

NORTHERN INDIA ENGINEERING COLLEGE
NEW DELHI
PRACTICAL INSTRUCTION SHEET OF FOUNDRY SHOP

EXPERIMENT NO. 1

OBJECT:

To study and sketch various types of tools and equipments used in foundry shop and describe various types of moulding & sand.

THEORY:

FOUNDRY:

The place where jobs are prepared by melting and pouring the molten metal into moulds is known as foundry.

FOUNDRY TERMS

MOULD:

Mould is a cavity prepared in which molten metal is poured and allow to solidify. Mould is made from moulding materials like moulding sands etc. there are two types of moulding sand.

(i) Natural moulding sand

(ii) Synthetic moulding sand

PATTERN:

Pattern is a model or replica of required casting or job.

CASTING:

It is that object which is get after solidification of liquid metal in the mould.

GATING SYSTEM:

The way, which are made in the mould to supply molten metal to the cavity from the ladle or crucible.

CAVITY:

It is the depression in the mould made by pattern.

SPRUE:

It is vertical round hole in the cope to give molten metal to the runner and gate.

GATE:

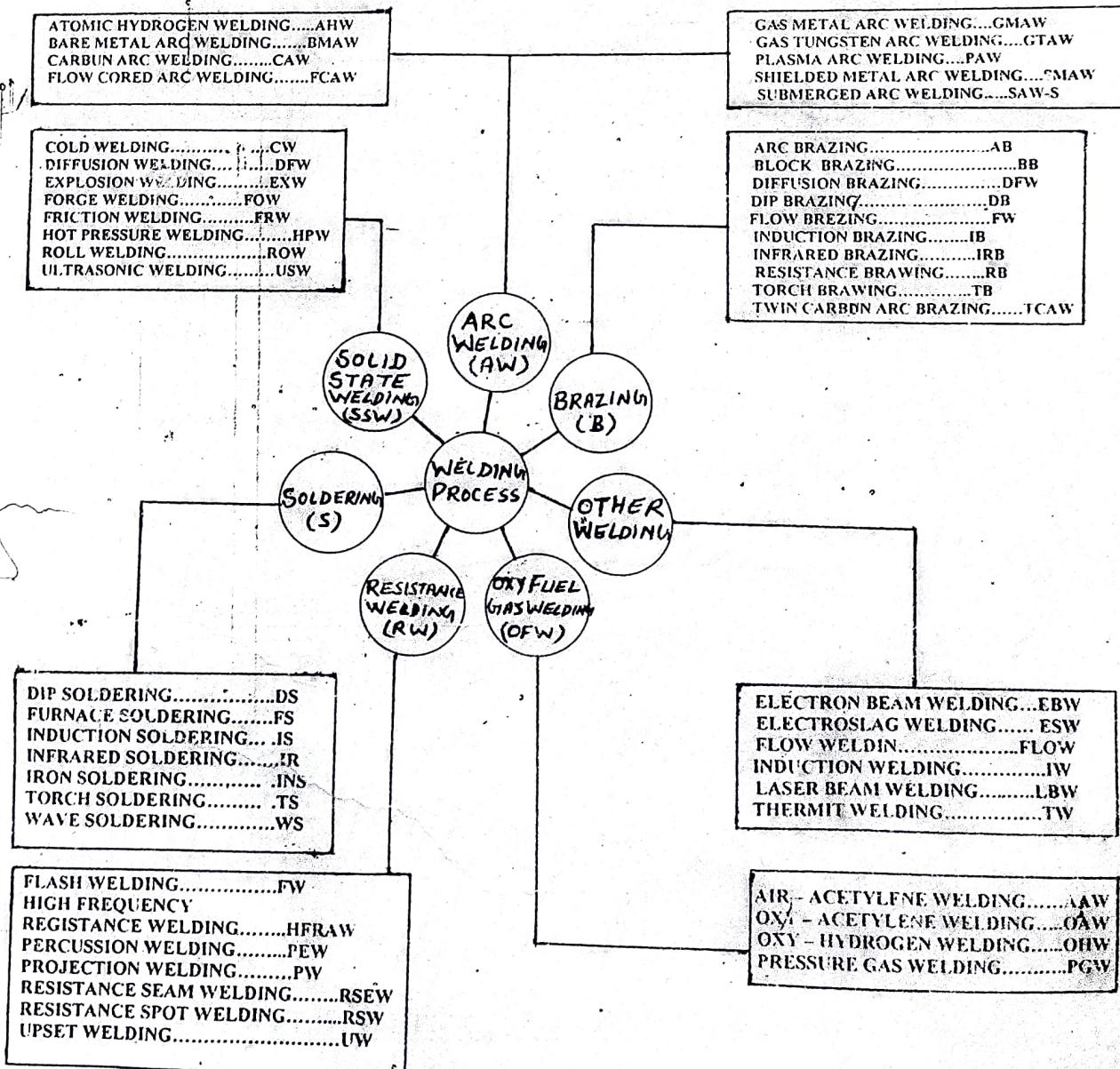
It is the rectangular way in the mould, which supply molten metal to the cavity from runner.

