SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

Ex. No.: 1.a

Date : 27.08.2024

SHIELDED METAL ARC WELDING - BUTT JOINT

Aim

To join two mild steel plates in butt joint configuration using Shielded Metal Arc Welding (SMAW) process.

Material Specification

Mild steel plates of dimension 100 mm x 30 mm x 6 mm – Two pieces

Tools Required

1) Bench vice 2) Try square 3) Steel rule 4) Flat File 5) Chipping hammer
6) Wire brush 7) Tongs

Equipment Required

1) SMAW machine 2) Arc welding cable 3) Ground clamp

Safety Equipment's

1) Leather apron 2) Hand gloves 3) Goggle 4) Welding Hand Shield

Sequence of Operation

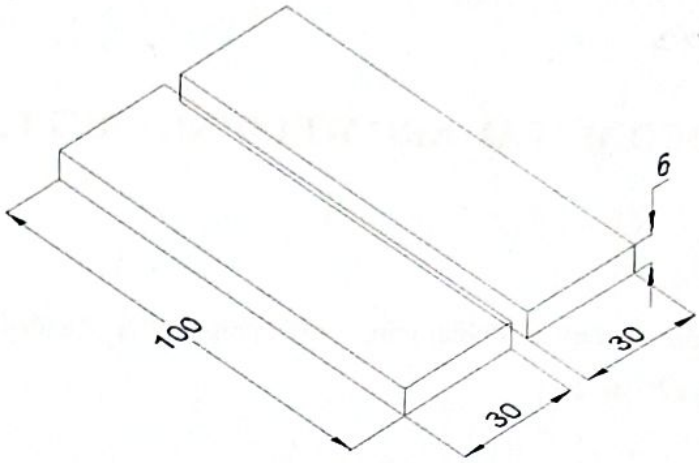
1) Edge preparation 2) Tack welding 3) Welding 4) Chipping & Cleaning

Working Steps:

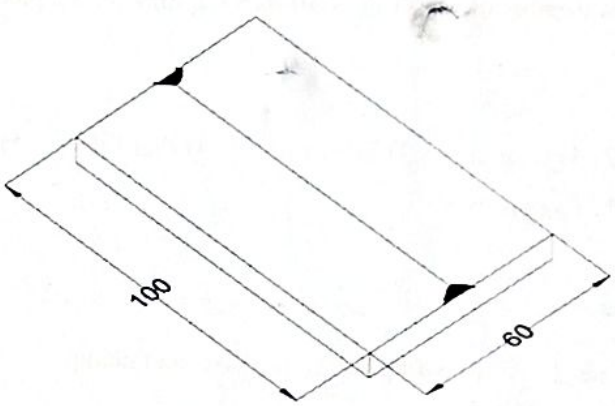
1) Preparation

a) Clean the edges of the work piece using wire brush to remove dust and rust.
b) Check the dimensions using steel rule and also check the straightness of the edges using try square.
c) File the mild steel plate edges using flat file, and check whether two edges are perpendicular or not using try square.

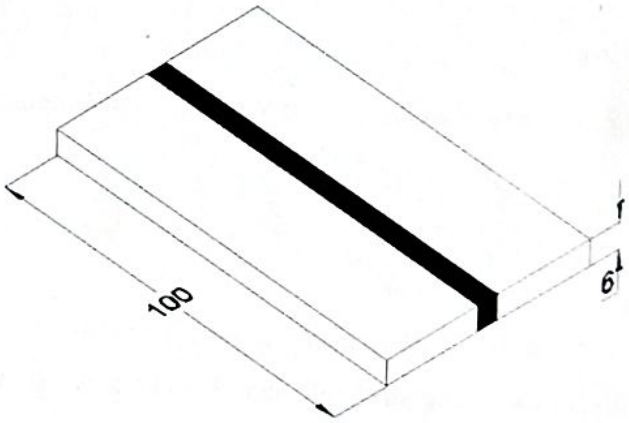
SHIELDED METAL ARC WELDING - BUTT JOINT



PREPARATION



TACK WELD



FINAL WELD

All Dimensions are in "mm" (100 x 30 x 6)

