

## "Welding"

### Introduction:-

Welding is a process of joining similar or dissimilar metals by the application of heat, with or without application of pressure or filler metal, in such a way that the joint is equivalent in composition and characteristics of metals joined.

It is extensively used in manufacturing industry, construction industry and maintenance work, replacing riveting and bolting to a greater extent.

The various welding processes are :-

- (i) Electric arc welding
- (ii) Gas welding
- (iii) Thermit welding
- (iv) Resistance welding
- (v) Friction welding.

Arc welding :- In arc welding, the heat required for joining the metals is obtained from an electric arc. Transformers or motor generator sets are used as arc welding machines. These machines supply high electric currents at low voltages and an electrode is used to produce the necessary arc. The electrode serves as the filler rod and the arc melts the surface, so that the metal to be joined are actually fused together.



## Equipments And Tools :-

- ① Transformers :- The transformer type of welding Machine produces A.C Current and is considered to be least expensive. It takes power directly from a power supply line and transform it to the voltage required for welding.
- ② Motor Generators :- These are D.C generator sets, in which electric motor and alternator are mounted on the same shaft to produce D.C power as per requirement for welding.
- ③ welding cables :- Two welding cables are required, one from the machine to the electrode holder and other from the machine to ground clamp.
- ④ Electrodes :- Filler rods used in arc welding are called electrodes. They are made of metallic wire called Core wire. They are coated with flux, Flux act as insulator of electricity.
- ⑤ Electrode Holder :- The electrode holder is Connected to the end of the welding cable and holds the electrode. The jaws of the holder are insulated.
- ⑥ Ground clamp :- It is Connected to the end of the ground cable and is clamped to the work.
- ⑦ wire brush :- Used for cleaning and preparing the work for welding.



## welding Joints

It is better to weld, by placing the part in the flat position.

Some common types of welded joints :-



Plain Butt



Single V-Butt



Double-V-Butt



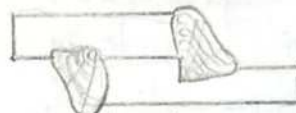
Single U-Butt



Double-U-Butt



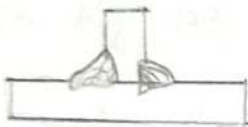
Single lap



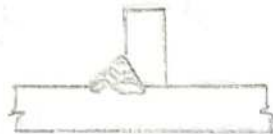
Double lap



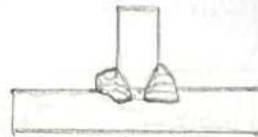
Joggled



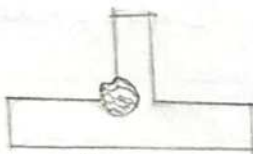
Plain T



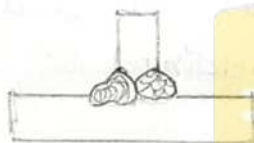
Single V-T



Double V-T



Single U-T



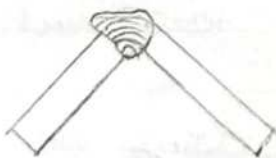
Double U-T



Flush Corner



Half Corner



Full Corner



Plain Edge



V-edge



U-edge



Plug



## Advantages of Arc welding:-

- ① welding process is simple.
- ② Equipment is portable and the cost is fairly low.
- ③ All the engineering metals can be welded because of availability of a wide variety of electrodes.

## Disadvantages of Arc welding:-

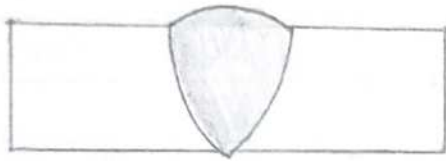
- ① Number of electrodes may have to be used while welding long joints.
- ② Unless proper care is taken, a defect may occur at place where welding is restarted with a fresh electrode.

Types of Flames:- The correct adjustment of flame is important for efficient welding. When oxygen and acetylene are supplied to the torch in nearly equal volumes, a neutral flame is produced having a maximum temperature of  $3200^{\circ}\text{C}$ . The neutral flame is widely used for welding steel, stainless steel, cast iron, copper, aluminium etc. Carburizing flame produced with an excess of acetylene, is needed for welding lead. Oxidizing flame with excess of oxygen is used for welding brass and bronze.

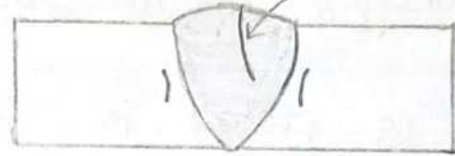
Depending upon thickness of the job, different torch nozzle sizes are used. The pressure of the gases and the flame size vary depending upon the size of the nozzle tip.