EXPERIMENT NO. 1

OBJECT : Study of tools and operation in Welding Shop.

WELDING:- Welding is the process of joining two similar or different metals by bringing the junction to fusing point by the use of intense heat with or without the application of pressure and with or without addition of filler material.

CLASSIFICATION OF WELDING PROCESS



ELECTRIC ARC WELDING :- Electric arc welding is the process by which welding is done by producing heat from an electric arc, between the work and electrode. Heat generated in an arc welding is in the range of 3600°C to 4000°C . Both A.C. as well as D.C. is used in producing an arc, each having its particular applications.

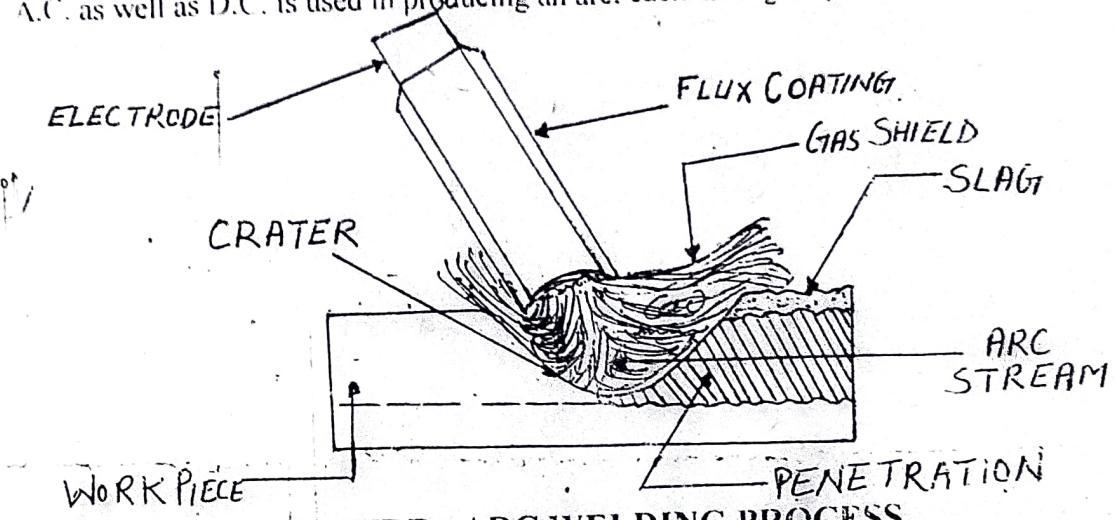


FIGURE : ARC WELDING PROCESS

EQUIPMENT AND TOOLS USED FOR METAL ARC WELDING

(1) ARC WELDING EQUIPMENT : Both alternating current (A.C.) and direct current (D.C.) are used for arc welding, when D.C. arc is to be employed the current is generated by a D.C. generator. This generator can be given by means of an electric motor or by means of a petrol or diesel engine.

For A.C. arc welding a step-down transformer is used which receives current from the supply mains at 400 – 440 volts and transforms it to the required voltage for welding i.e. 80 – 100 volts.

