SEMPEO227

Preparing and using manual metal arc welding equipment

Overview

This standard covers a broad range of basic manual metal arc (MMA) welding competences that will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare the welding equipment, and to ensure that all the leads/cables, electrode holder and workpiece earthing arrangements are securely connected and free from damage. You will also need to obtain and check that all the workholding equipment and manipulating devices are in a safe and usable condition

In preparing to weld, you will need to set and adjust the welding conditions in line with instructions and/or the welding procedure specification. You must operate the equipment safely and correctly, and make any necessary adjustments to settings in line with your permitted authority, in order to produce the welded joints to the required specification.

On completion of the welding operations, you will be expected to check the quality of the welds using measuring equipment, visual examination and destructive testing techniques, as appropriate to the aspects being checked. You will need to be able to recognise welding defects, to take appropriate action to limit any faults that occur and to ensure that the finished workpiece is within the specification requirements. On completion of the welding activities, you will be expected to return the workholding devices to their designated location, and to leave the welding equipment and work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the welding activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the welding activities, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate manual metal arc welding techniques safely. You will

understand the welding process, and its application, and will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with the manual metal arc welding equipment, and with the associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

Welded joints must be at least 150mm long, using single or multi-run welds (as appropriate), with at least one stop and start included.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. plan the welding activities before you start them
3. obtain and prepare the appropriate welding equipment and welding consumables
4. prepare and support the joint, using the appropriate methods
5. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding
6. weld the joint to the specified quality, dimensions and profile
7. use appropriate methods and equipment to check the quality, and check that all dimensional and geometrical aspects of the weld are to the specification
8. deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
9. shut down and make safe the welding equipment on completion of the welding activities

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be followed when preparing and using MMA welding equipment (such as general workshop safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume extraction/control)
2. the hazards associated with MMA welding (such as live electrical components; poor earthing; the electric arc; fumes and gases; spatter; hot slag and metal; grinding and mechanical metal/slag removal; elevated working; welding in enclosed spaces; slips, trips and falls), and how they can be minimised
3. the personal protective equipment to be worn for the welding activities (such as correctly fitting overalls; leather aprons, welding gloves/gauntlets; safety boots; head/eye shield with correct shade of filter)
4. the manual metal arc welding process (such as basic principles of fusion welding, AC and DC power sources, power ranges)
5. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
6. types of electrodes used, and the correct control, storage and drying of electrodes
7. the types of welded joints to be produced (such as lap joints, corner joints, tee joints, butt welds, single and multi- run welds)
8. terminology used for the appropriate welding positions
9. how to prepare the materials in readiness for the welding activity (such as ensuring that the material is free from excessive surface contamination such as rust, scale, paint, oil/grease and moisture); ensuring that edges to be welded are correctly prepared (such as made flat, square or bevelled)
10. how to set up and restrain the joint, and the tools and techniques to be used (such as the use of jigs and fixtures, restraining devices - such as clamps and weights/blocks; setting up the joint in the correct position and alignment)
11. tack welding size and spacing in relationship to material thickness
12. checks to be made prior to welding (such as confirming the correct set-up of the joint; condition of electrical connections, welding return and earthing arrangements; checking operating parameters)

13. the techniques of operating the welding equipment to produce a range of joints in the various joint positions (such as striking and initiating the arc; fine adjustment of parameters; correct manipulation and welding speed of electrode; blending in stops/starts and tack welds)
14. how to close down the welding equipment safely and correctly
15. how to control distortion (such as welding sequence; deposition technique)
16. problems that can occur with the welding activities (such as causes of distortion and methods of control; effects of welding on materials and sources of weld defects), and how these can be overcome
17. the safe working practices and procedures to be adopted when preparing the welds for examination (such as handling hot materials, using chemicals for cleaning and etching, using equipment to fracture welds)
18. how to prepare the welds for examination (such as removing slag, spatter and surface irregularities; cleaning the weld, polishing and making saw cuts on welds to be fracture tested)
19. how to check the welded joints for uniformity, alignment, position, weld size and profile
20. the various procedures for visual examination of the welds for cracks, porosity and slag inclusions (such as dye penetrant, fluorescent penetrant; magnetic particle testing)
21. the various procedures for carrying out destructive tests on the welds (such as macroscopic examination, bend tests, nick break tests)
22. methods of removing a specimen of weld from a suitable position in the joint (such as a stop/start position using a non-thermal process, such as hand saws, power saws, abrasive discs)
23. how to examine the welds after the tests and check for such defects as the degree of penetration and fusion, inclusions, porosity, cracks, undercut and overlap, uneven and irregular ripple formation
24. when to act on your own initiative and when to seek help and advice from others
25. the importance of leaving the work area and equipment in a safe condition on completion of the welding activities (such as isolation of electrical supplies; safely storing welding cables and electrode holders; storing electrodes; removing and disposing of waste)

Scope/range related to performance criteria