

# CARPENTRY SHOP

## Objective

To prepare a Cross halving lap joint by using wooden work piece as per given dimensions.

## Material Required

Soft wood (Kail) of size (300x50x22)  
mm.

## Tools to be used

Steel Scale, HB pencil, marking  
Gauge, Try-Square, Iron Jack  
plane, Tenon saw, Rap saw Hammer  
& bench vice.

## Procedure

- Take a flat rectangular wooden work piece and holding it about 10mm above into the wooden vice such as the surface of work piece is parallel to the jaws of vice and start planning & smoothing operation with

Teacher's Signature : \_\_\_\_\_

the help of Iron Jack plane.

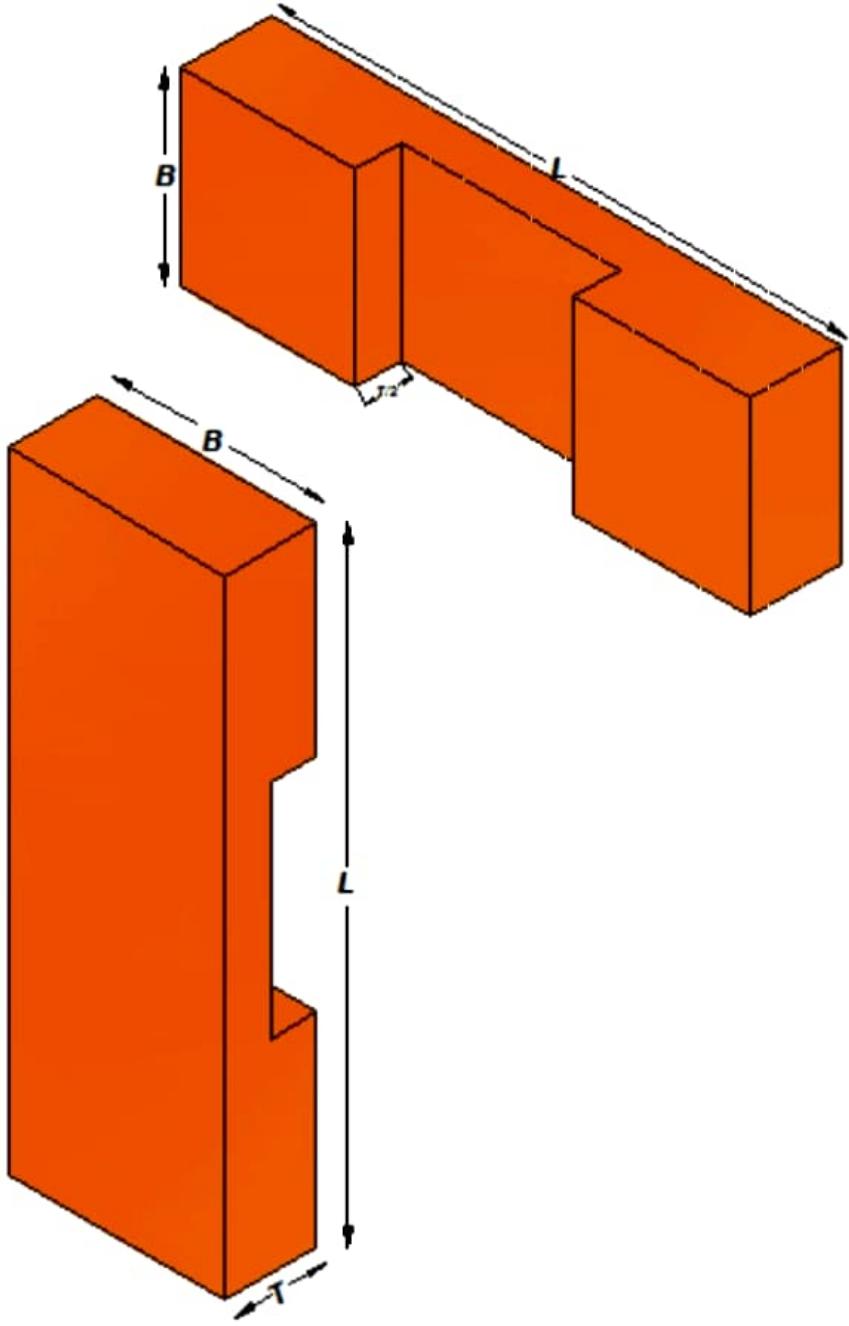
- After smoothing then check flatness of the surface of work piece with the help of try-square, if not done correctly then repeating step 1.
- After smoothing two adjacent surface mark a parallel line both side the work piece 42mm apart from the smoothing edge with the help of marking gauge and smoothing the work piece to the marking line.
- Again mark a parallel line on both side of the work piece 22mm apart from the smoothing face & then smoothing the last face to the marking.
- Doing marking on work piece according to given drawing with the help of HB pencil, steel scale