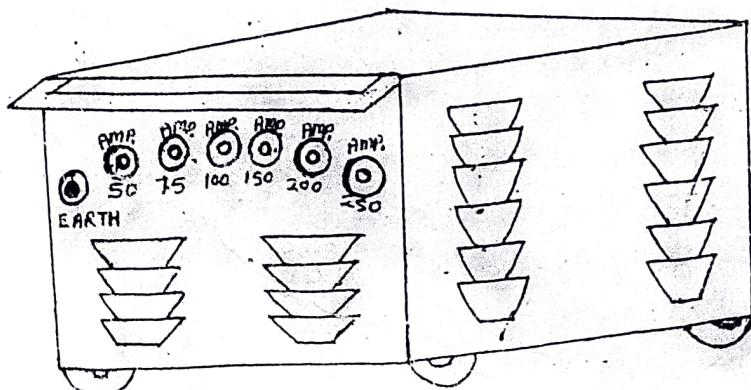


FIGURE : A.C. WELDING TRANSFORMER (AIR COOLED)

(2) FACE SHIELD / HAND SCREEN: When arc is produced around the job, infrared rays and ultraviolet rays are produced. To protect the face and eyes from these dangerous rays, a shield is necessary.

The body of a shield is made of fiber glass and coloured glasses are used to see the arc. The coloured glasses of different shades are available for welding and cutting.

Shade no. 10 is used for metal arc welding and 14 for Plasma cutting.

(3) HAND GLOVES, APRON AND LEATHER SHOES : The hand gloves, apron and leather shoes are used to protect hands, cloths and foot, while welding. These are made of leather or asbestos material.

(4) CABLES OR LEADS: These leads are made up of copper or aluminum wire. The wires are insulated with rubber and cloth fiber. A heavy insulation is necessary for these cables.

(5) ELECTRODE HOLDER : It is connected to electrode lead and is used to hold the metallic electrode during metal arc welding. It should be light in weight, balanced, insulated except jaws, heat resistant and easy to receive and eject the electrode.

(6) CLEANING TOOLS : Chipping hammer and wire brushes are used to clean the weld area & to remove the slag and spatter. The chipping hammer is generally double ended, having a point at one end and a flat chisel shape at the other.

(7) CHIPPING GOGGLES : This is wearied to protect eyes from slag during chipping process.

(8) TONG : It is made of forge steel and is used to hold the work piece.

(9) ELECTRODE : Electrodes are of two types.

(I) COATED ELECTRODES :- Coated electrodes are generally applied in arc welding processes. Metallic core is coated with some suitable material. The material used for core are mild steel, nickel steel, chromium, molybdenum steel etc. One end of the coated core is kept bare for holding.

(II) BARE ELECTRODE :- Bare electrode produce the welding of poor quality. These are cheaper than coated electrodes. These are generally used in modern welding process like M.I.G. Welding.

(11) FIRE EXTINGUISHERS :- Fire extinguishers are used to prevent the fire that may break out of chance. Sand filled baskets and closed cylinders are kept ready to meet such accidents.

(5) TORCH TIPS :- For different types of job, different types of tips are used. The size of the tip is specified by the outlet hole diameter. More than one hole are also provided in tips. The tip is screwed or fitted on the front end of the torch.

(6) HOSE PIPE :- IT is generally used as a passage to draw the oxygen and acetylene gases from the respective cylinders. It is re-enforced to withstand the high pressures of gases.

Green or black hose pipe is used for oxygen gas and red or maroon hose pipe is used for acetylene gas.

(7) GOGGLES :- Gas flames produce high intensity light & heat rays, which are harmful to naked eyes. To protect the eyes from these rays, goggles are used. Goggles also protect the eyes from flying sparks.

(8) SPARK LIGHTER :- For starting the flame, the spark should be given by a spark lighter. Matchsticks should not be used, as there is risk of burning hand.

(9) FILLER :- The rod which provides additional metal in completing the welding is known as filler. The composition of filler metal should be the same as that of the metals to be welded.

(10) FLUX :- The chemicals which deoxidize the metal surface and provide inert atmosphere around the molten metal are known as fluxes. Fluxes are available as liquid, powder, paste and gas.

(11) FIRE EXTINGUISHERS :- Fire extinguishers are used to prevent the fire that may break out of chance. Sand filled baskets and closed cylinders are kept ready to meet such accidents.

EQUIPMENTS AND TOOLS USED FOR GAS WELDING

(1) OXYGEN CYLINDER :- Cylinder is made up of steel in capacity range 6.3m^3 to 7m^3 . The cylinders are filled with oxygen at about 125 to 140kg/cm^2 at 21°C . A safety valve is also provided on it. The cylinder can be opened or closed by a wheel which operates a valve. A protector cap is provided on the top of the cylinder to safe guard the valve.