2) Tack welding

a) Place the pieces as close as possible butting against each other over welding table.
b) Check the welding machine, cable, electrode and clamp for proper connection.
c) Select correct electrode (3.15 mm diameter) and fix it in electrode holder. Hand gloves should be used while fixing the electrode.
d) Switch on the welding machine, adjust the current to 100 amps. Keep the hand shield closer to eyes and move the electrode nearer to one end of the work piece. Make tack weld on both ends of the workpiece.

3) Final welding

a) Move the electrode to first tack, establish the arc and maintain proper arc length.
b) Gradually move the electrode towards the second tack without shaking the electrode and maintain the constant arc length.
c) Repeat the same procedure on the other side.

4) Chipping and cleaning

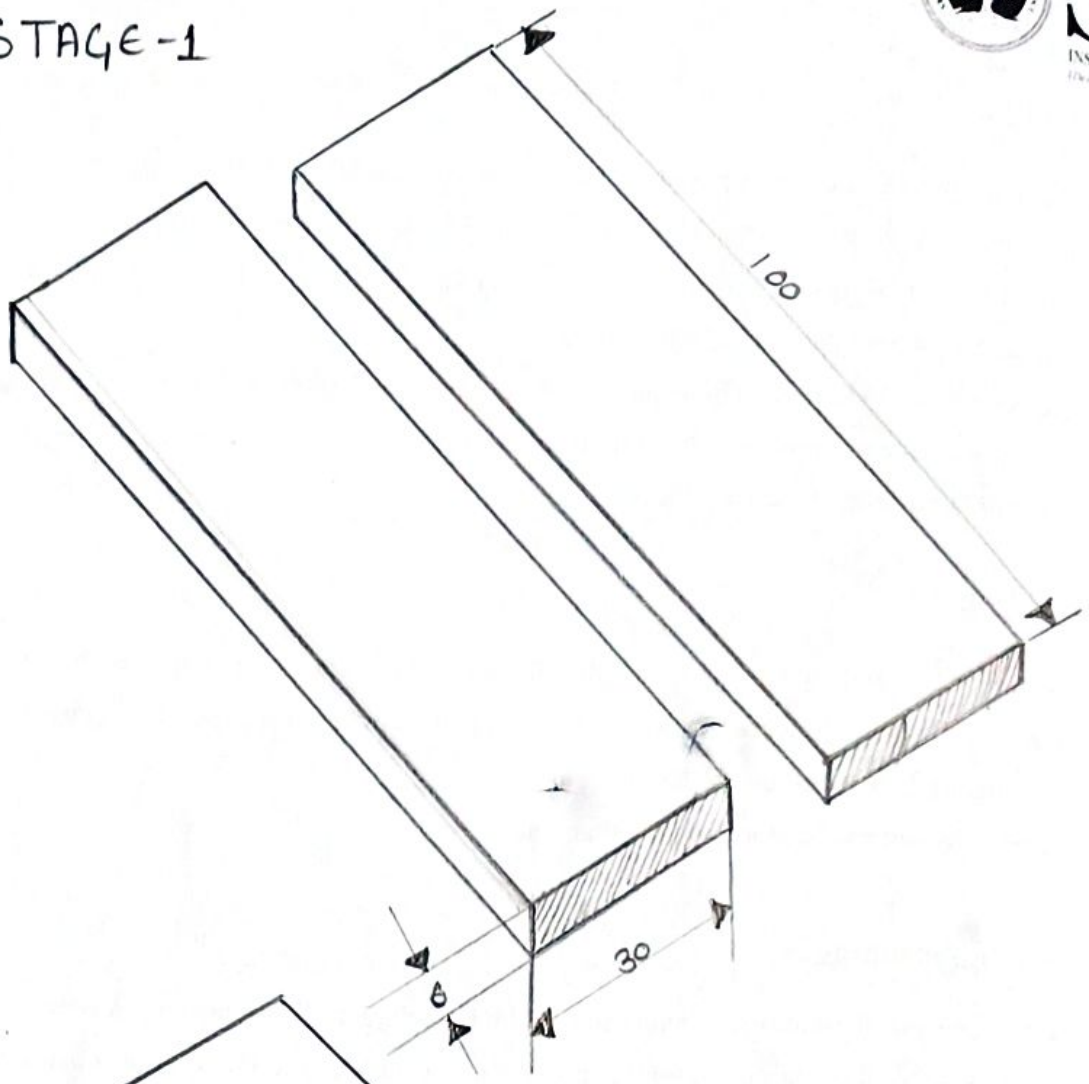
a) Hold the welded plates using tongs and cool the work piece by immersing in water.
b) With the help of chipping hammer gently tap the weld bead, so that the slag coating is removed from the work piece
c) Clean the work piece with wire brush thoroughly.
d) Check for the dimensions