try-square, and then cutting operation perform according to the marking.

- Doing cutting and chiseling according to the drawing.
- Assembly both part in cross shape with the help of hammer, and obtained the required joint.

### Precautions

- Work piece should be hold properly in the vice.
- Marking should be doing carefully.
- Always use proper sharpened tools.
- Don't saw or chisel without holding.



**Where,**  
 $L=150$   
 $B=42$   
 $T=22$

Fig.18

**NOTE:** All dimensions are in mm

# FITTING SHOP

## Objective

To perform the operations of Making, Filing and Sawing on the given Mild steel work piece as per given dimensions.

## Tools & Equipment Used

Bench vice, Hacksaw files, Scriber  
Steel rule, Try square, Hammer  
Surface plate, Surface gauge, Ball  
peen hammer etc.

## Materials Required

Mild steel flat  $48\text{ mm} \times 48\text{ mm} \times 7\text{ mm}$

## Theory

### Marking

Measurement is performed on the job by measuring instrument and scriber does marking.

## Filing

This operation is performed with the help of files, pressure should be exerted in the forward stroke and backward stroke is ideal.

## Sawing

This operation is required to cut the metal in different sizes and shapes by hacksaw.

## Procedure

- Mark the M.S flat  $50 \times 50$  mm & cut the metal pieces with Hack saw clamping in a Bench vice.
- File the two sides at right angles check with try square.
- Mark the other 2 sides with surface gauge on a surface plate supporting by angle plate to dimension  $48 \times 48$  mm.

Cut extra metal and file to accurate  $48 \times 48$  mm square piece. Finish the surface with smooth file keeping tolerance  $\pm 0.5$  mm; check the dimension with steel scale.

- Mark parallel lines at 15 mm distance on a finished square piece of  $48 \times 48$  mm as shown in diagram.
- Punch mark at equal distance drill 7 mm dia hole.
- Draw an arc of radius 33 mm from centre of 7 mm dia. Hole, and cut the exterior metal with hacksaw and filing them with flat file.

### Safety Precaution

- Grip the Job in the vice properly.
- Always move the hacksaw in perfect straight and horzontal positions.

