

WELDING SHOP

Introduction

Welding is a process of joining two or more than two similar or dissimilar metals with or without application of pressure along with or without application of filler material.

Types of Welding Process

Homogenous: In this method two similar metal are joined together by welding and used filler material of same material if required is known as homogenous welding.

Heterogeneous: This is defined as the welding of two dissimilar metals along with or without use of filler material is known as heterogeneous welding.

Welding process according to pressure application

Fusion/non pressure welding: In this method edge are heated up to their melting point and filler metal from electrode is filled. The types of non-pressure welding are electric arc welding gas welding seam welding & projection welding etc.

Pressure welding: In this method edge are also heated up to plastic state edges are joined by applying pressure hence no filler metal is used. The types of pressure welding are spot welding, flash, welding and tungsten arc welding etc.

Electrical Arc Welding:

In an open circuit two terminal carrying high ampere and low voltage current brought closer till the resistance offered by air gap between both terminals diminished by the high value of current Voltage then a certain amount of electrons tends to jump from one terminal to another terminal having currents of different polarities due to this jumping of electrons a large amount of heat generated (approximate 3700°C - 4000°C)^{2nd} this flow of jumping electrons termed as electric arc and this amount of heat used to melt the base metal and filler material and this pool of metal and filler metal make a welding joint this process is termed as electric arc welding.

Tools/Equipment's for Electric Arc Welding

- 1. Welding Transformer:** It is simple step down transformer which can supply different current values, these are made air cooled and oil cooled type.
- 2. Electrode:** Electrode is a filler metal rod used for filling the gap between the welding joints during welding this is made in thin wire shape of different metals as per requirement.
- 3. Electrode Holder:** It is used for holding or mounting the electrode.
- 4. Earthing Clamp:** It is mostly made up of mild steel, brass and copper etc. It is used to connect earthing terminal of welding machine with work table or work piece etc.
- 5. Face Shield:** It is used for protection of face and eyes for the spatter, ultra violet and infrared rays generated during welding. It is made up of fibre sheet and black glass.
- 6. Chipping Hammer:** It is a chisel shaped hammer used for removing slag and spatter from welding job.

- 7. Wire Brush:** It is wooden handle shape tool having number of wires. It is used for removing fine slag and carbon etc. from welding job after chipping.
- 8. Gloves and apron:** These are made by thin cotton cloth or by lather and used to protect clothes and hands of operator during welding etc.

Terms used in Welding:

Spatter: Molten metal dispersed around the welding beats in form of small drop is known as spatter and this process of generation of spatter is known as spattering.

Chipping: Removing process of spatters and slag etc. from welding place is known as chipping. This process is carried out with the help of chipping hammer.

Edge Preparation: Edge preparation is for making different types of joint some sites/edge of work metal to be grinded or sharpened in a specific position.

Arc Length: Arc length may be defined as the distance of electrode tip from work during welding process.

Slag: When a flux coated electrode used in welding then a layer of flux metal is formed over the welding bead which is known as slag.

