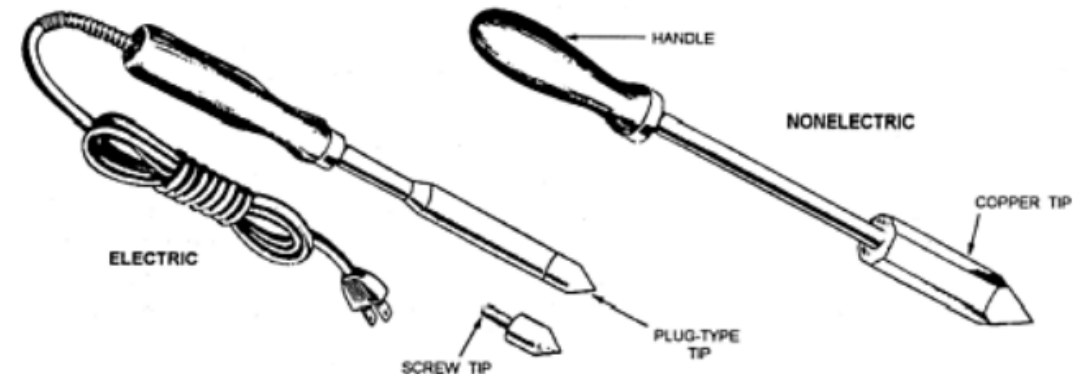
- What are the different types of tools that will be used for Sheetmetal operations?



Stake: Stake is used for making shape on the sheet



Pliers: Pliers are used for holding jobs or bending edges

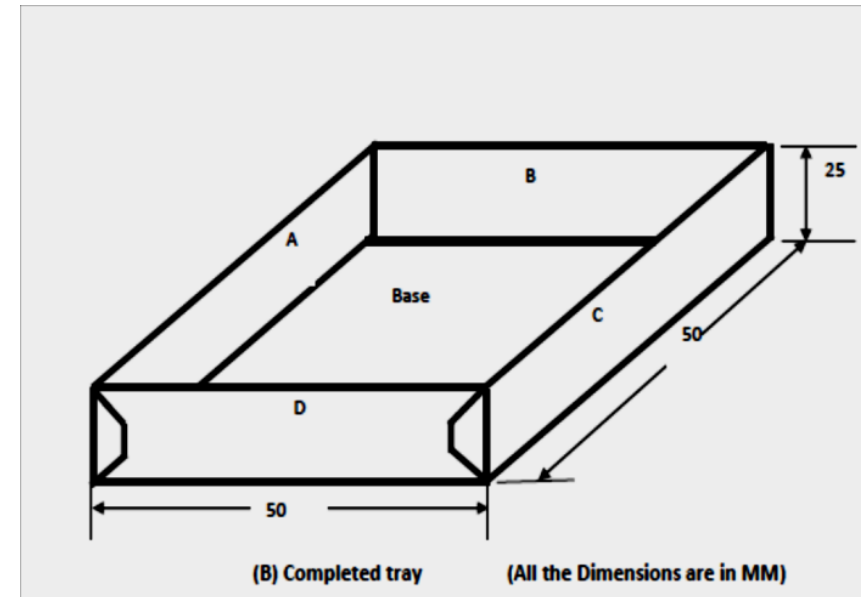
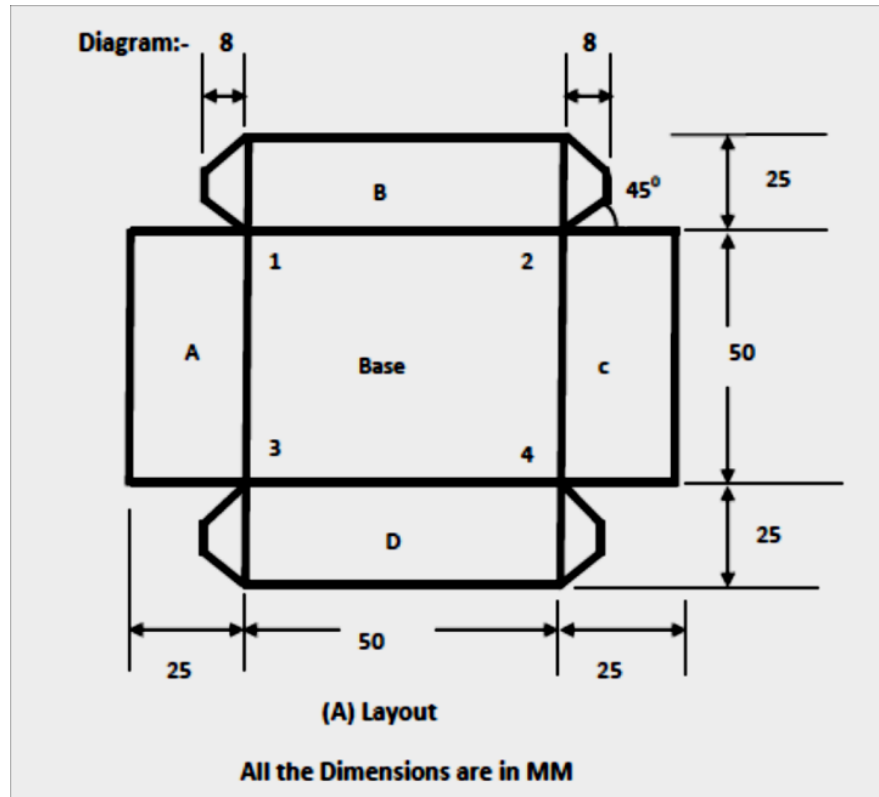