Pre Lab-Questions

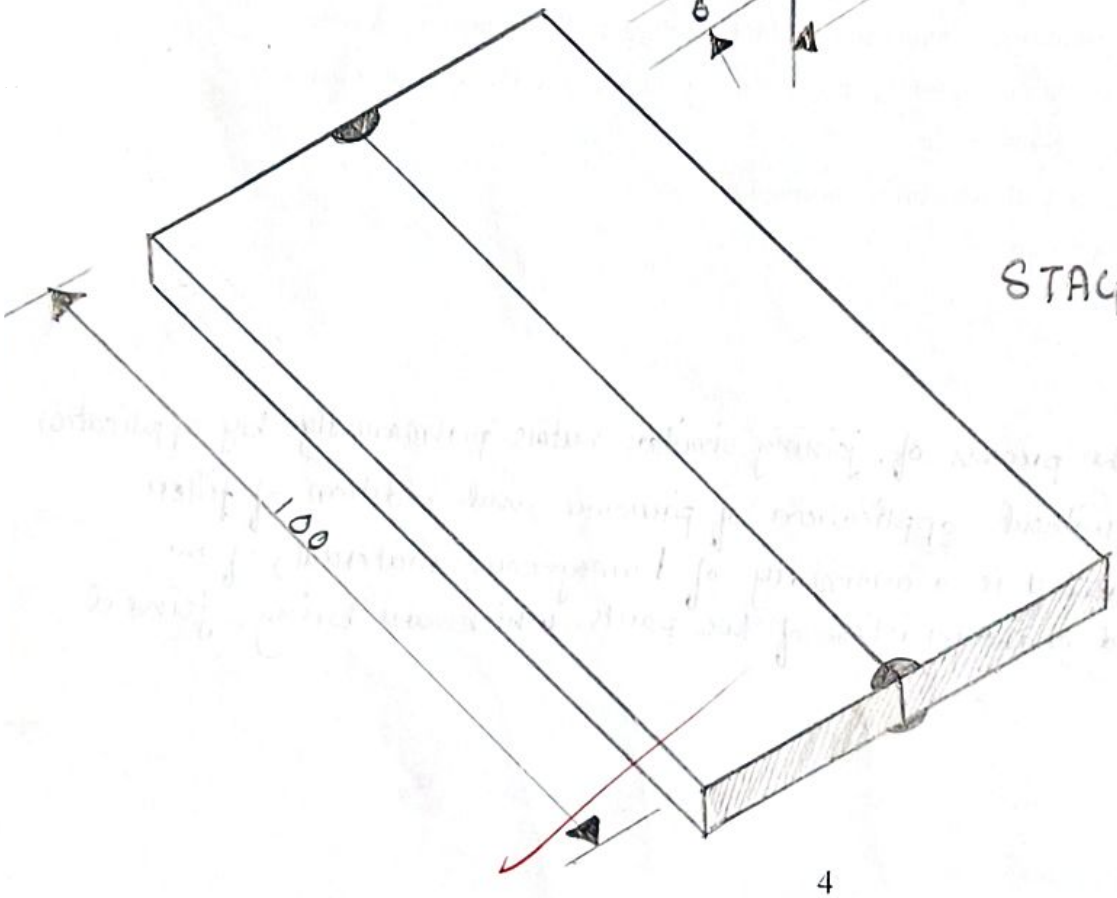
1. Define welding?