Types of Welding Positions

1. Flat position
2. Horizontal position
3. Vertical position
4. Overhead position
5. Inclined position

Types of Welding Joints

1. Butt joint
2. Lap joint
3. T-joint
4. Corner joint
5. Edge joint

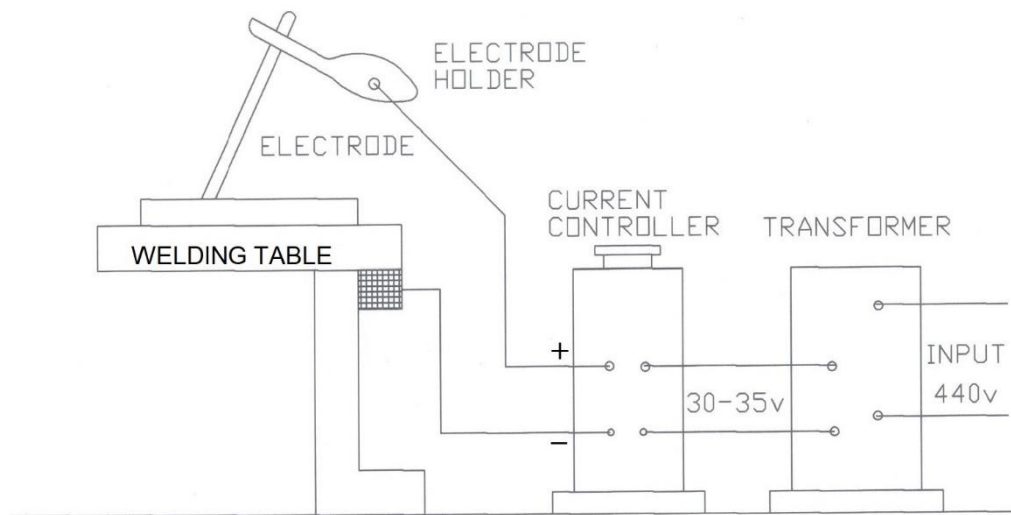


Fig. 1: Block diagram of Electric Arc Welding Setup

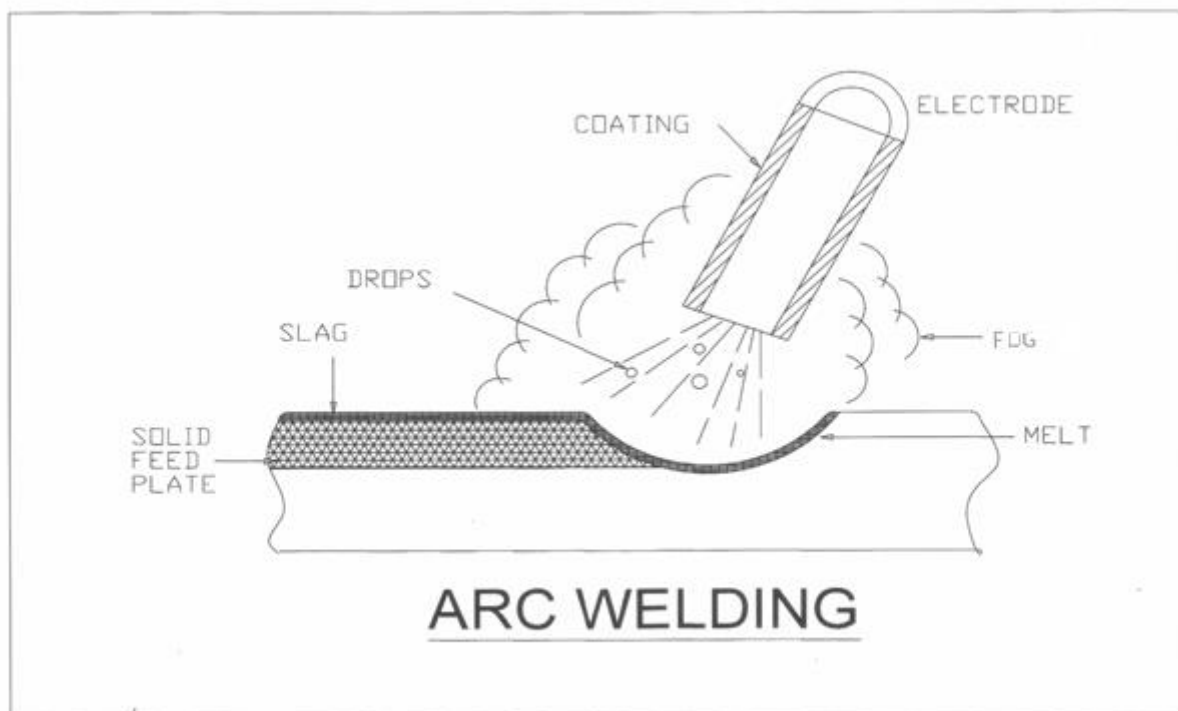


Fig. 2: Arc Welding



Fig. 3: Tong



Fig. 4: Chipping Hammer



Fig. 5: Wire Brush



Fig. 6: Face Shield

PRACTICAL NO.- 1

OBJECTIVE

To prepare a butt joint (Single-V) through electric arc welding in flat position.

MATERIAL REQUIRED

To mild steel pieces of size (140 x 45 x 6) mm each and M. S electrode.

TOOLS & EQUIPMENT USED

- Arc-welding transformer (with all accessories) steel rule
- Scriber
- Files
- safety equipment's like shield, gloves, tons, chipping hammer, wire brush etc.