(2) ACETYLENE CYLINDER :- Acetylene cylinders are also made up of steel. Gas is filled at a pressure of 16 - 20 kg/cm^2 . The capacity of the cylinder is about 4m^3 to 6m^3 . Regulator valve and safety valve are also mounted on cylinder. Safety plugs are also provided on the bottom of the cylinder. When acetylene is filled into the cylinder, then it is dissolved in acetone.

(3) REGULATOR :- Regulator is used to control the flow of gases from high pressure cylinder. A simple type of regulator is shown in the figure.

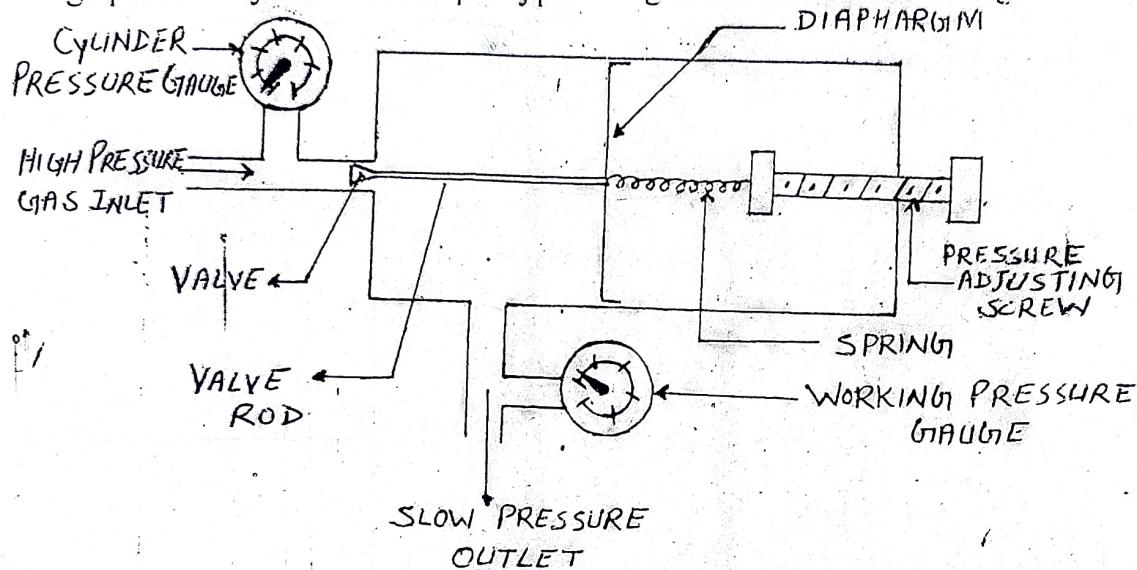


FIGURE : REGULATOR (SINGLE STAGE)

(4) TORCH / BLOW PIPE :- Torch is a device used to mix acetylene and oxygen in the correct proportion and the mixture flows to the tip of the torch. There are two types of torches.

- (I) Low pressure or injector torches.
- (II) Medium pressure or equal pressure torches.

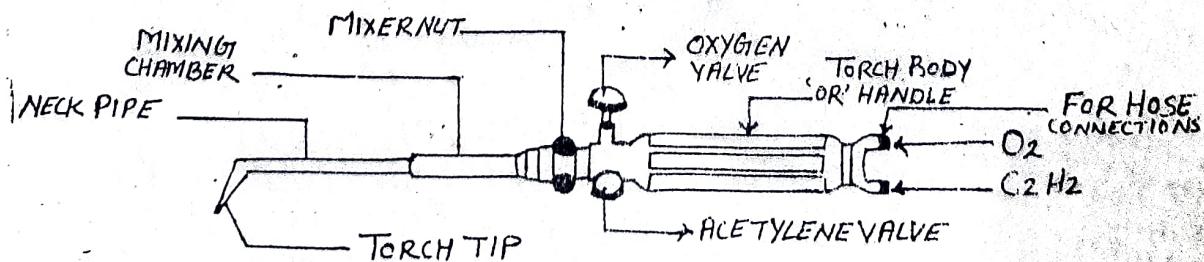


FIGURE : GAS WELDING TORCH

-: GAS WELDING :-

(10)

PRINCIPLE OF OXY-ACETYLENE WELDING :-

A very hot flame is produced by burning of the gases coming through the torch tip. The edges to be welded are heated up to melting point. A filler metal is also added to complete the welding. This molten metal mixture when solidifies on cooling forms a welded joint.