Ans - Welding is the process of joining similar metals permanently by application of heat with or without application of pressure and addition of filler materials. The result is a continuity of homogenous material, of the composition and characteristics of two parts which are being joined together.

STAGE-1



STAGE-2



2. Write the different types of welding process?

Ans - The different types of welding process involves -
(1) Plastic welding / Pressure welding
(2) Fusion welding / Non- // welding
(3) Gas welding
(4) Arc welding

3. What is fusion welding process?

Ans - In fusion welding or non-pressure welding, the material at the joint is heated to a molten state and allowed to solidify. This includes gas welding & arc welding.

4. List down the applications of welding process.

Ans - Welding processes are commonly used across a range of industries like -
(1) Aerospace
(2) Automotive
(3) Construction
(4) Railroads
(5) Shipbuilding.
(6) Pipelines

5. When welding process should be preferred over other joining methods.

Ans - While joining metal pieces using welding it makes the joint as strong as any other part of the metal whereas in other joining process like mech. joining you cannot control the overlaping of metal & loosening of the joint i.e possible here.

Post Lab Questions

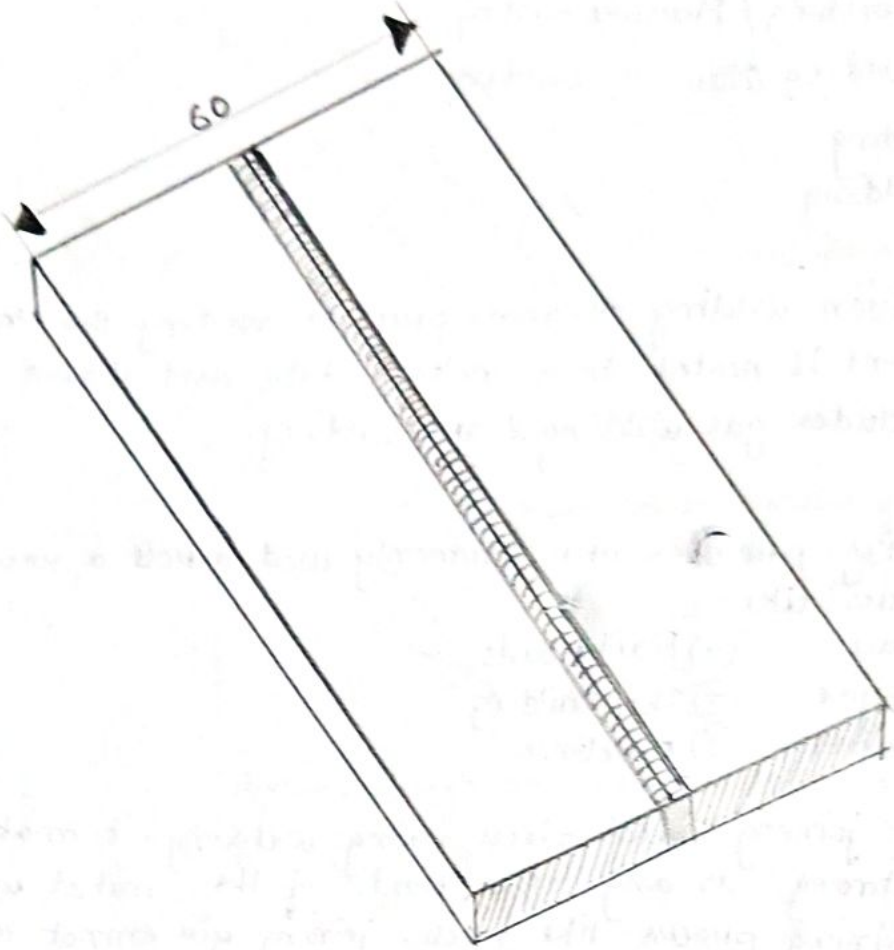
1. What is the reason for the formation of spatters in welding process?

