

**WELDING****INTRODUCTION**

Solid materials need to be joined together in order that they may be fabricated into useful shapes for various applications such as industrial, commercial, domestic, art ware and other uses. Depending on the material and the application, different joining processes are adopted such as, mechanical (bolts, rivets etc.), chemical (adhesive) or thermal (welding, brazing or soldering). Thermal processes are extensively used for joining of most common engineering materials, namely, metals. This exercise is designed to demonstrate specifically: gas welding, arc welding, resistance welding, brazing.

**WELDING PROCESSES**

Welding is a process in which two materials, usually metals, and is permanently joined together by coalescence, resulting from temperature, pressure, and metallurgical conditions. The particular combination of temperature and pressure can range from high temperature with no pressure to high pressure with any increase in temperature. Thus, welding can be achieved under a wide variety of conditions and numerous welding processes have been developed and are routinely used in manufacturing.

To obtain coalescence between two metals following requirements need to be met:-

- (1) Perfectly smooth, flat or matching surfaces.
- (2) Clean surfaces, free from oxides, absorbed gases, grease and other contaminants.
- (3) Metals with no internal impurities.

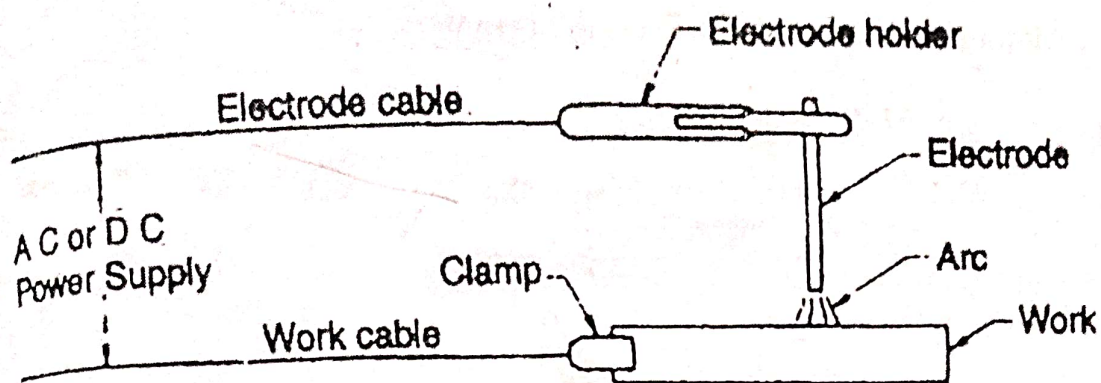
These are difficult conditions to obtain. Surface roughness is overcome by pressure or by melting two surfaces so that fusion occurs. Contaminants are removed by mechanical or chemical cleaning prior to welding or by causing sufficient metal flow along the interface so that they are removed away from the weld zone. Friction welding is a solid state welding technique. In many processes the contaminants are removed by fluxing agents. The production of quality welds requires

- (1) A satisfactory heat and/or pressure source,
- (2) A means of protecting or cleaning the metal, and
- (3) Caution to avoid, or compensate for, harmful metallurgical effects.

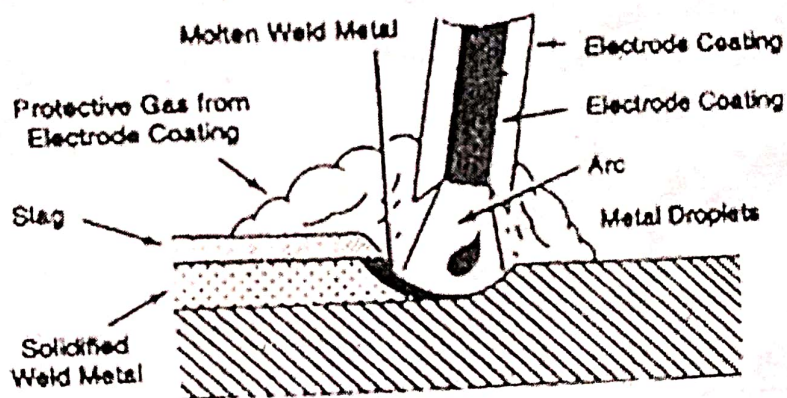
**ARC WELDING**

In this process a joint is established by fusing the material near the region of joint by means of an electric arc struck between the material to be joined and an electrode. A high current low voltage electric power supply generates an arc of intense heat reaching a temperature of approximately 3800°C. The electrode held externally may act as a filler rod or it is fed independently of the electrode. Due to higher levels of heat input, joints in thicker materials can be obtained by the arc welding process. It is extensively used in a variety of structural applications.

