Types of welding position

This chapter presents common types of welding position and various difficulties associated with them. Further, need for edge preparation and the rationale for selection of suitable groove design have also been presented.

Keywords: Flat welding, horizontal welding, vertical and overhead welding, groove weld, edge preparation

23.1 Welding position

The welding positions are classified on the basis of the plane on which weld metal is deposited.

- ✓ Flat welding

In flat welding, plates to be welded are placed on the horizontal plane and weld bead is also deposited horizontally (Fig. 23.1). This is one of most commonly used and convenient welding position. Selection of welding parameters for flat welding is not very crucial for placing the weld metal at desired location in flat welding.

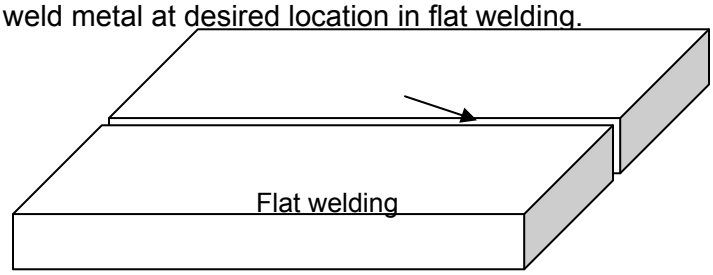

Fig. 23.1 Scheme of placement of components to be welded for flat welding

- ✓ Horizontal welding

In horizontal welding, plates to be welded are placed in vertical plane while weld bead is deposited horizontally (Fig. 23.2). This technique is comparatively more difficult than flat welding. Welding parameters for horizontal welding should be selected carefully for easy manipulation/placement of weld metal at the desired location.

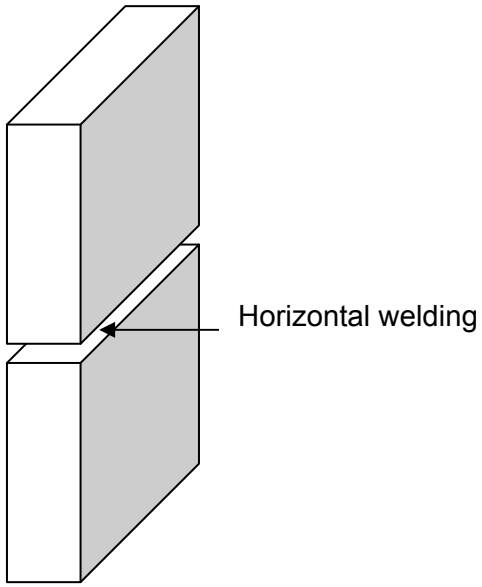

Fig. 23.2 Scheme of placement of components to be welded for horizontal welding

✓ Vertical welding

In vertical welding, plates to be welded are placed on the vertical plane and weld bead is also deposited vertically (Fig. 23.3). It imposes difficulty in placing the molten weld metal from electrode in proper place along the weld line due to tendency of the melt to fall down under the influence of gravitational force. Viscosity and surface tension of the molten weld metal which are determined by the composition of weld metal and its temperature predominantly control the tendency of molten weld metal to fall down due to gravity. Increase in alloying elements/impurities and temperature of melt in general decrease the viscosity and surface tension of the weld metal and thus making the liquid weld metal more thin and of higher fluidity which in turn increases tendency of weld metal to fall down conversely these factors increase difficulty in placing weld metal at desired location.

Therefore, selection of welding parameters (welding current, arc manipulation during welding and welding speed all are influencing the heat generation) and electrode coating (affecting composition of weld metal) dilution becomes very crucial for placing the weld metal at desired location in vertical welding.

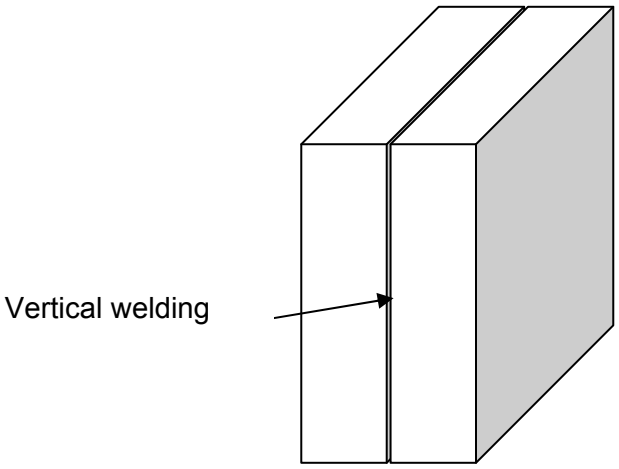

Fig. 23.3 Scheme of placement of components to be welded for vertical welding

✓ Overhead welding

In overhead welding, weld metal is deposited in such a way that face of the weld is largely downward and there is high tendency of falling down of weld metal during welding (Fig. 23.4). Molten weld metal is moved from the electrode (lower side) to base metal (upper side) with great care and difficulty hence, it imposes problems similar to that of vertical welding but with greater intensity. Accordingly, the selection of welding parameters, arc manipulation and welding consumable should be done after considering all factors which can decrease the fluidity of molten weld metal so as to reduce the weld metal falling tendency. This is most difficult welding position and therefore it needs great skill to place the weld metal at desired location with close control.