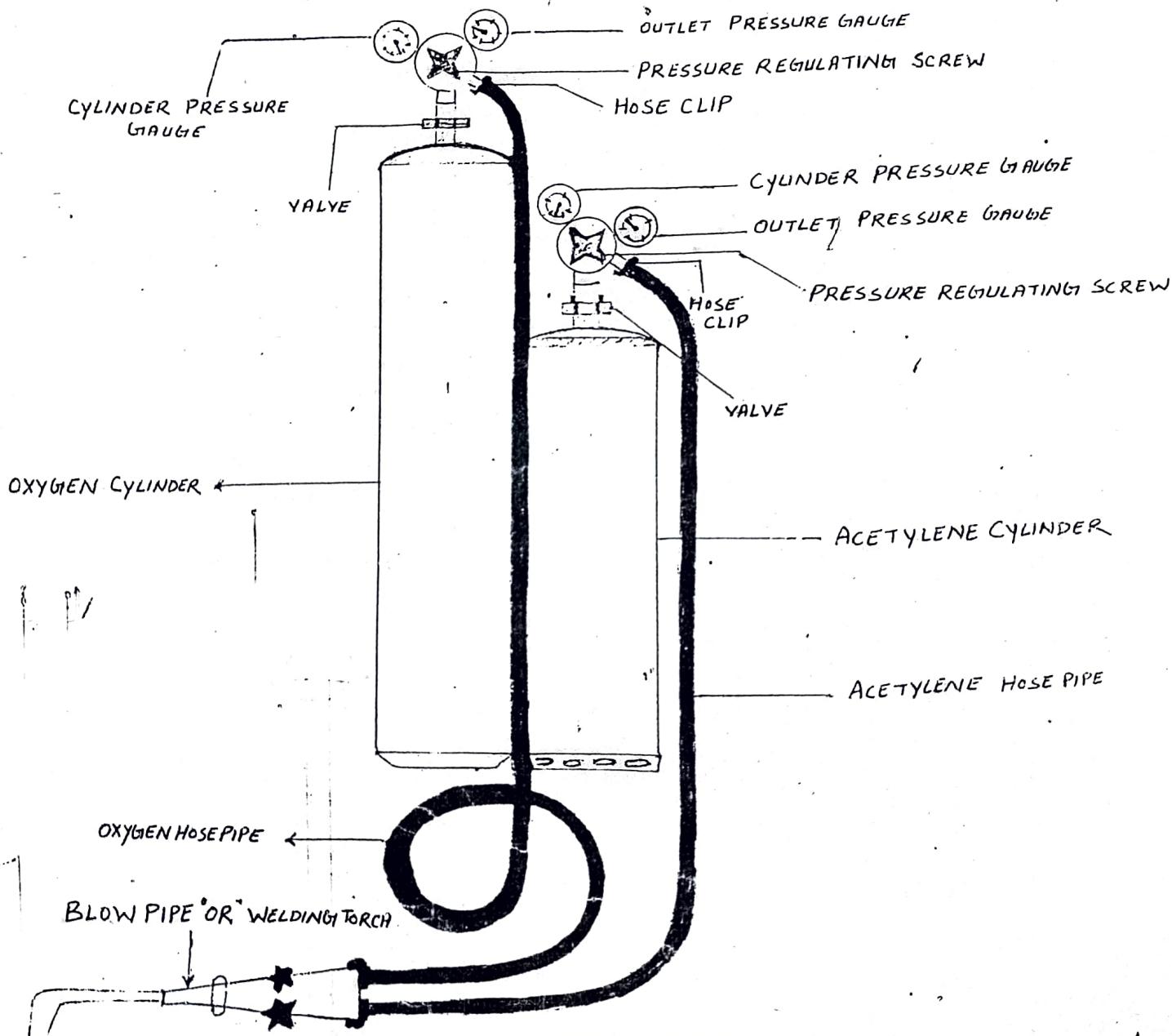


FIGURE: HIGH PRESSURE WELDING PLANT

APPLICATIONS: - All the metal can be welded with proper filler metals. Some equipment may be used for cutting purposes. Oxyacetylene welding is particularly used for sheet metal work.