Ans - Weld spatter is formed from droplets of molten metal or non-metallic materials that can be produced during a welding process. This mostly happens when the welding voltage is too low or amperage is higher for a given wire and gas combination.

2. List the roles of fluxes used in SMAW process?

Ans - The function/roles of fluxes used in SMAW are as follows: -
(1) to assist arc striking
(2) stability
(3) to form slag that protects the shape of weld

STAGE - 3



WELDING BEAD

3. Name few of the weld defects.

Ans - ① Inclusions
② lack of fusions
③ Porosity
④ Undercut
⑤ Under-fill
⑥ Cracks
⑦ Overlap
⑧ Excess penetration.

4. Write down the four different welding positions?

Ans - The four different welding positions are as follows -
① Horizontal welds.
② Vertical welds
③ Flat welds
④ Groove welds

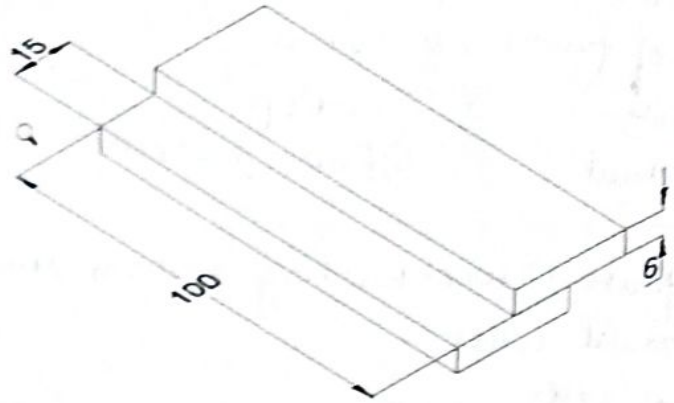
5. Write down the welding parameters associated with SMAW process.

Ans - The process variable formed in SMAW welding are electrode position, arc length, arc travel speed, temperature, power input. These process variables effects the out response in terms of material properties.

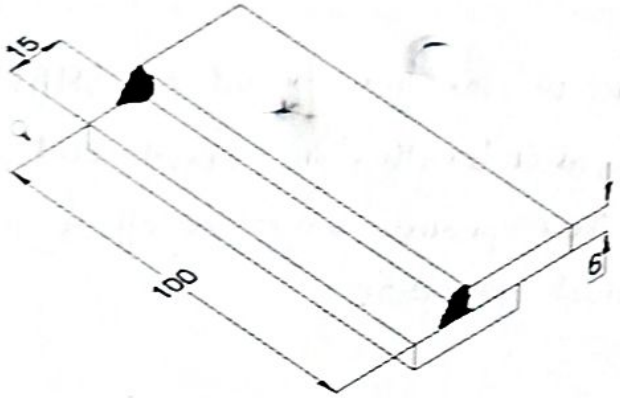
Result

Mild steel plates are joined in butt joint configuration using SMAW Process.

