◆Electric Current for Welding:

Both D.C. (direct current) and A.C. (alternating current) are used to produce an arc in electric arc welding. Both have their own advantages and applications.

The D.C. welding machine obtains their power from an A.C. motor or diesel/petrol generator or from a solid state rectifier.

The capacities of D.C. machine are:

Current:

Up to 600 amperes.

Open Circuit Voltage:

50 to 90 volts, (to produce arc).

Closed Circuit Voltage:

18 to 25 volts, (to maintain arc).

The A.C. welding machine has a step down transformer which receives current from main A.C. supply. This transformer step down the voltage from 220 V-440V to normal open circuit voltage of 80 to 100 volts. The current range available up to 400 amperes in the steps of 50 ampere.

• capacities of A.C. welding machine are:

Current Range:

Up to 400 ampere in steps of 50 ampere.

Input Voltage:

220V- 440V

Actual Required Voltage:

80 – 100 volts.

Frequency:

50/60 HZ.

◆Significance of Polarity:

When D.C. current is used for welding, the following two types of polarity are available:

(i) Straight or positive polarity.

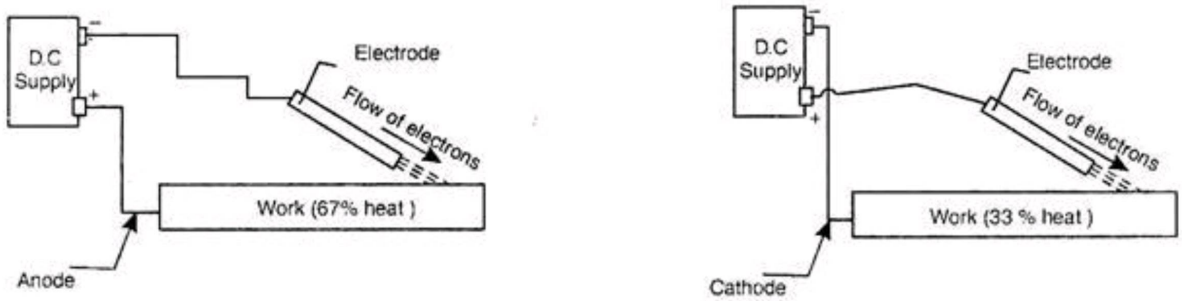
(ii) Reverse or negative polarity.

When the work is made positive and electrode as negative then polarity is called straight or positive polarity, as shown in Fig.

In straight polarity, about 67% of heat is distributed at the work (positive terminal) and 33% on the electrode (negative terminal). The straight polarity is used where more heat is required at the work. The ferrous metal such as mild steel, with faster speed and sound weld, uses this polarity.

(a) Straight polarity.

(b) Reverse polarity



(*a*) Straight polarity. (*b*) Reverse polarity

Fig. 7.16. Polarity for D.C. Arc Welding.

On the other hand, when the work is made negative and electrode as positive then polarity is known as reverse or negative polarity, as shown in Fig.

In reverse polarity, about 67% of heat is liberated at the electrode (positive terminal) and 33% on the work (negative terminal).

The reverse polarity is used where less heat is required at the work as in case of thin sheet metal weld. The non-ferrous metals such as aluminum, brass, and bronze nickel are welded with reverse polarity.

◆Equipments Required for Electric Arc Welding:

The various equipments required for electric arc welding are:

