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INTRODUCTION

Articles such as pipe funnels, containers guards and boxes etc which fulfill our day-to-day needs are generally made from metallic sheets or plates.

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, like hand tools and simple machines. It has its own significance to prepare all the relative items economically and without too many complications as compared to the other trade methods.

However, it should be understood very clearly that for successfully working in this trade one must have a good knowledge of mensuration, geometry, and properties of different metals. Laying out of patterns and cutting of sheet to exact sizes and shapes entirely depends upon the study and sketch practice. If the layout of pattern is drawn properly, it means saving of time and money.

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METAL USED IN SHEET METAL WORKS

The sheet of black iron, tin, galvanised iron (G.I.), stainless steel, copper, zinc and aluminium etc. are widely used in tin smithy work. The sheets are specified by gauge numbers. The larger the gauge number, the lesser the thickness.

- BLACK IRON SHEET

It is the cheapest type of metallic sheet. It has a bluish-black appearance and is often referred to as uncoated sheet. The use of this sheet is limited to articles that are painted after fabrication work such as tanks, stoves and pipes.

- GALVANISED IRON (GI) 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, galvanised iron sheet withstands contact with water and exposure to weather. It is mainly used to make the articles such as furnaces, cabinets, buckets, pans and gutters etc.

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• 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 silver appearance and is used mainly in making the roofs, canes, pans dairy equipment and food containers etc.

• STAINLESS STEEL SHEET

It is used in tin-smithy shop and can be worked as galvanised iron sheet, but is tougher than it. 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. This type of sheet is used in food processing items, chemical plants, canneries, dairies items and kitchen wares etc.

• COPPER SHEET

This type of sheet has better appearance than other metals. Cost of copper sheet is higher in comparison to galvanised iron sheet. Being resistant to corrosion, it is used for making the articles such as hoods, roof flashing, expansion joints and gutters etc.

• 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 corrossion and abrasion, whitish in color and light in weight. It is

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now widely used in the manufacturing of a number of articles such as trays, refrigerators, house hold appliances, lighting fixtures, parts of aeroplanes, electrical and transport industries and in the fitting and fixture used in windows, doors and building requirements etc.

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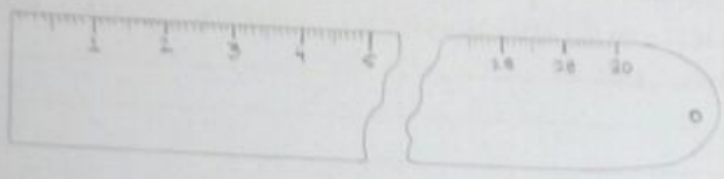
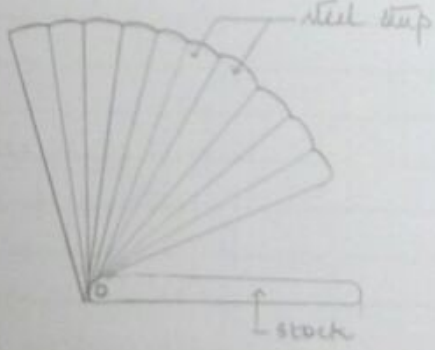


Steel rule



Slip Gauge

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HANDTOOLS~

There are a large number of hand tools and machines which are commonly used by a tin smithy or sheet-metal worker such as mallets, hammers, shears and snips and stakes or forming supports, shearing machine, bending machine and folding machine etc.

According to their use, all the concerning tools may be classified as follows:

↳ MARKING AND MEASURING TOOLS

- Steel Rule → It is particularly useful in measuring and laying out small size of work.
- Folding Rule → Useful in measuring and laying out of larger size of work.
- Steel Circumference Rule → This type of rule is used to find out directly the circumference of a cylindrical shape.
- Thickness Gauge → Also known as slip gauge and is used to measure the clearance between two assembled parts.
- Straight Edge → It's main function is to scribe long

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straight lines. It is simply a flat graduated bar of steel with one longitudinal edge is beveled.

- Steel-Square → This is L-shaped hardened steel piece. It has two parts - Tongue and Body. The narrow arm of the square is known as tongue while the wider part is called as body. It is used for checking the 90° between two adjacent surfaces and for making the line in perpendicular direction to any base line.

- Sheet-metal gauge → Used to measure the thickness of sheets.

- Scribes → It is a long wire of steel with its one end sharply pointed and hardened to scratch the lines on metallic sheet in laying out patterns.

- Dividers → Made of hardened steel and generally used for drawing or scratching the circles or arcs on the metallic sheet.

- Trammel → Consists of a steel bar with two movable steel heads which have bottom part sharply pointed and hardened. Its main function is to draw large sizes of circles or arcs that are beyond the limit of dividers.

