6/3/2012

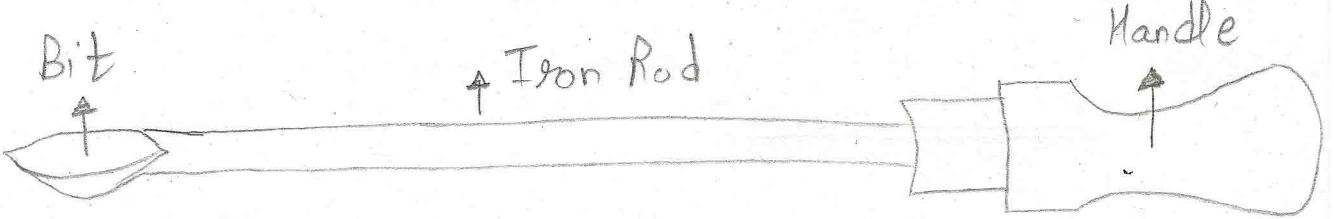
3- Soldering & Brazing

Object:- To join two wires using soldering and two pieces of metal by using brazing.

Apparatus Used:- Soldering iron, soldering pad soldering wire & flux, electric cables.

SOLDERING

Soldering is a method of joining similar metals without melting the base metal. It is a method of joining similar or dissimilar metals by heating them to a suitable temp. and by means of a filler metal, called solder, having liquidus temp. not exceeding 450°C and below the solidus of the base material. Though soldering obtains a good joint between the two plates, the strength of the joint is limited by the strength of the filler metal used. Solders are essentially alloys of lead & tin. To improve the mechanical properties and temp. resistance, solders are added to other alloying elements such as zinc, cadmium and silver in various proportions.



Soldering Iron

* Types of Soldering

- Soft Soldering → The job performed by using a soft solder is known as soft soldering. A soft solder is particularly an alloy of lead & tin to which some other metals are added sometimes to lower its melting point. Usual composition of soft solder is

→ Tin - 67% Lead - 33%
→ Tin - 50% Lead - 50%
→ Tin - 33% Lead - 67%

A soft solder usually melts at temp. of about 350°C.

- Hard Soldering :→ The job performed using a hard solder is known as hard soldering. A hard solder is an alloy of Cu & Zn to which other metals are added sometimes. Hard solder usually at temp. of about 600°C.

Basic Operations in Soldering →

1- Shaping & fitting of metals parts together Filler metal on heating flows between the

closely adjacent surfaces due to capillary action, thus, closer the parts the more is solder penetration. This means that the two parts should be shaped so closely so that the space between them is extremely small to be filled completely with solder by the capillary action.

→ Cleaning of surfaces →
This is done to remove dirt, grease or any other foreign material from the surface pieces to be soldered, in order to get a sound joint.

→ Flux Application → The purpose of using the flux is to prevent the formation of oxides on metal surfaces. Even if a metal is clean, it rapidly acquires an oxide film of submicroscopic thickness due to heat and this film insulates the metal from the solder, preventing the surface to get wetted by solder. This film is broken and removed by the flux.

→ Application of heat & solder →
The parts must be held in a vice or with

special work holding devices so that they do not move while soldering. The parts should be heated to solder-melting temperature before applying the solder for soldering.