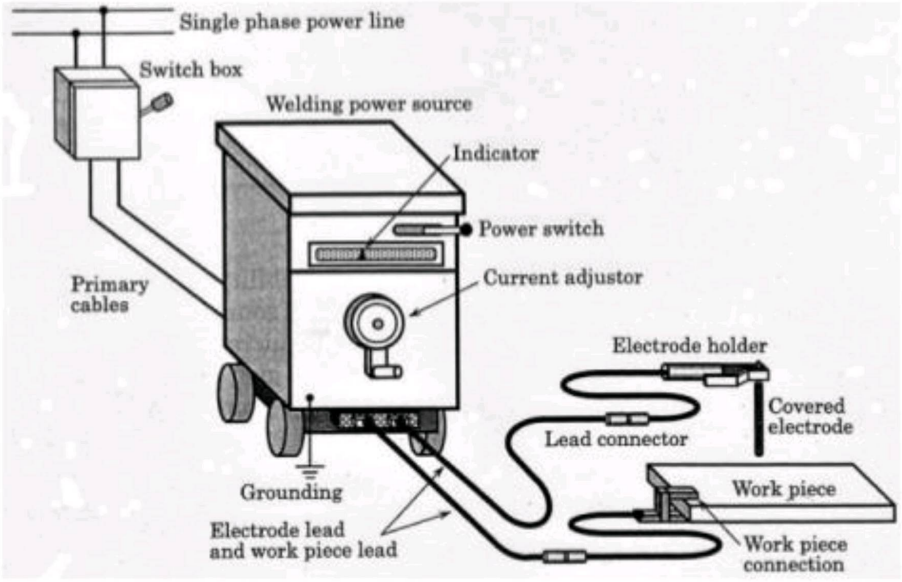
1. Welding Machine:

The welding machine used can be A.C. or D.C. welding machine. The A.C. welding machine has a step-down transformer to reduce the input voltage of 220- 440V to 80-100V. The D.C. welding machine consists of an A.C. motor-generator set or diesel/petrol engine-generator set or a transformer-rectifier welding set.

A.C. machine usually works with 50 hertz or 60 hertz power supply. The efficiency of A.C. welding transformer varies from 80% to 85%. The energy consumed per Kg. of deposited metal is 3 to 4 kWh for A.C. welding while 6 to 10 kWh for D.C. welding. A.C.

welding machine usually work with low power factor of 0.3 to 0.4, while motor in D.C. welding has a power factor of 0.6 to 0.7. The following table 7.9 shows the voltage and current used for welding machine.

Set-up of Manual Metal Arc Welding (MMAW) Equipment



2. Electrode Holders:

The function of electrode holder is to hold the electrode at desired angle. These are available in different sizes, according to the ampere rating from 50 to 500 amperes.

3. Cables or Leads:

The function of cables or leads is to carry the current from machine to the work. These are flexible and made of copper or aluminum. The cables are made of 900 to 2000 very fine wires twisted together so as to provide flexibility and greater strength.

The wires are insulated by a rubber covering, a reinforced fibre covering and further with a heavy rubber coating.

4. Cable Connectors and Lugs:

The functions of cable connectors are to make a connection between machine switches and welding electrode holder. Mechanical type connectors are used; as they can he assembled and removed very easily. Connectors are designed according to the current capacity of the cables used.