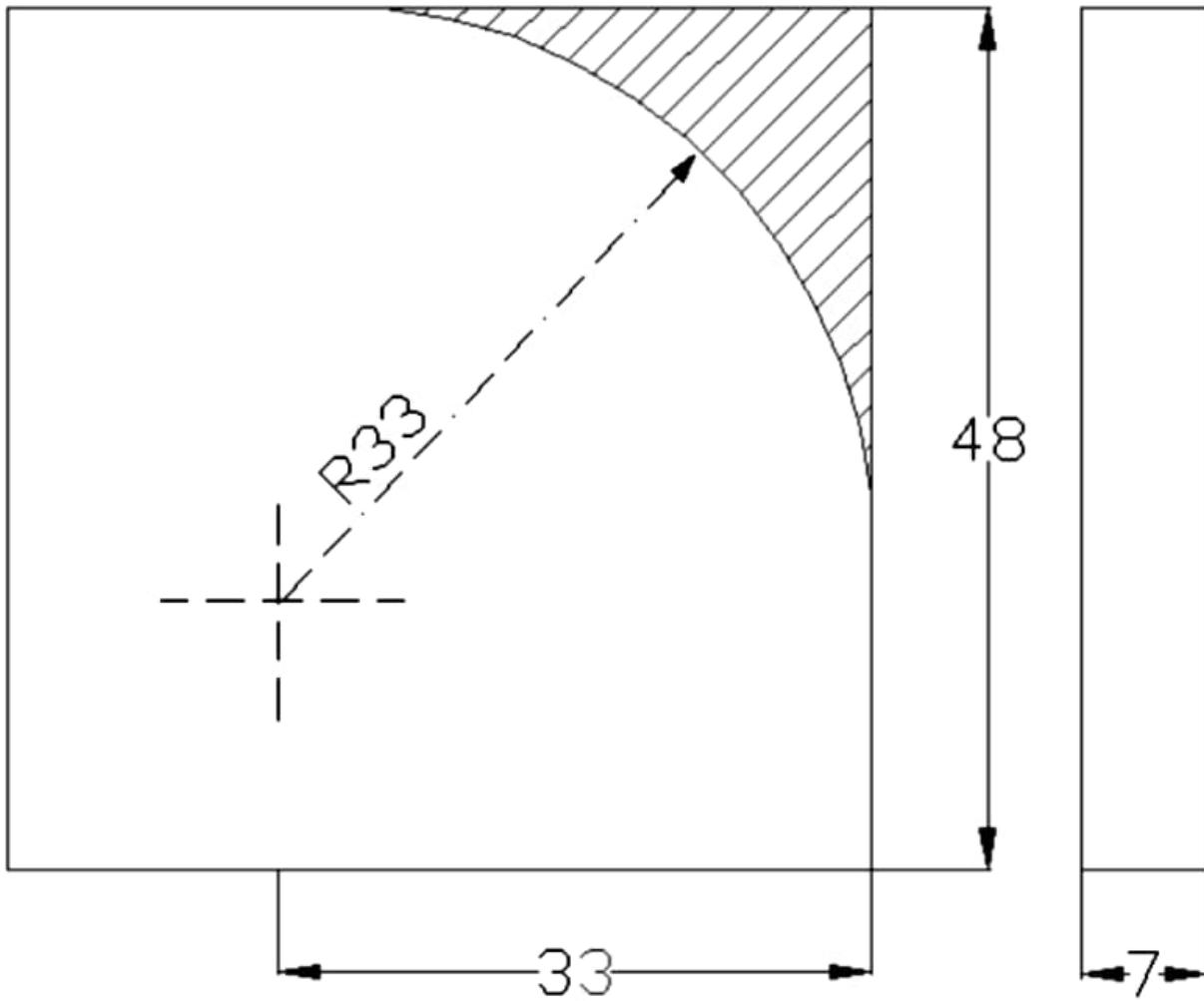


fig.22

Note: - All dimensions are in mm

# WELDING SHOP

## Objective

To prepare a Lap joint by the use of Electric Arc Welding process.

## Materials Used

MS plate of size ( $48 \times 48 \times 7$ ) mm  
- Two piece.

## Tools & Equipments Required

Arc welding machine with all the accessories, electrode holder, earth clamp, try square, hacksaw, steel rule, hammer, pair of tong, chipping hammer, face shield etc.

## Material Required

MS Electrode 3.15 mm dia [SW610]  
length 350 mm.

## Theory

### Lap Joint

This type of joint is used in joining two overlapping plates so that the corners of

each plate is joined with the surface of other plate. Common types of lap joints are single lap, double lap or offset lap joint.

### Procedure

- 1- Making and cutting the MS Flat.
- 2- Start the welding transformer machine and then set the current to approx 100 amps.
- 3- Tack both the sides of joints. Keeping the flat position of the job, complete the layer.
- 4- Clean with a chipping hammer and a wire brush and then check the welding layer.