Soldering Iron: A soldering iron is a hand tool used in soldering. It supplies heat to melt the solder so that it can flow into the joint between two work pieces.

Sheetmetal Section Experiment

- **Aim of experiment:** To prepare a **Square Tray**
- **Raw Material Required:** **G. I Sheet of (100mmx100mmx24 S.W.G), Solder, Flux.**
- **Tools required:** Steel rule, Try square, Scriber, Mallet, Hammer, Straight Snip, Square Stakes, Anvil, Vice, Pliers & Soldering iron
- **Operations involved**
 - Measuring and marking
 - Blanking
 - Notching
 - Bending
 - Joining

Layout of the Job



Completed Square Tray

Safety Precautions

- Safety precautions to be followed in Sheetmetal section
 - Always wear gloves, to avoid injuries to hand by sharp edges and corners of the cut piece
 - Hammering, punching or other similar striking operations should not be done on a surface plate
 - To avoid electric shock during soldering operation, use nonconducting holding tool
 - Always use a tong for holding heated job piece

Procedure

- **Step by step procedure**

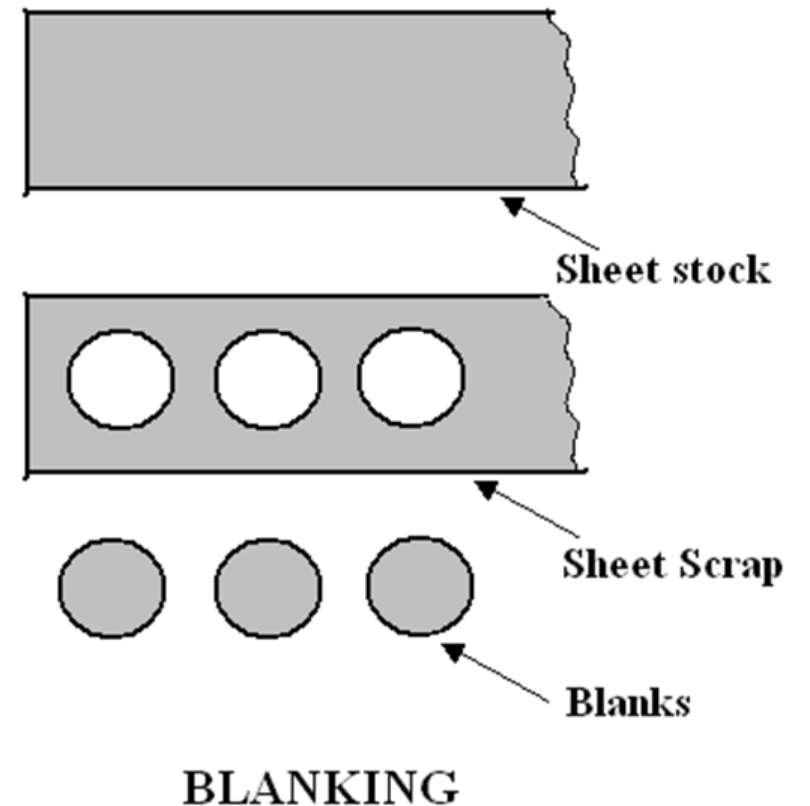
- Mark and cut a piece of *G.I sheet* as per the given dimension.
- Place it on the Anvil and straighten with the help of the mallet.