EXIPERIMENT NO. 2

OBJECT : To make different flames in oxy-acetylene welding.

- EQUIPMENT :**
- (1) Oxygen Cylinder
 - (2) Acetylene Cylinder
 - (3) Oxygen & Acetylene pressure regulators
 - (4) Hose pipe & Hose clip
 - (5) Blow pipe / Welding torch
 - (6) Goggles & Hand gloves
 - (7) Spark lighter
 - (8) Spanner & Valve key

PROCEDURE :

First of all regulator is tight with the help of regulator key on oxygen & acetylene cylinders.

Hose pipes of acetylene & oxygen cylinders are connected to the blow pipe. Oxygen cylinder valve is opened with a valve key, and working pressure is adjusted with the help of pressure adjusting screw.

Similarly valve of acetylene cylinder is opened with the help of valve key, and working pressure is adjusted with the help of pressure adjusting screw. Now gas leakage is checked by applying soap water foam on the blow pipe tip before igniting the gas to ensure that there is no leakage of gas in the joints.

Thereafter blow pipe of acetylene needle valve is opened for half circle and the flame is ignited with spark lighter and the flame is set by opening oxygen supply.

Thus we have three types of flame.

TYPES OF GAS FLAMES :

(1) CARBURISING FLAME :- When the volume of acetylene in the flame more than the oxygen, carburising flame is formed.

This flame is used for welding Nickel, Hard facing etc.

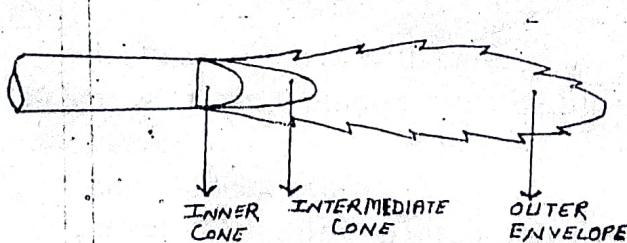


FIGURE : CARBURISING FLAME

(2) NEUTRAL FLAME :- It is known as balanced flame. Oxygen and acetylene gases are mixed in equal volumes. Neutral flame is used for normal welding of Steel, Cast iron, Stainless steel, Copper, Aluminum etc.

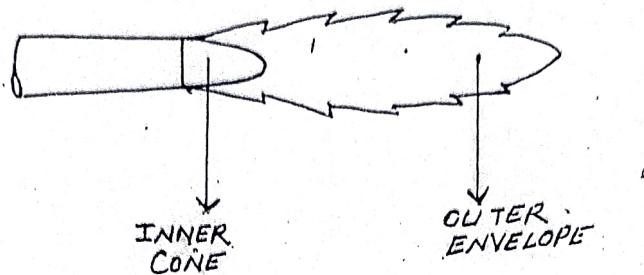


FIGURE : NEUTRAL FLAME

(3) OXIDISING FLAME :- When the volume of oxygen gas is more than the volume of acetylene mixed in the torch. This flame is used for welding Brass and is also used for cutting the metals.

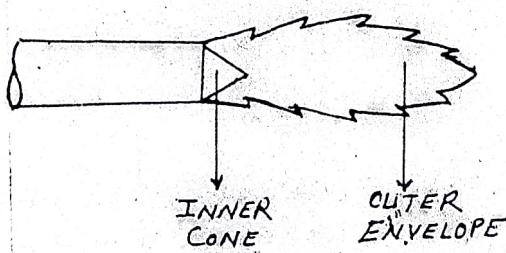


FIGURE : OXIDISING FLAME

PRECAUTIONS:

- (1) Always handle the gas cylinders with care.
- (2) The adjusting screw on the regulator must be fully released before opening a cylinder valve.
- (3) The cylinder should be leak proof.
- (4) Never use matchstick for lighting a torch. Always use spark lighter.
- (5) Acetylene cylinders should be stored in up right position.
- (6) Always use goggles while welding.
- (7) Always use tong for holding the heated job.
- (8) Keep in mind the location of the fire extinguishers.

