

Overview

This standard identifies the competences you need to prepare and operate manual metal arc (MMA) welding equipment, in a marine environment, in accordance with approved welding procedures. You will be required to set up and check the welding equipment and any associated workholding and manipulating devices required. In setting up the equipment, you will need to connect all the required leads/cables, electrode holder and workpiece earthing arrangements ready for use and to set and adjust the welding conditions, in line with the welding procedure specification. You must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification. You will be expected to carry out the welding activities in a range of different environmental/access conditions, which will include working at height, working in confined spaces (such as bilge or double bottoms), working in a non-workshop environment and where it is difficult to access the joints to be welded.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding activities or equipment that you cannot resolve, or are outside your permitted authority, to the relevant person. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying marine welding procedures and instructions. You will understand the manual metal arc welding process and its application and will know about the equipment, materials and consumables, in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring that the work output is produced to the required specification. Visual inspection and non-destructive testing of your completed work is implied.

You will understand the safety precautions required when working with the welding 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.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant joining procedure and job instructions
3. check that the joint preparation complies with the specification
4. check that joining and related equipment and consumables are as specified and fit for purpose
5. make the joints as specified using the appropriate thermal joining technique
6. produce joints of the required quality and of specified dimensional accuracy
7. shut down the equipment to a safe condition on completion of joining activities
8. deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
9. deal promptly and effectively with problems within your control and report those that cannot be solved
10. complete relevant documentation in line with organisational procedures

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when working with MMA welding equipment in a marine environment (including general site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers from effects of the arc, safety in enclosed/confined spaces, fume control)
2. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)
3. statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials
4. the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
5. 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, working in enclosed spaces) and how they can be minimised
6. principles of MMA welding, the equipment and its operation (including fusion welding principles, characteristics of the metal arc, AC and DC power sources, typical equipment and power ranges, care of equipment, terminology used in welding)
7. how to extract the information required from drawings and welding procedure specifications (such as interpretation of welding symbols; scope, content and application of the welding procedure specification)
8. types and classification of electrodes (including flux coverings, correct control, storage and drying of electrodes)
9. types and features of welded joints in plate, tube and sections (including fillet and butt welds, single and multi-run welds, welding positions, weld quality)
10. problems that can occur with the welding activities and how these can be overcome (including causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
11. methods of setting up the joint to achieve correct location of components and control of distortion (such as edge preparation, use of jigs/fixtures, use of

manipulators and positioners, tack weld size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)

12. setting up the welding equipment and the checks to be made to ensure that it is safe and ready to use (such as electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters, care and maintenance of equipment)

13. the techniques of operating the welding equipment to produce a range of joints in the various joint positions (including fine tuning parameters, correct manipulation of electrode, safe closing down of the welding equipment)

14. the organisational quality systems used and the weld standards to be achieved

15. weld inspection and test procedures used (including destructive and non-destructive methods)

16. personal approval tests and their applicability to your work

17. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1.

Prepare for the manual metal arc welding process, to include carrying out all of the following:

- 1.1 obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity)
- 1.2 checking the condition of and correctly connecting welding leads, earthing arrangements and electrode holder
- 1.3 setting and adjusting welding conditions/parameters, in accordance with welding procedure specification
- 1.4 preparing the work area for the welding activities (such as sighting welding screens, positioning fume extraction equipment)
- 1.5 ensuring that the workpiece is correctly set up with regard to specified joint preparation and is secure
- 1.6 obtaining and wearing appropriate personal protective equipment

2.

Use manual metal arc welding and related equipment, to include either:

- 2.1 alternating current equipment (AC)
- 2.2 direct current equipment (DC)

3.

Use one type and two different sizes of electrode from the following:

- 3.1 rutile
- 3.2 nickel alloy
- 3.3 stainless steel
- 3.4 basic
- 3.5 cellulosic
- 3.6 other specific electrodes

4.

Produce welded joints which incorporate both:

- 4.1 butt welds
- 4.2 fillet welds

5.

Produce joints in two forms of specified materials from different material groups, to include the following:

- 5.1 plate
- 5.2 section/bar
- 5.3 pipe/tube
- 5.4 other specific forms

6.

Carry out the welding process under three of the following conditions:

- 6.1 confined spaces (such as bilge, double bottom)
- 6.2 at height
- 6.3 in non-workshop environments
- 6.4 difficult access

7.

Weld joints according to approved welding procedures in the following BS EN ISO

6947 positions:

- 7.1 vertical upwards (PF) butt weld and four other positions chosen from:
- 7.2 flat (PA)
- 7.3 horizontal vertical (PB)
- 7.4 horizontal (PC)
- 7.5 vertical downwards (PG)
- 7.6 overhead (PE)
- 7.7 inclined tube/pipe (H-LO45 or J-LO45)

8.

Produce welded components which:

- 8.1 achieve a weld quality equivalent to Level B of BS EN 25817/ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium, EN30042/ISO10042 applies)
- 8.2 meet the required dimensional accuracy within specified tolerances

Behaviours

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

SEMME3162

Welding marine materials and structures using the manual metal arc process



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