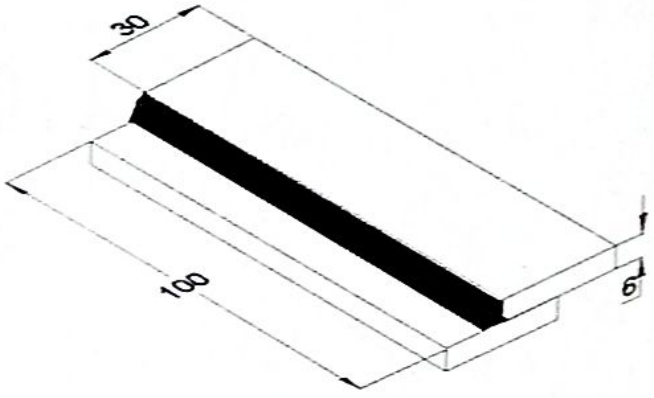
SHIELDED METAL ARC WELDING - LAP JOINT



PREPARATION



TACK WELD



FINAL WELD

All Dimension are in mm (100 X 30 X 6

Ex. No.: 1.b

Date : 27.08.2024

SHIELDED METAL ARC WELDING- LAP JOINT

Aim

To join two mild steel plates in lap joint configuration using Shielded Metal Arc Welding (SMAW) process.

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Mild steel plates of dimension 100 mm x 30 mm x 6 mm – Two pieces

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1) Bench vice 2) Try square 3) Steel rule 4) Flat File 5) Chipping hammer
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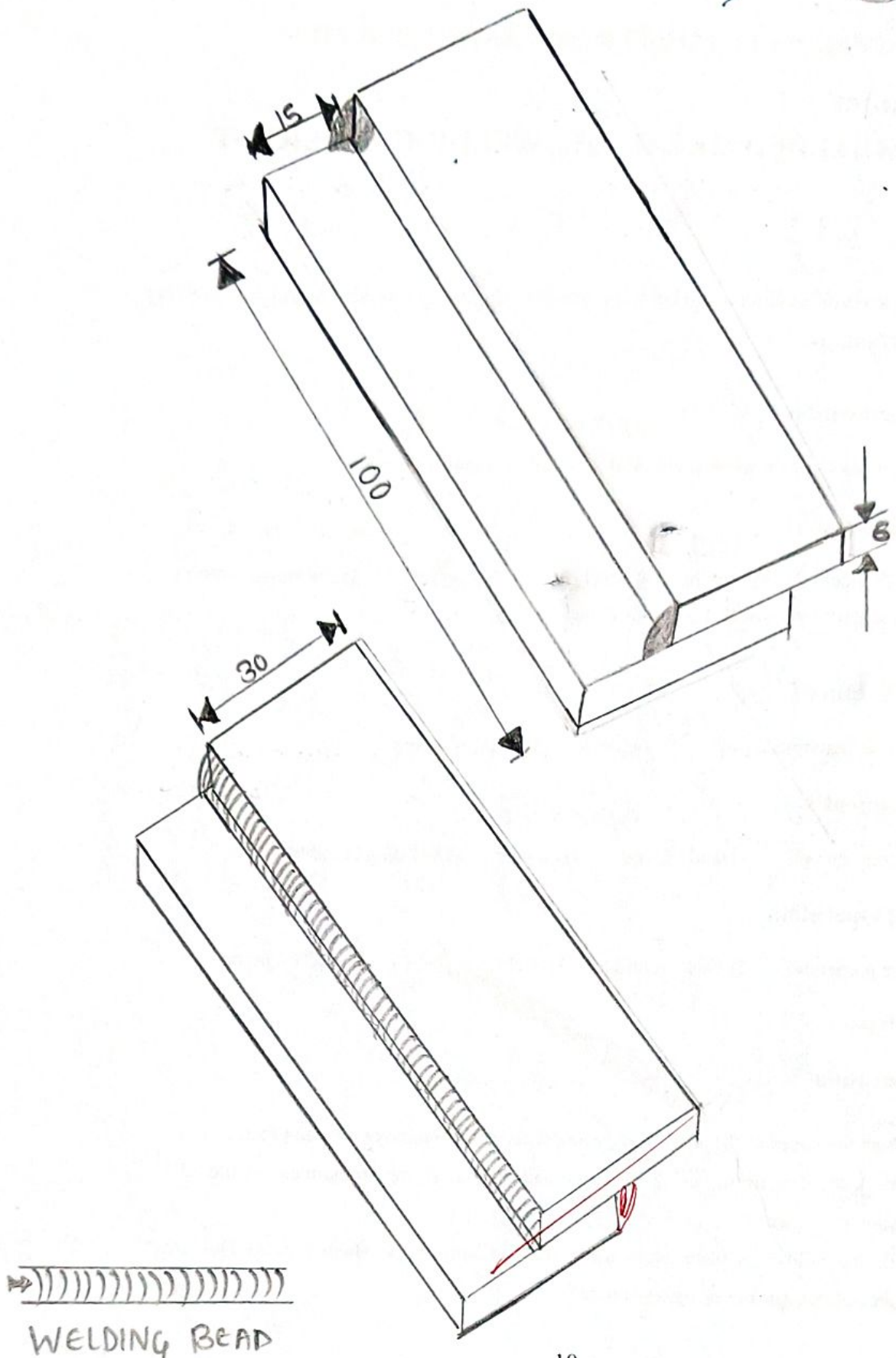
15
100
6
30
WELDING BEAD