EXPERIMENT NO. 3

OBJECT : TO make a lap joint with the given piece of mild steel by using metal arc welding.

EQUIPMENTS : A.C. Welding set, air / oil cooled transformer.

TOOLS USED :

- (1) Electrode Holder
- (2) Earthing Clamp
- (3) Hand Screen
- (4) Hand Gloves, Apron & Leather Shoes
- (5) Wire Brush
- (6) Tongs
- (7) Chipping Hammer
- (8) Chipping Goggles
- (9) Welding Table etc.

MATERIAL REQUIRED : Two mild steel pieces of given size $60 \times 50 \times 5$ mm
Electrode – 3.15mm Ø
Welding position – D/H (Down Hand)
Current required – 90 to 120 Amp.

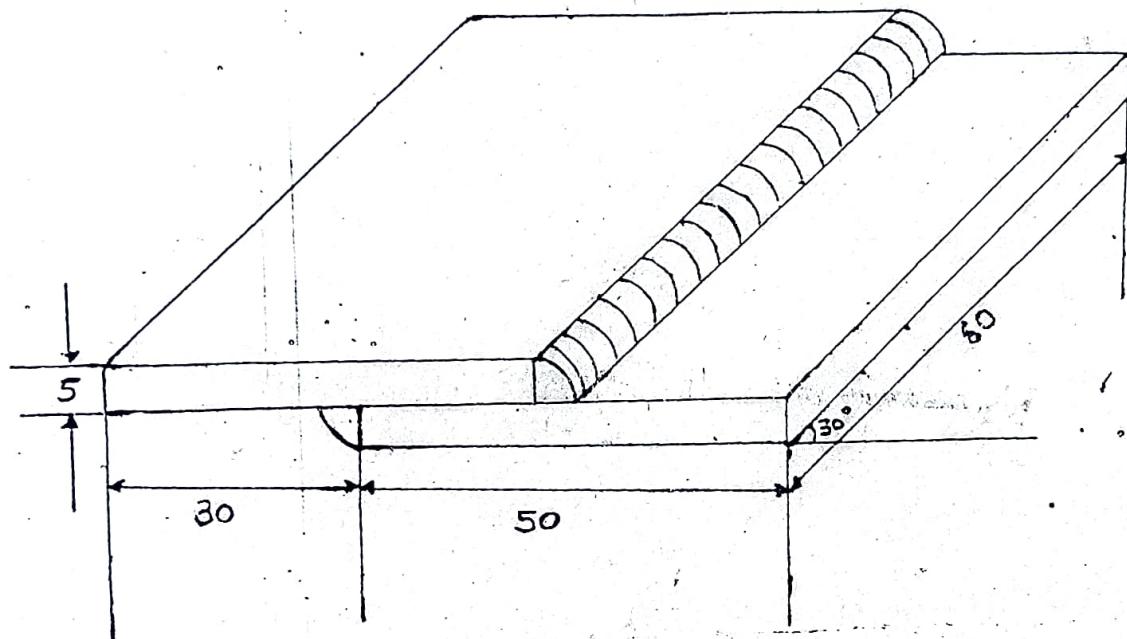
PROCEDURE :

- (1) Cut the work piece according to the given dimensions.
- (2) Start the welding machine and set the current (90 to 120 Amp).
- (3) Connect earthing clamp to the base plate and keep the job on the base plate.
- (4) Put electrode in the electrode holder.
- (5) Place the work piece together on the welding table.
- (6) First mark two tag on the both ends of the work piece so that the pieces may not shifts while welding.
- (7) Weld the pieces together from top to down.
- (8) Complete the weld with finishing run.
- (9) Chip off the slag by chipping hammer and clean the joint by wire brush.

RESULT : A proper lap joint has been achieved / made.

PRECAUTIONS :

- (1) Never look at the arc by naked eyes. Use the welding screen or goggles.
- (2) Always wear the safety hand gloves, apron & leather shoes.
- (3) Never chip slag while it is hot, without wearing chipping goggles.
- (4) Avoid use of damaged tools.
- (5) Always use tong for holding the heated job.

**FIGURE : LAP JOINT**

ALL DIMENSIONS ARE IN M.M.
M.S. PIECE SIZE - 60×50×5 M.M.
Ø OF ELECTRODE - 3.15 M.M.
WELDING POSITION - D/H