- The layout of the required tray is given in the drawing.
- Mark it on the table and check all the dimensions properly
- Cut away the unwanted material from the metal piece to obtain the final layout.
- Again, straighten the piece and check the dimension to make necessary correction if required.
- Using suitable stake and hammer, bend the surfaces as per requirement.
- Check the squareness of all four bent sides, with reference to the square base of the tray.
- Finally check the dimensions of the tray, and then join the edges by soldering process and submit to the concern teacher

Measuring and Marking Operations

- For making any job, measuring and marking operations are important to get the required dimension of the job
- The workpieces are measured using different measuring tools such as Steel rule, measuring tape and try square, and marked accordingly using a marker
- Accuracy of the job depends to a large extent on the marking operation.
- Tools used are:
 - Steel rule
 - Try square
 - Marker

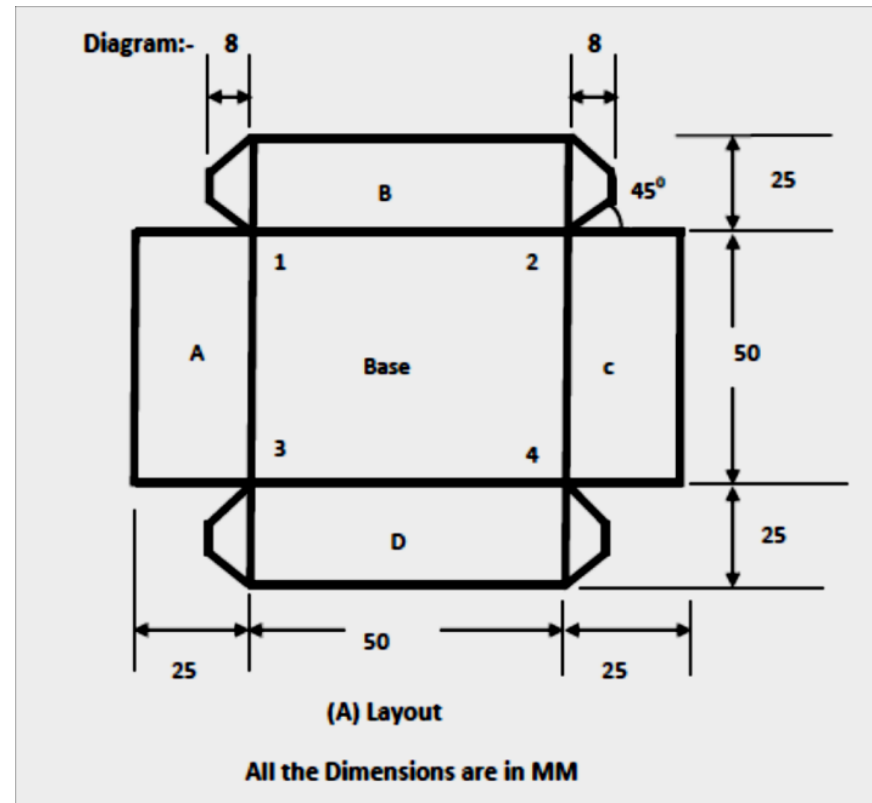
Blanking Operation

- Cutting a piece according to the job from a flat sheet is called blanking.
- In blanking the punched-out piece is used and called a blank
- This work is done by snip or a die.
- Tool used for Blanking is
 - Snip