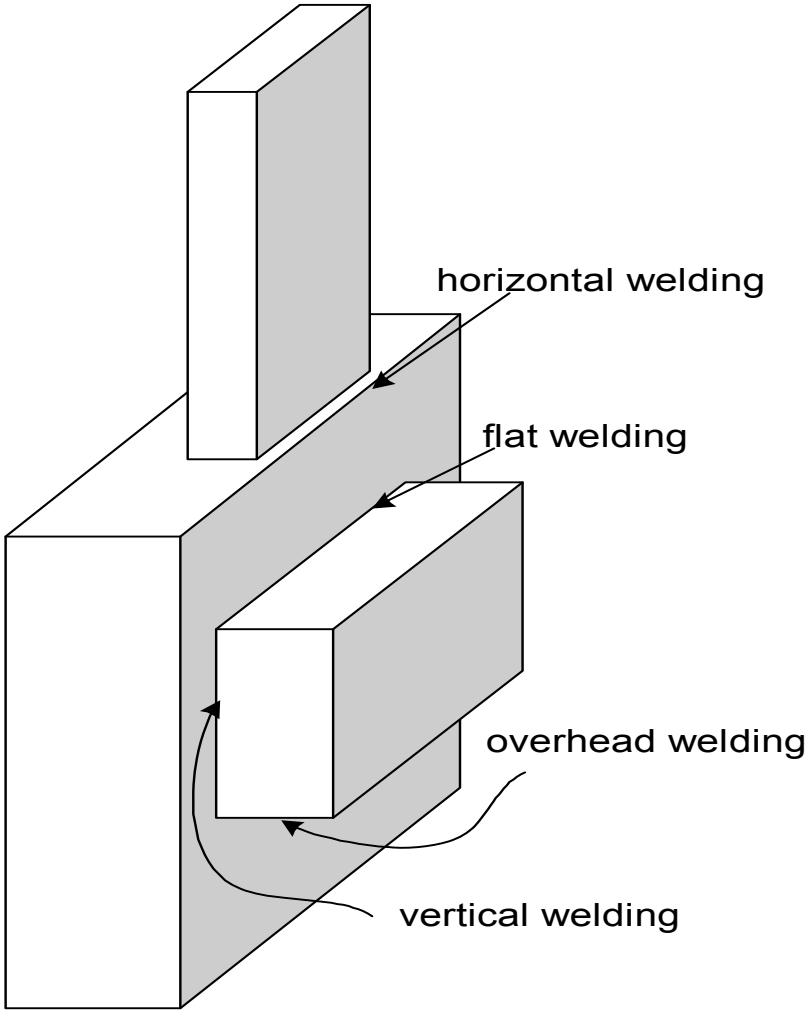

Fig. 23.4 Scheme of placement of components to be welded for different types of welding positions including overhead welding

23.2 Rationale behind selection of weld and edge preparation

23.2.1 Groove weld

Groove weld is called so because a groove is made first between plates to be welded. This type of weld is used for developing butt joint, edge and corner joint. The groove preparation especially in case of thick plates ensures proper melting of the faying surfaces by providing proper access of heat source up to the root of the plates and so as to help in developing sound weld joint. It is common to develop grooves of different geometries for producing butt, corner and edge joint such as square, U (single and double), V (single and double), J (single and double) and bevel (single and double). Following sections describe various technical aspects of different types of groove welds.

Single groove weld

Single groove means edge preparation of the plates to produce desired groove from one side only resulting in just one face and one root of the weld. While in case of double groove, edge preparation is needed from both sides of the plates which in turn results in two faces of the weld and welding is needed from both sides of the plates to be welded. Single groove weld is mainly used in case of plates of thickness more than 5 mm and less than 15 mm. Moreover, this range is not very hard and fast as it depends on penetration capability of welding process used for welding besides weld parameters, as welding parameters affect the depth up to which melting of plates can be achieved from the top.

Double groove weld

Double groove edge preparation is used especially under two conditions a) when thickness of the plate to be welded is more than 25 mm, so the desired penetration up to root from one side is not achievable and b) distortion of the weld joints is to be controlled. Further, double groove edge preparation lowers the volume of weld metal to be deposited by more than 50% as compared to that for the single groove weld especially in case of thick plates. Therefore, selection of double groove welds helps to develop weld joints more economically, at much faster welding speed than the single groove weld for thick plates.

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