- Punches → Made of hardened steel, used for marking out work and to locate the centre in a permanent

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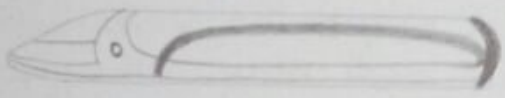
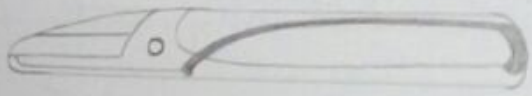


→ Beak Bird



→ Straight Bird

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manner.

→ CUTTING TOOLS

- Chisels → These are generally used for chipping and cutting operations and are made of high carbon steel. For sheet metal work, the flat and round nose chisels are widely used.

- Snip or shears → Made of high carbon steel and used for cutting thin and soft metallic sheets. The straight snip or shear is used for cutting along a straight line while the curved or bent type of snip is used for cutting the sheet along a curvature.

→ STRIKING TOOLS

- Hammer → To suit the different types of work on tin sheet, various sizes and shapes of hammers are used. They are made to have square or round heads to suit for striking or hammering the corners and round surfaces respectively.

- Mallet → used for striking purpose and made of hard rubber, lead, copper or mostly of hard wood.

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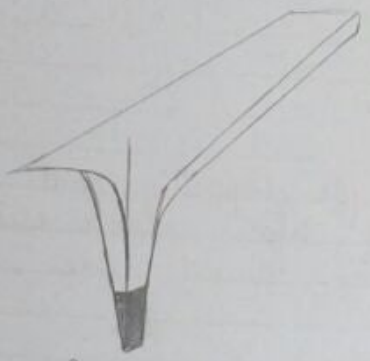
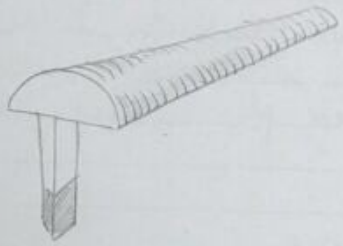


Bick iron

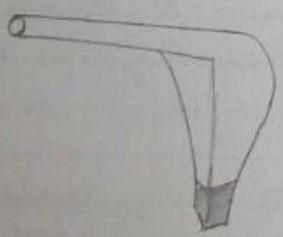
Hatched stake

Half-moon stake

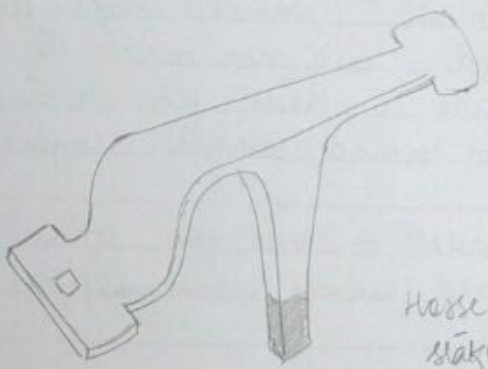


Funnel-stake

Conner-stake



Pipe-stake



Horse type stake

DIFFERENT TYPES OF STAKES.

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→ HOLDING, SUPPORTING AND FORMING TOOLS.

- Stakes → Used for seaming, bending or forming operations. They actually work as supporting tools as well as forming tools.
- Pliers → These are used for holding and forming the various shapes and patterns. In general, flat nose and round nose pliers are widely used.
- Rivet set → It is a hardened steel tool with a hollow part at one end. It is used to shape the end of a rivet into a smooth and round head.

→ MISCELLANEOUS TOOLS

Tools which are generally used in this shop on time to time such as soldering iron, spanner set and screw drivers etc. are classified as miscellaneous tools.

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~ SHEET METAL OPERATIONS

The various operations which are commonly used in sheet metal works can be listed as follows:

↳ SHEARING

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 has to be sheared or cut.

Some of the basic shearing operations are described below:

- Cutting off → To divide a piece from a strip with a cut along a single line.
- 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.
- Parting → Signifies that scrap is removed between the two pieces to part them.
- Notching → To remove the metal in desired shape from the side or edge of a metallic strip / sheet.

↳ BENDING AND FORMING.

Bending occurs when forces are used to localise areas, such as in a bending case, a piece of metal into a right angle while for forming, it occurs

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when complete parts/items are shaped.

↳ DRAWING OPERATIONS

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

↳ SQUEEZING

It means to press closely. The squeezing operations such as sizing, coining etc. mostly used on sheet metal.

↳ SIZING

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

↳ RIVETING

It is a process of joining two metallic pieces by compressing an auxiliary joining component, i.e. rivet.

↳ MOULDING

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

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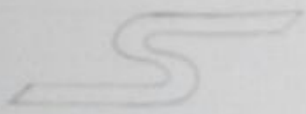
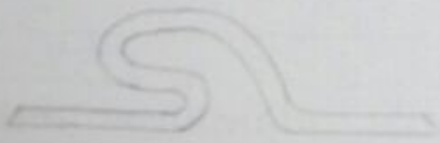
Lap.

Lap or Cowles.



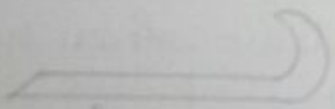
Seam.