# "Welding Defects"

Ideal weld



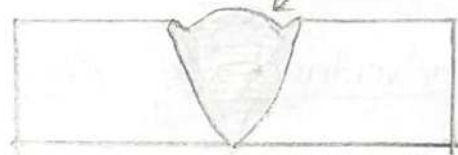
Cracks



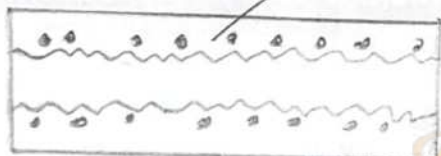
Porosity



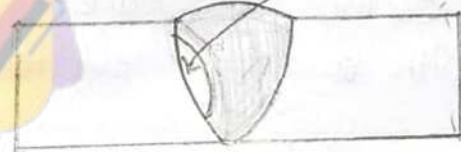
Undercut



Spatter

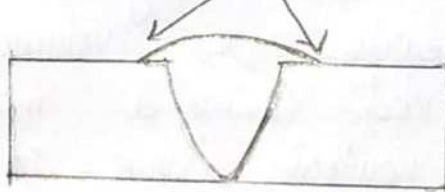


Incomplete fusion

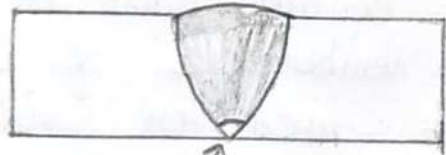


Pen down

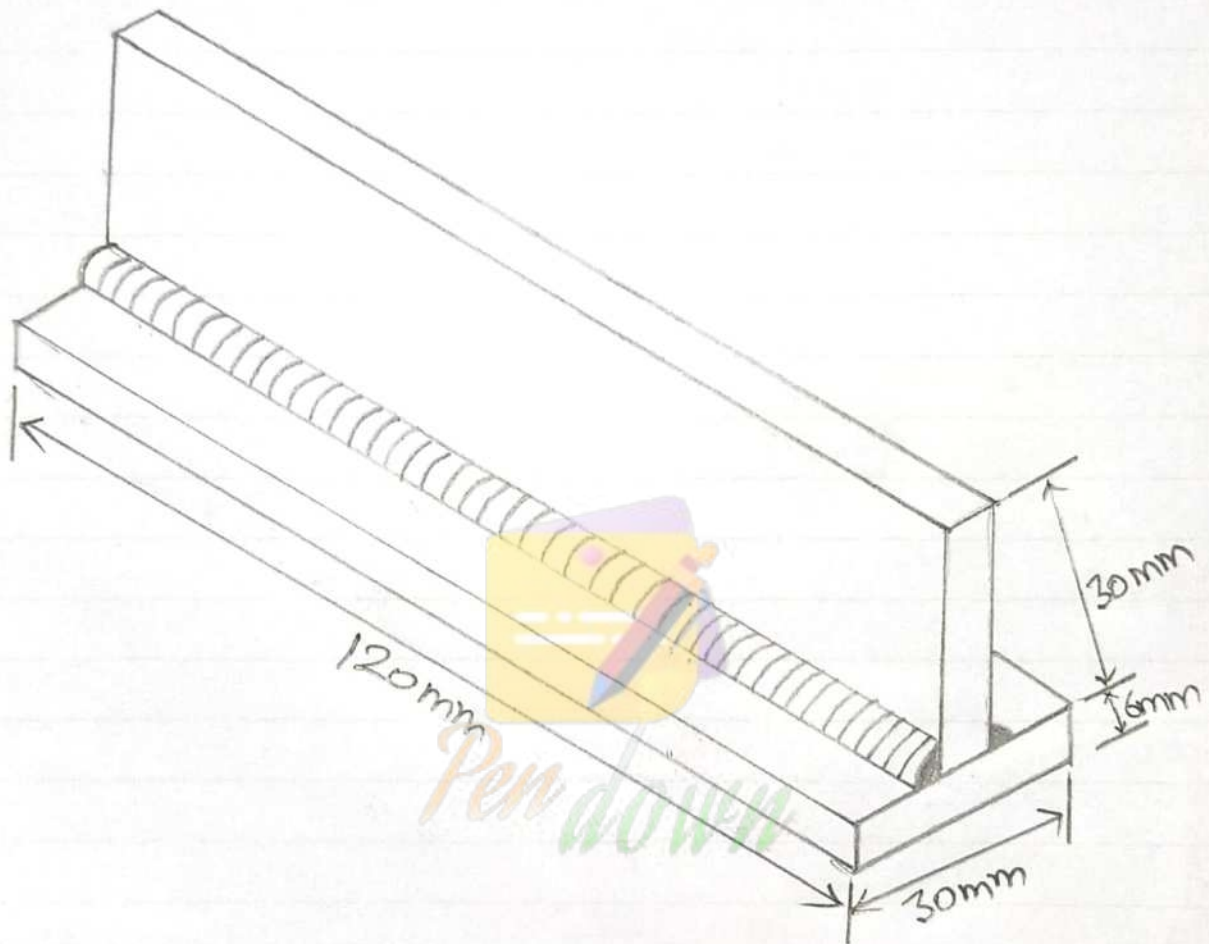
Overlap




Incomplete Penetration







 Fillet (TEE) Joint

## "Model" "Fillet (TEE) Joint"

Aim:- To make a butt joint on the given mild steel flat pieces in down hand by arc welding.

### Materials Required:-

work piece :- Mild steel flat of size  $123 \times 30 \times 6$  mm (2 nos)

Electrode :- Mild steel electrode 10SWG (3.2mm) - 1 no.

Tools Required:- steel rule, Try square, scriber, Hacksaw, Bence vice, Flat file, face shield, Tongs, wire brush, chipping hammer, welding machine and all other welding accessories.

List of operations:-

- ① Measuring
- ② Marking
- ③ Fixing
- ④ Cutting , ⑤ Filing , ⑥ welding ,
- ⑦ Deslagging , ⑧ cleaning , ⑨ Inspecting.

Procedure:- ① Copy the given drawing in the work record.

② Cut the work piece as per the drawing  
③ file the work piece on the welding table in down hand position.



- ④ set the ampere of the machine and use protective cloth, select suitable electrode and proper shield.
- ⑤ Tack welds the two ends of the work piece and checks the alignment.
- ⑥ Remove the slag and spatters using the chipping hammer and wire brush.
- ⑦ After completion of weld, the weld bead should be inspected.

Result:- The desired TEE joint is obtained.

- Precautions:-
- ① Always wear the safety hand gloves, face shield, apron and leather shoes.
  - ② Apply eye drop after welding is over for the day, to relieve the strain on the eyes.
  - ③ Follow all safety practices of welding shop.