PROCEDURE

1. Cut to pieces of required length from mild steel flat plat by hacksaw.
2. Cut the required level on the edges of both pieces to from 60⁰ angle.
3. With the help of filling, prepare the root faces of both pieces.
4. Checked the root and "V" groove by keeping the two pieces. In reverse position i.e. the root gap on the top and "V" groove in lowered position.
5. Keep them in opposite position along the root gap from both ends to a reasonable distance of 2 mm.
6. Jack- welded the two pieces, inverted welded pieces and place them in flat position to start welding.
7. Setting of required current (120 amps.) on the welding machine and layed the root bead using a
8. 3 mm diameter mild steel electrode.
9. 8.Cleaned the root bead and checked the penetration of electrode material.
10. For covering bead or intermediate bead, current setting carried out according to depositing of filler material size 4 mm diameter, uniform speed and a side-to- side motion of electrode.
11. Cleaning carried out by wire-brush of this intermediate covering using chipping hammer also.
12. Now using 5 mm electrode and 220 amps current, deposit the filler metal covering bead using the same weaving motion of electrode.
13. Finally clean the prepared joint thoroughly using chipping hammer and wire- brush from both sides and also to be checked for proper root - penetration, distortion and visual surface defects if any.

RESULT ANALYSIS

Changes in dimensions (length, width, dia., weight etc.).

LEARNING OUTCOMES

What did you learn in this practical?

APPLICATION

Where we can apply the knowledge gained in this practical.

SUGGESTIONS

If you have any suggestion related to this practical, please advise.

PRECAUTIONS

1. To wear proper protective clothing like apron.
2. Proper shielding from arc.
3. Maintaining proper arc throughout welding.
4. While cleaning the joint, goggles are to be useful eye protection.
5. Selection of proper size electrode and required rating of current.

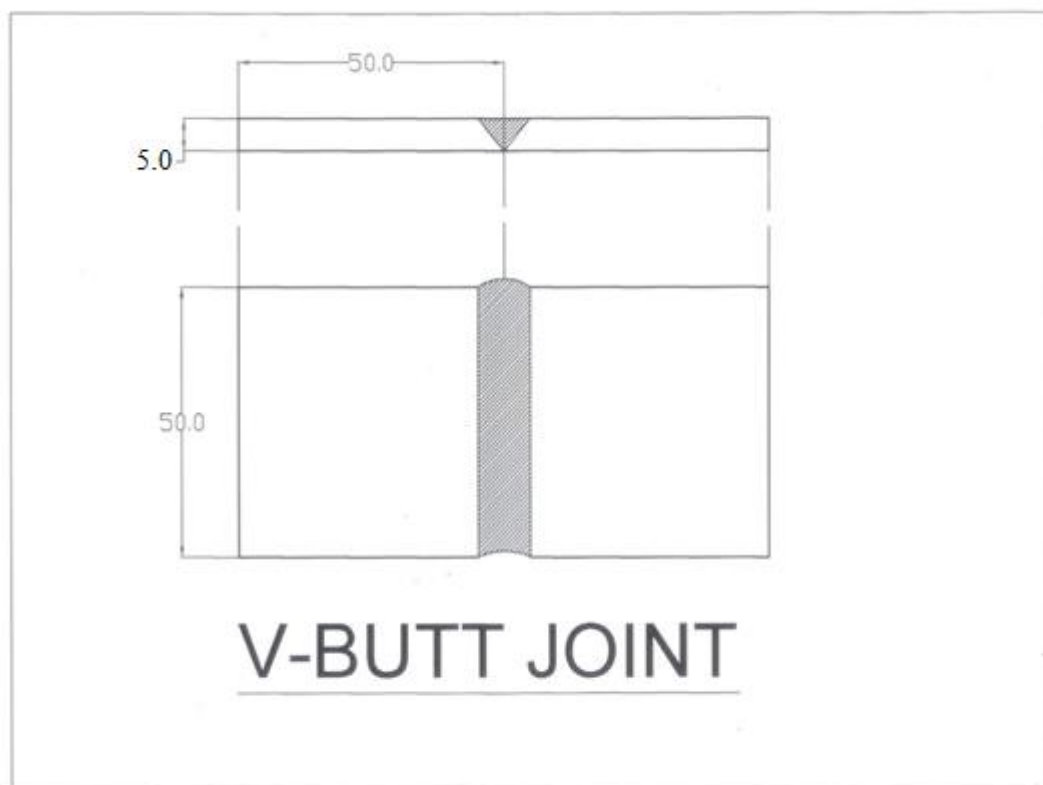


Fig. 7: V-Butt Joint

PRACTICAL NO.- 2

OBJECTIVE

To prepare a butt joint (Single-V)/ fillet joint through TIG/MIG welding.