### Precautions

- 1- Never look at the welding arc without face shield.
- 2- Always wear flexible gloves and leather apparels.

- Never touch the hot job with hands.
- Use specified current and electrodes for arc welding.

### Outcomes

On successful completion of this experiment the students will be able for fabrication work with the help of electric arc welding process.

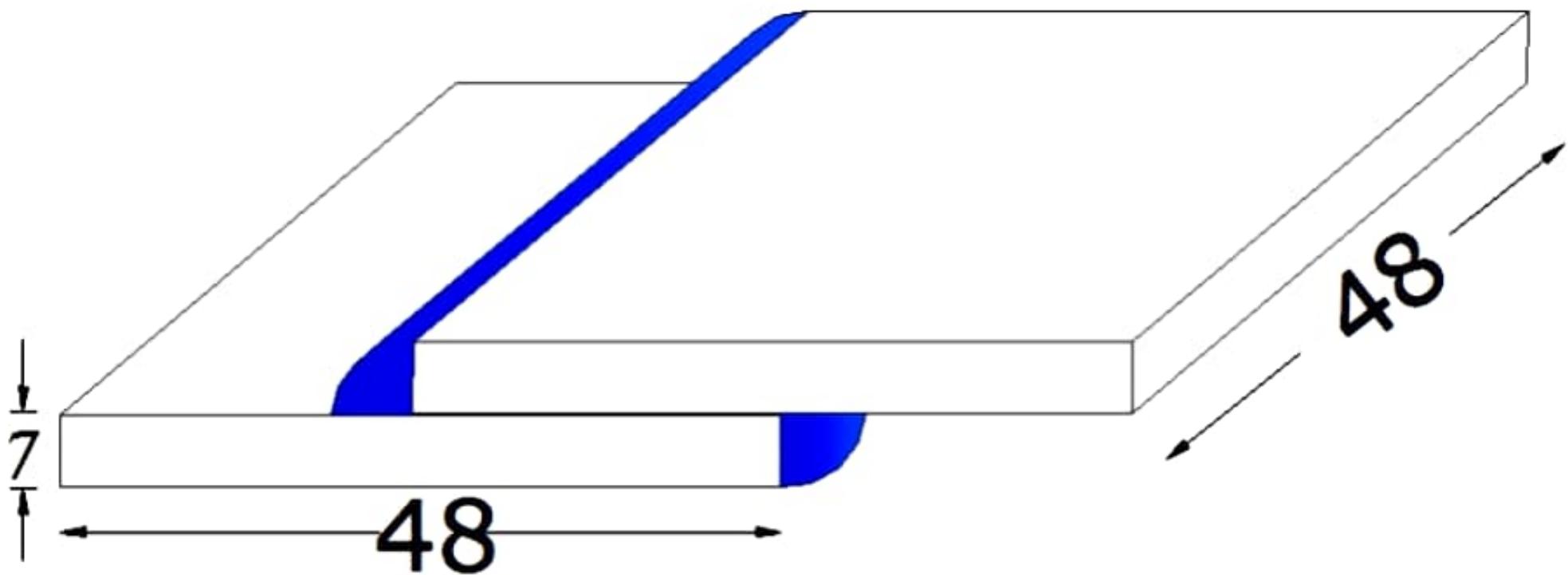


Fig. 14

# FOUNDRY SHOP

## Objective

To prepare a Sand mould for solid casting with the help of Step Pulley Pattern.

## Material Required

Green Sand

## Tools to be Used

Step Pulley Pattern, Moulding boxes or flasks, Travels, Plane smoother

Lifter Vent wire, Swab, Grate  
Cutter Spun pin, Spun cutter, sticks  
Draw spike.

## Procedure

Taking the moulding box and properly placed it on the table. With the help of travel filled the green sand inside the drag of the moulding box. Now ram the sand using the rammer leaving a very little space over drag in order to place the pattern.

