SEMFWE3-05 – SQA Unit Code HE8W 04
Welding materials by the Semi-Automatic MIG/MAG and Flux Cored Arc processes

Overview

This standard identifies the competencies you need to prepare and operate semi-automatic MIG, MAG and flux cored wire arc welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment you will need to connect all the required leads/cables, hoses, shielding gas supply and wire feed mechanisms ready for use, and 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.

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 equipment or welding activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying welding procedures and instructions. You will understand the MIG, MAG or flux cored wire welding process used, 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 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.

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Performance criteria

You must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
- P2 follow the relevant joining procedure and job instructions
- P3 check that the joint preparation complies with the specification
- P4 check that joining and related equipment and consumables are as specified and fit for purpose
- P5 make the joints as specified using the appropriate thermal joining technique
- P6 produce joints of the required quality and of specified dimensional accuracy
- P7 shut down the equipment to a safe condition on completion of joining activities
- P8 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
- P9 deal promptly and effectively with problems within your control and report those that cannot be solved

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Knowledge and understanding

You need to know and understand:

K1 the safe working practices and procedures to be observed when working with MIG, MAG or flux cored wire welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)

K2 the hazards associated with arc welding and how they can be minimised (live electrical components, poor earthing, the electric arc, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)

K3 the correct handling and storage of gas cylinders, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)

K4 principles of MIG, MAG, or flux cored wire arc welding, the equipment and its operation (fusion welding principles, characteristics of the metal arc, power sources, typical equipment and power ranges, care of equipment, control systems, filler wires, gas supply and control, terminology used in welding)

K5 extracting information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken

K6 types and classification of consumables (wires, shielding gases -inert and active; control and storage of consumables)

K7 types and features of welded joints in plate, sheet and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)

K8 problems that can occur with the welding activities and how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)

K9 methods of setting up the joint to achieve correct location of components and control of distortion (edge preparation; correct joint set-up; cleanliness of materials used; use of jigs/fixtures, manipulators and positioners; tack welding, size and spacing in relationship to material thickness and component size; use of temporary attachments; pre-setting)

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K10 setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; wire feed mechanisms; gas supply; equipment calibration; setting welding parameters; care and maintenance of equipment)

K11 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters; correct manipulation of the welding gun; safe closing down of the welding equipment)

K12 the organisational quality systems used and weld standards to be achieved

K13 weld inspection and test procedures used including destructive and non-destructive methods

K14 personal approval tests and their applicability to your work

K15 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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Additional Information

Scope/range related to performance criteria

You must be able to:

1. set up, check, adjust and use welding and related equipment for **one** of the following welding processes:
   - 1.1 MIG
   - 1.2 MAG
   - 1.3 Flux cored wire

2. use consumables appropriate to the material and application to include **both** of the following:
   - 2.1 two wire types and sizes from different material groups
   - 2.2 two different shielding gases (where applicable)

3. produce welded joints which incorporate **both** of the following:
   - 3.1 butt welds
   - 3.2 fillet welds

4. produce joints in **two** forms of specified materials from different material groups to include the following:
   - 4.1 plate
   - 4.2 section
   - 4.3 sheet (<3mm)
   - 4.4 pipe/tube
   - 4.5 other forms

5. weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
   - 5.1 vertical upwards (PF) butt weld

   and **four** other positions chosen from:

   - 5.2 flat (PA)
   - 5.3 horizontal (PC)
   - 5.4 overhead (PE)
   - 5.5 horizontal vertical (PB)
   - 5.6 vertical downwards (PG)
   - 5.7 inclined pipe/tube (H-LO 45 or J-LO45)

6. produce welded components which:
   - 6.1 achieve a weld quality equivalent to Suite B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Suite C shall apply (for aluminium EN 30042/ISO 10042 applies)
   - 6.2 meet the required dimensional accuracy within specified tolerances

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