Flanged

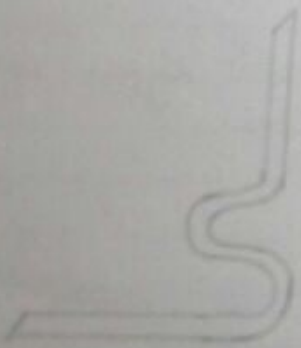


Locked seam

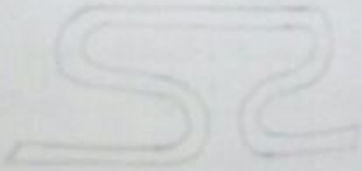
Seam.



Wired Edge



Angles



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Sheet Metal Joints

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~ SHEET METAL JOINTS

The various types of sheet metal joints are:

- LAP JOINT
  It is the simplest and common type of joint that can be prepared by means of soldering or riveting process.

- SEAM JOINT
  It is a joint made by fastening two edges to each other.

- HEM JOINT
  Hem is an edge or border made by folding. It stiffens the sheet and does away with the sharp edge.

- WIRED EDGE
  It is smooth and very strong as it is prepared by folding the edges along a piece of wire.

- FLANGE JOINT
  It is commonly used in making pipe connection.

- ANGULAR and CUP-JOINT
  angular and cup-joints are mainly used for joining two pieces at an angle of 90°.

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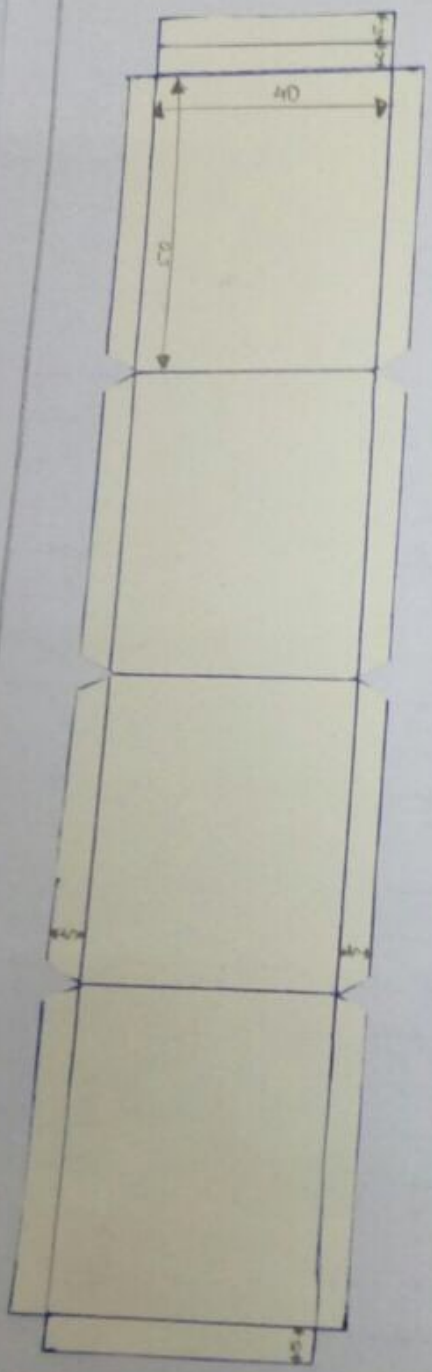
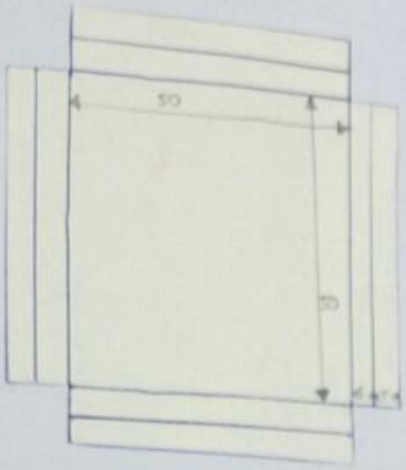
LATERAL SURFACE



Development



BASE

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- CAP JOINT
It is a useful form of locked-seam.

JOB-1

* Aim: To make an open box structure from given sheet with a square base of 50 x 50 mm and height of 40 mm.

* Materials Used: Steel scale, drawing sheet, given iron sheet

* Tools Required: Scribers, Chisels, Hammers, Sheers/snip, Brick iron stake, Shearing Machine, Knotching Machine, Folding Machine.

* Working procedure:
1) Draw the development of the lateral surface and the base of the open box on a drawing sheet.
2) Scribe the same on the G.I. sheet with the help of a scriber
3) Now cut that development with the shearing machine.
4) Cut out the knotches with the help of knotching machine and snip.
5) Now along the lines of the scriber, fold the sheet using the folding machine.
6) Make the seams and the hems for the base as well as the folding edge using hammer. Brick stake can be used.
7) Finally, the job can be finished by slight hammering.

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along the natural surfaces with stake as a support.

* Result:
The required job is ready.

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