After placing the pattern match the centre point of the pattern with that of the above part of drag. Hold the pattern over there for a while and fill the sand around the pattern properly. Remove extra sand with the help of a leveling scale or plane smoother. Adjust the gate cutter on either side of the pattern & place two sponge pins on the respective gate cutter. One of the pin will act as a runner and other will be as riser. Now place the cope of moulding box over drag and fill it properly with the sand with the help of rammer. Remove the extra sand with plane smoother. After leveling, using vent wire make small holes over the mould cavity in order to provide proper ventilation of gases. Slightly pick up the cope, remove the pattern slowly and replace it on the drage. Also, remove gate cutters from drag as well as

sprue pins from cope. Now, make core using core box and core sand of desired size. Place this core on core prints inside the mould cavity in order to get the desired cavity of hollow cylinder.

### Precautions

- Cope & drag part of moulding box should be kept in proper alignment!
- Runner & Riser should be placed in proper alignment.
- Parting sand should be provided in between cope & drag.
- Remove the extra item like runner, riser & pattern very carefully after completing the desired mould.
- Holes using vent wire should be made before removing the pattern from the moulding box.

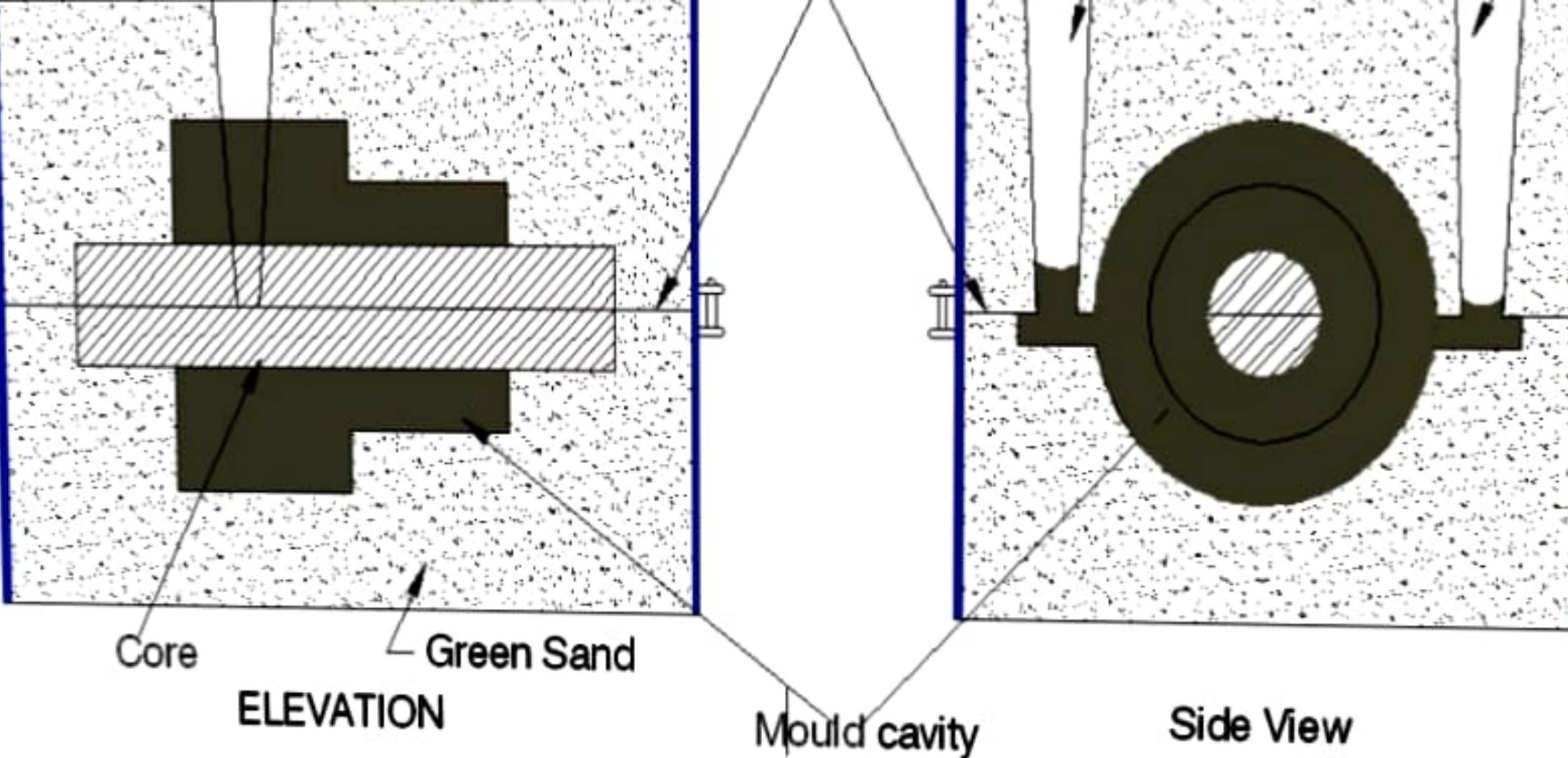


Fig. 13

# SHEET METAL SHOP

## Objective

To make a Rectangular box using GI Sheet as per given dimensions.

## Tools Required

Straight snip, steel rule, scribe, Mallet, Hammer, Stakes, pliers, soldering iron, solder, flux, bench vice, file spring divider.

## Materials Used

Galvanized iron sheet 28 SWG.

## Theory

### Development of Surfaces of Various objects

A layout of the complete surface of a three dimensional object on a plane is called the development of a pattern.