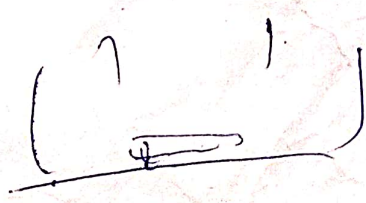




The Basic circuit for arc welding



Schematic diagram of shielded metal arc welding (SMAW)





## EXPERIMENT- W1:

**AIM:-** To prepare a LAP joint with mild steel strip using MMAW technique.

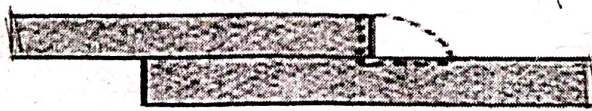
### **EQUIPMENT AND MATERIALS:-**

Welding unit, consumable mild steel Electrodes, mild steel flats (140 x 25 x 5 mm),

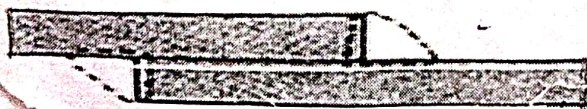
Wire brush, Tongs, Chipping hammer etc.

### **PROCEDURE:-**

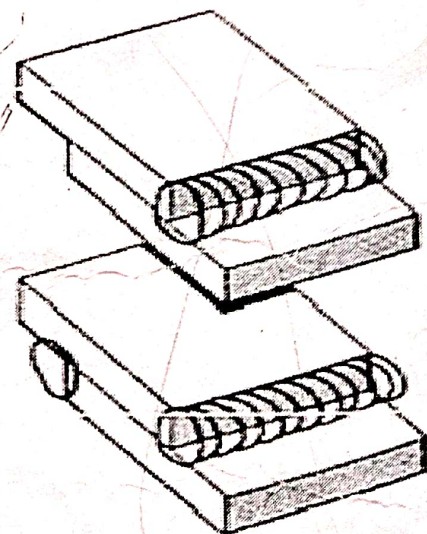
1. Clean the mild steel flats to be joined by wire brush
2. Arrange the flat pieces properly providing the gap for full penetration for butt joint (gap  $\frac{1}{2}$  thicknesses of flats).
3. Practice striking of arc, speed and arc length control
4. Set the welding current, voltage according to the type of metal to be joined.
5. Strike the arc and make tacks at the both ends to hold the metal pieces together during the welding process
6. Lay beads along the joint maintaining proper speed and arc length (Speed 100-150 mm/min).
7. Clean the welded zone and submit.



**Single fillet Lap joint**



**Double fillet Lap joint**



## **LAP JOINTS**

### **ARC WELDING**

In this process a joint



## PRECAUTIONS:-

1. Check the welding machine to make sure that it is properly grounded and that all leads are properly insulated.
2. Never look at the arc with the naked eye. The arc can burn your eyes severely, always use a face shield while welding.
3. Prevent welding cables from coming in contact with hot metal, oil, water or grease. Avoid dragging the cables around sharp corners.
4. Ensure proper insulation of cables and check for openings.
5. Always wear the safety hand gloves, aprons and leather shoes.
6. Always turn-off the machine when leaving the work.
7. Apply eye drop after welding is over for the day, to relieve the strain on the eyes.
8. While welding, stand on dry footing and keep the body insulated from the electrode.

**RESULT:**





**EXPERIMENT- W2:**

**AIM:** To prepare a BUTT joint with mild steel strip using MMAW technique.

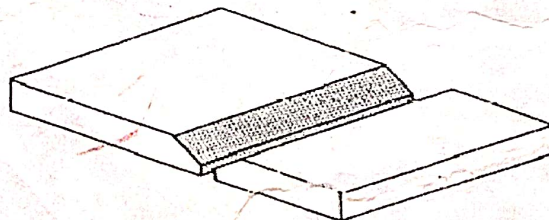
**EQUIPMENT AND MATERIALS:**

Welding unit, consumable mild steel Electrodes, mild steel flats (140 x 25 x 5 mm),

Wire brush, Tongs, Chipping hammer etc.

**PROCEDURE:**

1. Clean the mild steel flats to be joined by wire brush
2. Arrange the flat pieces properly providing the gap for full penetration for butt joint (gap  $\frac{1}{2}$  thicknesses of flats).
3. Practice striking of arc, speed and arc length control
4. Set the welding current, voltage according to the type of metal to be joined.
5. Strike the arc and make tacks at the both ends to hold the metal pieces together during the welding process
6. Lay beads along the joint maintaining proper speed and arc length (Speed 100-150 mm/min).
7. Clean the welded zone and submit.





**PRECAUTIONS:-**

9. Check the welding machine to make sure that it is properly grounded and that all leads are properly insulated.
10. Never look at the arc with the naked eye. The arc can burn your eyes severely, always use a face shield while welding.
11. Prevent welding cables from coming in contact with hot metal, oil, water or grease. Avoid dragging the cables around sharp corners.
12. Ensure proper insulation of cables and check for openings.
13. Always wear the safety hand gloves, aprons and leather shoes.
14. Always turn-off the machine when leaving the work.
15. Apply eye drop after welding is over for the day, to relieve the strain on the eyes.
16. While welding, stand on dry footing and keep the body insulated from the electrode.

**RESULT:**

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