5. Chipping Hammer:

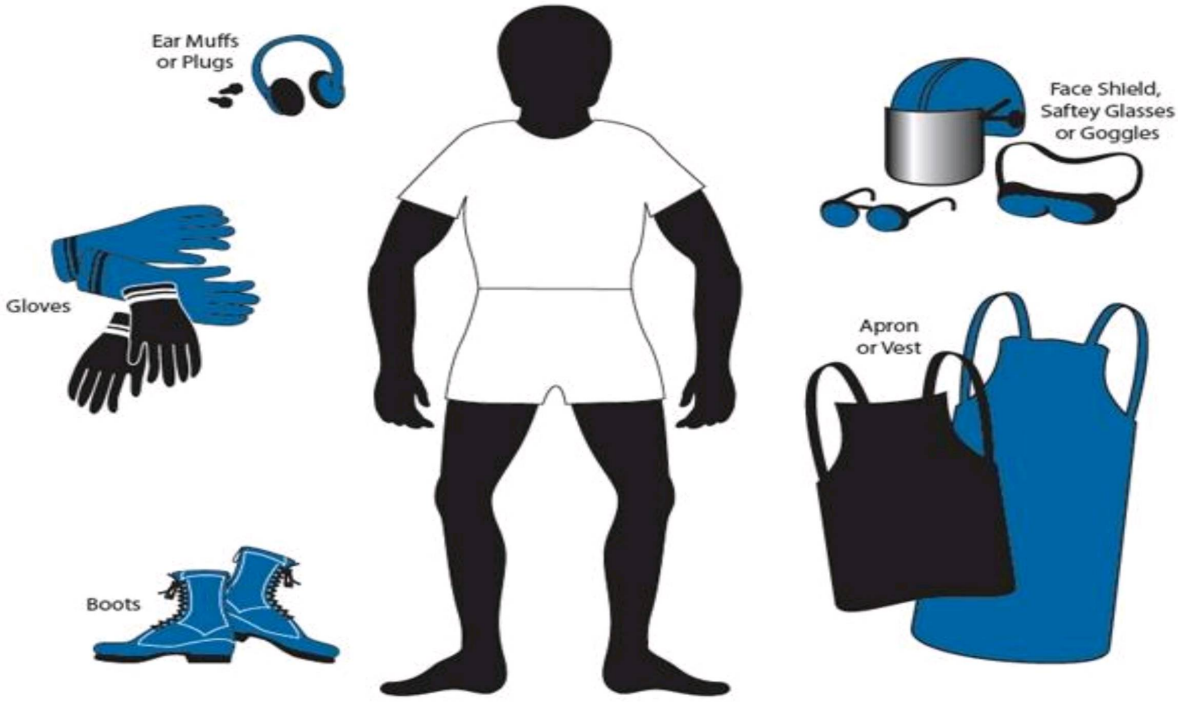
The function of chipping hammer is to remove the slag after the weld metal has solidified. It has chisel shape and is pointed at one end.

6. Wire Brush, Power Wire Wheel:

The function of wire brush is to remove the slag particles after chipping by chipping hammer. Sometimes, if available a power wire wheel is used in place manual wire brush.

7. Protective Clothing:

The functions of protective clothings used are to protect the hands and clothes of the welder from the heat, spark, ultraviolet and infrared rays. Protective clothing used are leather apron, cap, leather hand gloves, leather sleeves, etc. The high ankle leather shoes must be wear by the welder.



9. Screen or Face Shield:

The function of screen and face shield is to protect the eyes and face of the welder from the harmful ultraviolet and infrared radiations produced during welding. The shielding may be achieved from head helmet or hand helmet.

◆Edge Preparation of a Joint:

The efficiency and quality of welded joint also depends upon the correct preparation of the edges of the plates to be welded. It is necessary to remove all scales, rust, grease, paint, etc. from the surface before welding.

The cleaning of the surface should be carried out mechanically by wire brush or power wire wheel, and then chemically by carbon tetrachloride. Proper shape to the edges of the plate should be given to produce a proper joint.

The shape of edges may be plain, V-shaped, U-shaped, reshaped, etc. The choice of various edge shapes depends upon the kind, thickness of metal to be welded. Some different types of grooves for edges of the work :

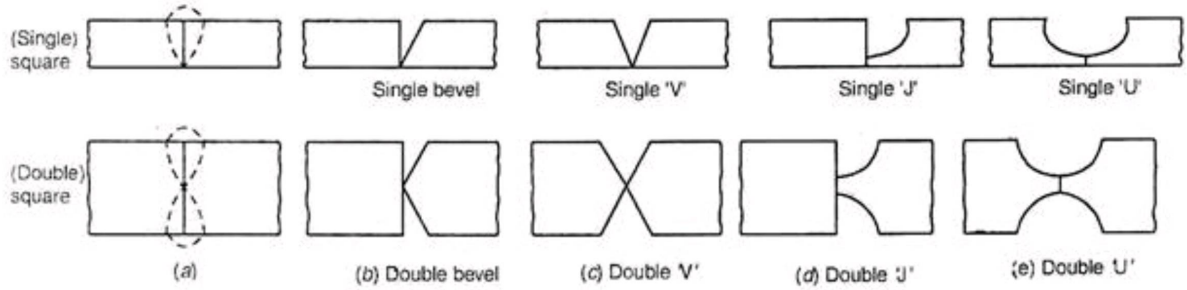


Fig. 7.17. Edge preparation for butt welding.