Development is the term frequently used in sheet metal work where it means the unfolding or unrolling of a detail into a flat sheet called pattern.

Practically, the development consists of drawing the successive surfaces of the object in its true shape & size with common edges joined together.

### Methods of pattern development

There are three methods in general use by means of which surface of solids may be geometrically developed.

#### 1.) Radial Line Method.

A radial line method is used for those objects such as cones & pyramids the sides of which converge to an apex.

#### 2.) Parallel Line Method

This method can be applied to the development of pattern for elbows, T-pipes intersection of pipes of equal diameter, cylindrical articles.

## Triangulation Method

This method is universally applied to solve a large number of developments.

### Procedure

- Draw a lay out as shown in development on drawing sheet.
- Cut the pattern to shape along the line using a suitable snip.
- Mark on the G.I Sheet as per the pattern and cut to required shape.
- Make the hem edge using mallet & stake.
- Make closed folds on both ends for lock seam joint.
- Make square folds on lines marked A, B, C, D, E & F.
- Make lock seam joint after joining both the ends.
- Make a bottom piece from G.I Sheet taking required allowance for double lock seam joints as shown in diagram.

- Join the bottom piece with square box by double lock seam joint using stakes and mallet.
- Do the soft soldering operation on the corners of double lock seam joints?
- File all the sharp corners with file.

### Precautions

- Be careful while working on sharp edges of sheets to avoid injury.
- Do not use blunt cutting edges tool.
- Appropriate cutting tools and machines must be used for cutting tin sheets.