MATERIALS FOR TIG WELDING

The most important area of application is:

- Welding of thin materials in stainless steels
- Aluminium
- Nickel
- Nickel alloys

TIG WELDING

The designation TIG comes from USA and is an abbreviation of Tungsten Inert Gas. Tungsten – also called wolfram - is a metal with a fusion point of more than 3300°C, which means more than double the fusion point of the metals which are usually welded. Inert Gas is the same thing as inactive gas, which means a type of gas that will not combine with other elements. In Germany this method is called WIG welding, the meaning wolfram. TIG welding is the international standardized designation for this welding method. The Principle of TIG welding is an electric arc welding process in which the fusion energy is produced by an electric arc burning between the work piece and the tungsten electrode. During the welding process the electrode, the arc and the weld pool are protected against the damaging effects of the atmospheric air by an inert shielding gas. By means of a gas nozzle the shielding gas is lead to the welding zone where it replaces the atmospheric air. TIG welding differs from the other arc welding processes by the fact that the electrode is not consumed like the electrodes in other process such as MIG.

ADVANTAGES

The TIG welding process has a very large area of application due to its many advantages, e.g.:

1. It provides a concentrated heating of the work piece.
2. It provides an effective protection of the weld pool by an inert shielding gas.
3. It can be independent of filler material.
4. The filler materials do not need to be finely prepared if only the alloying is all right.
5. There is no need for after treatment of the weld as no slag or spatter are produced.
6. Places of difficult access can be welded.

RESULT ANALYSIS: Changes in dimensions (length, width, dia, weight etc.).

LEARNING OUTCOMES: What did you learn in this practical.

APPLICATION: Where we can apply the knowledge gained in this practical.

SUGGESTIONS: If you have any suggestion related to this practical, please advise.

PRECAUTIONS:

- 1) To wear protective clothing like apron, hand gloves.
- 2) Proper shielding from the welding.
- 3) Maintaining proper wire feeding throughout welding.
- 4) While cleaning the joint, goggles are to be used for eye protection.
- 5) Selection of proper filler wire and required rating of current.

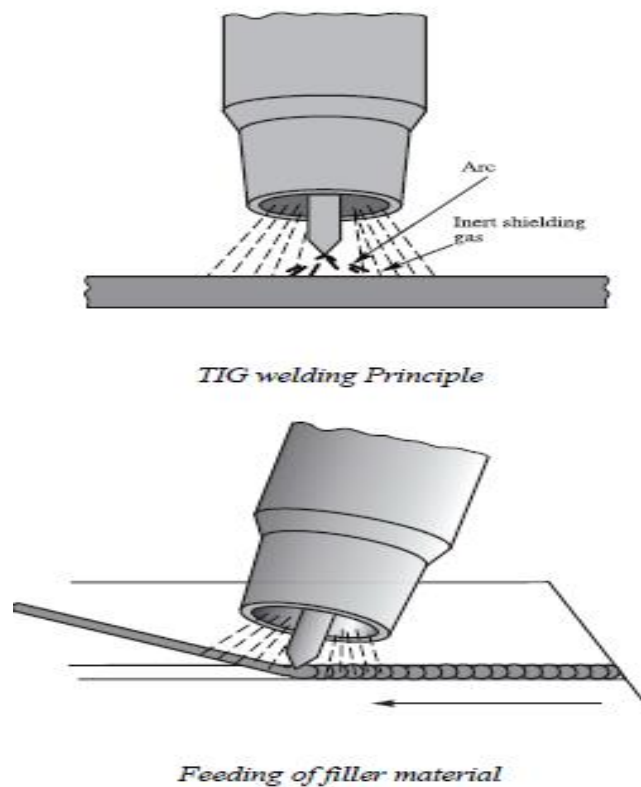


Fig. 8: TIG Welding