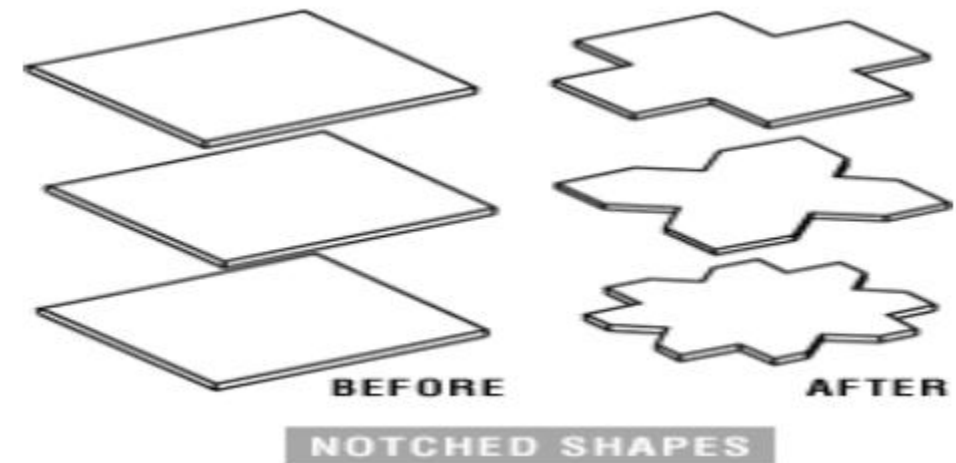
Tray Layout preparation

- Further measuring and layout preparation before bending operation
- The sheet is marked with required dimensions using try square and the marker
- Tools used:
 - Steel Rule
 - Try Square
 - Marker



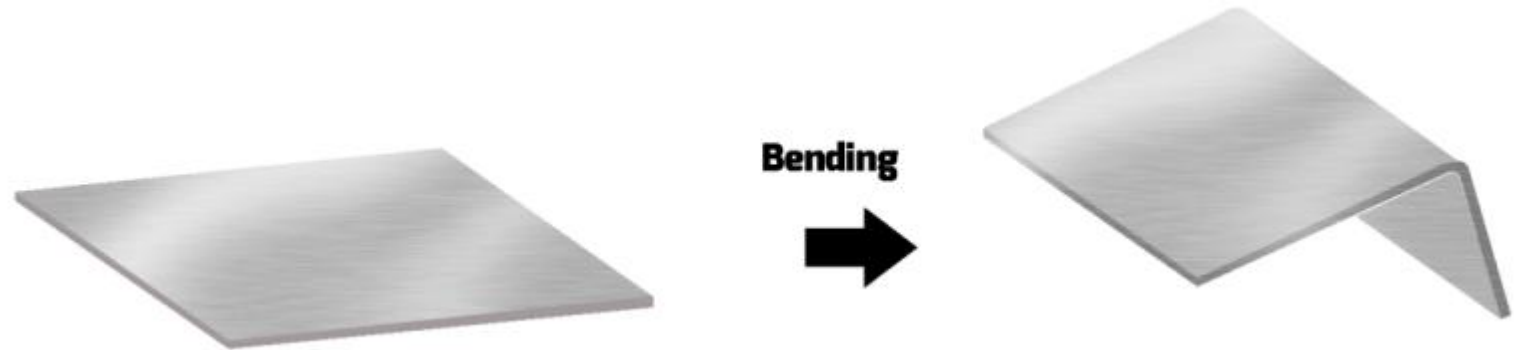
Notching Operation

- Notching operation is for cutting the corners, edge of square pans, etc. of blank pieced sheet metal work
- Notching is done by means of dies
- Tools required –
 - Snip