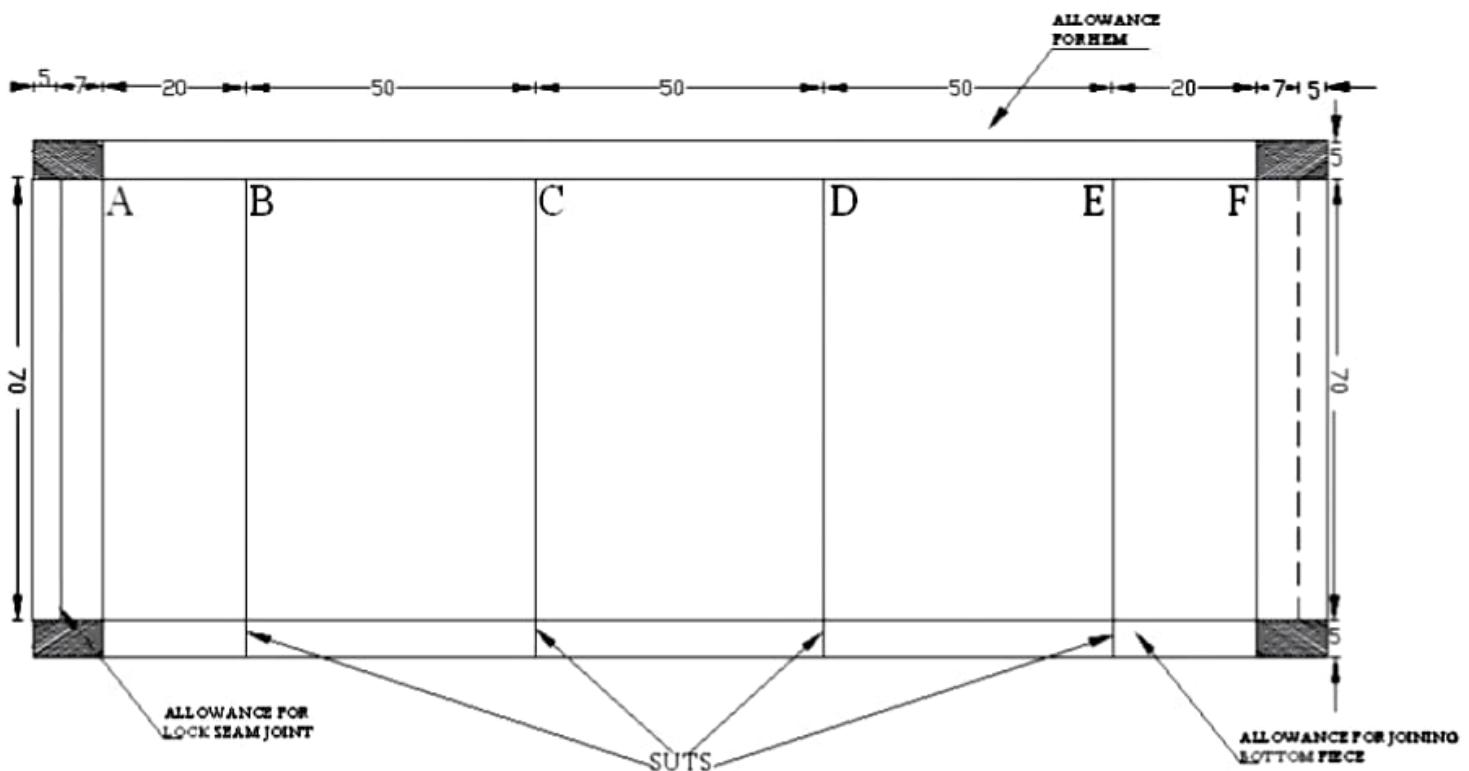
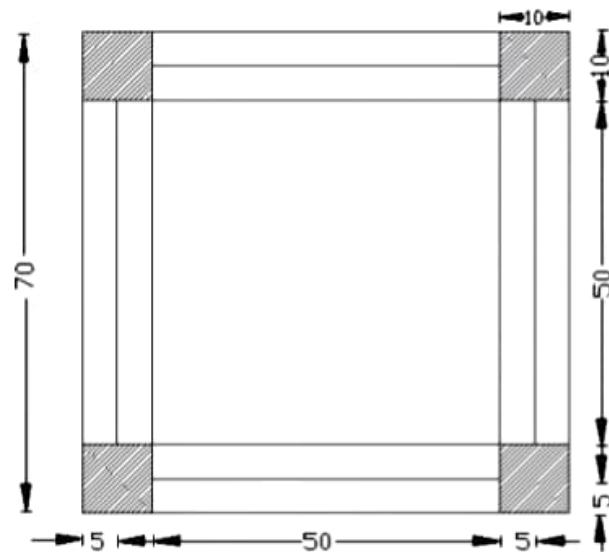


Fig. 19 Development of Rectangular Box



Where,



=Cutting Area

Note: All Dimensions are in "mm"