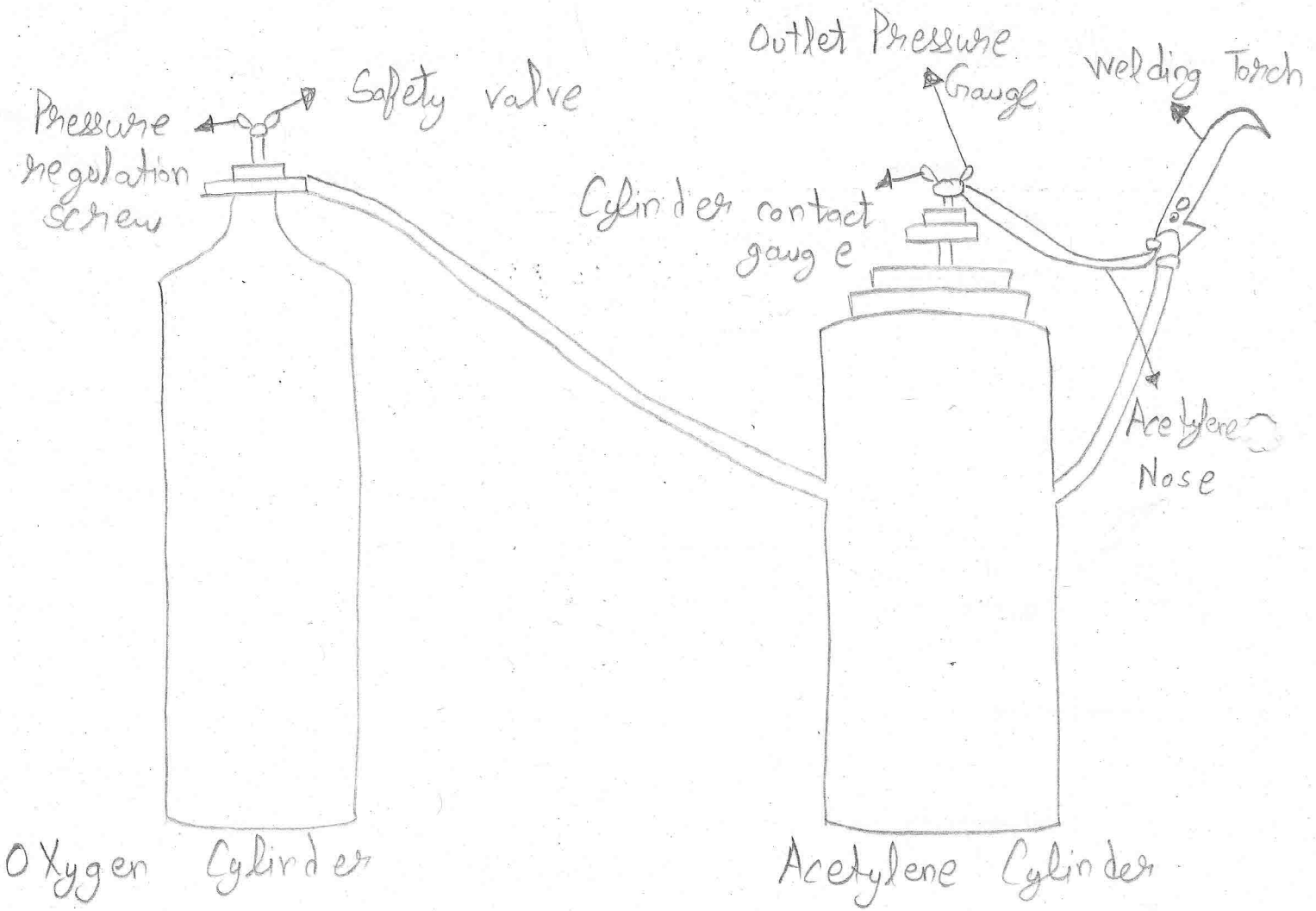
Brazing Process

(b)

* **Object** - To join two mild steel & zinc pieces by brazing process

* **Material Used**:- Oxy acetylene welding equipment
Mild steel plate of length 127mm

* **INTRODUCTION**:- Brazing is a process of joining metals without melting the base metal. Filler materials used for brazing has liquidus temperature above 450°C & below the solidus temperature of the base metal. Due to the higher melting point of the filler material, the joint strength is more than in soldering. Almost all metals can be joined by brazing except aluminium & magnesium which cannot be easily joined by brazing. The brazed joints are reasonably stronger, depending on the strength of the filler metal used. The colour of the filler metal in the brazed joint may not match with that of the base metal.



Oxy - Acetylene Welding

✲ Methods of Brazing

→ Torch Brazing → It is most widely used brazing method. Heat is produced, generally, by burning a mixture of oxy-acetylene gas, as in the gas welding. A carbonizing flame is suitable for this purpose as it produces sufficiently high temp. needed for brazing.

→ Furnace Brazing → It is suitable for brazing large number of small or medium parts. Usually brazing filler metal in the granular or powder form or as strips is placed at the joint, and then the assembly is placed in the furnace & heated.

✲ Equipments used for oxy acetylene flames

→ Welding torch → It is used for mixing the O_2 & acetylene in desired volume & burning the mix at the end of the tip which produces a high temp. flame. It has a handle at one end with two inlet connection for gases.

→ Welding Torch. Tip → It is that portion of

torch through which the gas pass. Just prior to its ignition & burning. The tip is made up of high thermal conductivity material such as Cu.

→ Pressure Regulator → Gas pressure regulators are employed for regulating the supply of acetylene and oxygen gas from cylinders. It permits the adjustment of deliver gas at a certain desired pressure.

→ Gas Cylinder → The O_2 & acetylene are usually obtained from sted strong cylinders. The cylinders are painted black for O_2 & maroon for acetylene usually. Fragile discs & fusible plugs are usually provided in the cylinders valves in case it is subjected to danger.

→ Spark lighter → It is used for frequently igniting the welding torch.

→ Ist Stage → The carbon from acetylene combines with O_2 to form CO.

$$C_2H_2 + O_2 \rightarrow 2CO + H_2$$

Neutral flame

Oxidising flame (Excessive oxygen)

Carbonising flame
(Excessive acetylene)

→ 2nd Stage → CO & H_2 react together with O_2 of surrounding to form CO_2 & H_2O

★ TYPES OF FLAME :->

→ Neutral flame → It results when approximately equal volumes of oxygen and acetylene are mixed in the welding torch and burnt at the torch tip. The temp. of neutral flame is about 5900°F (3260°C).

→ Carbonising or Reducing flame → The carbonising or reducing flame has excess of acetylene and has a temp. of about 3038°C. This flame is used for welding high carbon steel and those metals that do not tend to absorb carbon.

→ Oxidising Welding Flame → The oxidising flame has an excess of oxygen over the acetylene. It is the hottest flame (6300°F) produced by any oxy-fuel gas source. It is used for welding copper based metals, zinc based metals, manganese steel, etc.

PROCEDURE:- The ends of metal piece are cleansed well by means of filing. Brass filling is then spread over the surface together with flux. Then the joined pieces are heated using oxy-acetylene welding torch. The flux along the contacting surfaces melts, writes with the surface & solidifies with cooling to form the joint.

Result:- Desired piece with butt joint is obtained.

References:->

Workshop Technology by
B.S. Raghuvanshi. Vol. 2.