1) Tack welding

a) Place the work pieces in lap joint configuration.
b) Check the welding machine, cable, electrode and clamp for proper connection.
c) Select correct electrode (3.15 mm diameter) and fix it in electrode holder. Hand gloves should be used while fixing the electrode.
d) Switch on the welding machine, adjust the current to 100 amps. Keep the hand shield closer to eyes and move the electrode nearer to one end of the work piece. Make tack weld on both ends of the workpiece.

2) Final welding

a) Move the electrode to first tack, establish the arc and maintain proper arc length.
b) Gradually move the electrode towards the second tack without shaking the electrode and maintain the constant arc length.
c) Repeat the same procedure on the other side.

3) Chipping and cleaning

a) Hold the welded plates using tongs and cool the work piece by immersing in water.
b) With the help of chipping hammer gently tap the weld bead, so that the slag coating is removed from the work piece
c) Clean the work piece with wire brush thoroughly.
d) Check for the dimensions

Pre Lab-Questions

1. What are the different types of arc welding process?

Ans- ① Gas tungsten arc welding ⑦ Oxy fuel welding.
② Submerged arc welding
③ Resistance welding
④ Laser beam welding
⑤ Carbon arc welding.
⑥ Atomic H welding

2. Write down the different zones in weld?

Ans- The different zones in weld are as follows -

(1) the fusion zone / weld metal.
(2) Heat affected zone
(3) the unaffected zone

3. What is heat affected zone?

Ans- The heat affected zone is that area of metal that has not been melted and has undergone changes in properties as a result of being exposed to relatively high temperature during welding.

4. What is straight polarity?

Ans- A straight polarity or normal polarity is when the workpiece is connected to the positive terminal of DC power source and tool /electrode is connected to the negative terminal.

5. What is reverse polarity?

Ans- Reverse polarity is when the electrode is connected to the positive terminal and the workpiece is connected to the negative terminal. It results in deeper penetration while welding.

Post Lab Questions

1. Write down the formula for calculating heat input in arc welding process?

Ans - The formula is as follows -

$$\text{Heat input} = \frac{\text{Voltage} \times \text{current} \times \text{time}}{\text{dist travelled}} \times 1000$$

2. What is the difference between manual, automatic and semi-automatic welding process?

Ans - In manual welding the technician has to physically weld the materials. In case of automatic welding it is done completely by machine with no human intervention. In semiautomatics an operator guides the loading and unloadi of the material when the machine cycle ends.

3. What is the relationship between depth of penetration and welding current?

Ans - depth of penetration increases by increasing the value of welding current. Welding current is a factor that will determine the degree of penetration. Penetration is also influenced by factors like welding speed & arc voltage.

4. What is the relationship between bead width and welding speed?

Ans - It has been found out that with increasing welding speed; bead width, bead height and penetration decreases.

5. What is the reason for the porosity formation in welded sample?

Ans - Porosity is caused by the absorption of nitrogen, oxygen and hydrogen in the molten weld pool which is then released on solidification to become trapped in the weld metal.

Result

Mild steel plates are joined in Lap joint configuration using SMAW Process.