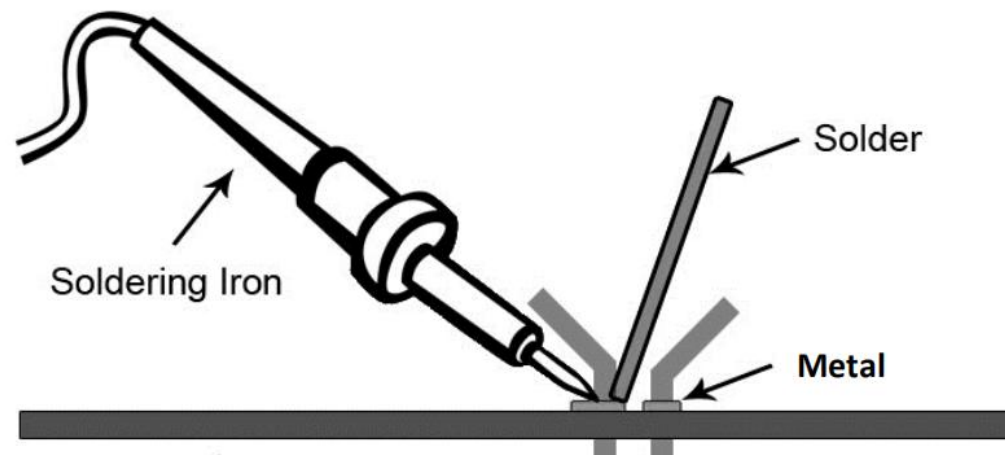
Bending Operation

- Bending operation in which a force is applied to a piece of sheet metal, causing it to bend at an angle and form the desired shape.
- Tools used
 - Steel rule
 - Plier
 - Hammer
 - Anvil
 - Bench vice



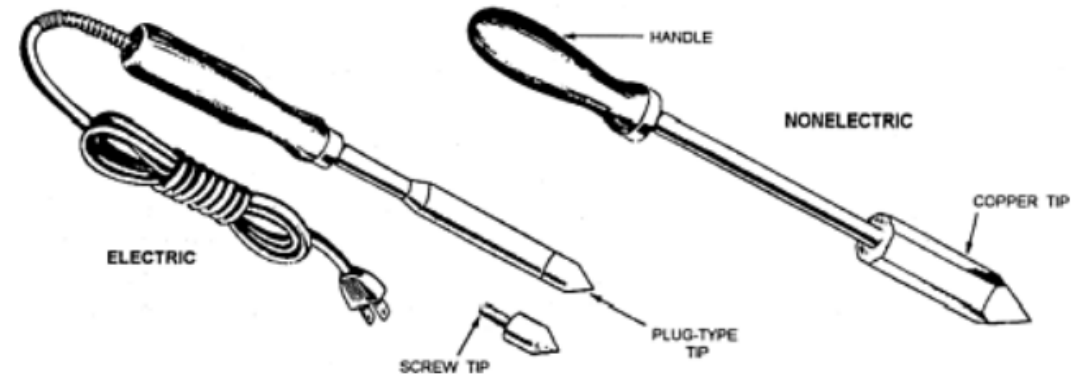
Joining Operation

- Joining Operation is used to join two or more pieces
- There are different types of joining processes such as Welding, Soldering, Brazing, Adhesive bonding, etc.
- **Soldering** is the process by which join two surfaces of the metal by applying heat with a filler metal
- The filler metal is known as solder. It's alloy of *Tin* and *Lead*. Percentage of alloy is 65% and 35% respectively.



Joining Operation

- Instruments and tools used for soldering are:
 - Solder and soldering iron
 - Plier
 - Flux



Concluding Remarks

- Summarize the learning points from this section