

# SEMFWE3-09 – SQA Unit Code HF36 04

## Welding Plate using Multiple Manual Arc Welding Processes



### Overview

This standard identifies the competencies you need to produce full penetration butt welds in plate or section materials using multiple manual welding processes such as manual metal arc (MMA), MIG, MAG, TIG, Plasma arc or cored wire welding equipment in accordance with instructions and/or approved welding procedures. You will be expected to produce welds using two or more welding processes such as root TIG and fill with MMA or MMA root and flux core fill. You will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. You will be expected to set up the welding equipment ensuring that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld you will need 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.

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 personally 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 multiple welding procedures and instructions. You will understand the welding processes used and their application, and will know about the equipment, materials and consumables used 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 the selected welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding 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 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)
- K3 the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls)
- K4 the manual welding process selected and an awareness of the different types of welding equipment (basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
- 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 the consumables associated with the chosen welding process (types of electrodes and or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
- K7 the types and features of welded joints in plate, fillet and butt welds (single and multi-run welds, welding positions, weld quality)
- K8 methods of setting up and restraining the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
- K9 preparing 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; equipment calibration, setting welding parameters)

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- K10 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 or electrode, safe closing down of the welding equipment)
- K11 the importance of complying with job instructions and the welding procedure specification
- K12 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)
- K13 the organisational quality systems used and weld standards to be achieved, weld inspection and test procedures used including visual and non-destructive tests
- 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 **two or more** of the following welding processes:
  - 1.1. Manual Metal Arc
  - 1.2. MIG/MAG
  - 1.3. TIG
  - 1.4. Plasma Arc
  - 1.5. Cored wire
2. use consumables specified in the welding procedure specification for the following:
  - 2.1. the root run(s)
  - 2.2. the fill and capping runs
3. produce full penetration butt joints in **one** the following types of material:
  - 3.1. carbon range of steel plate
  - 3.2. stainless plate
  - 3.3. non-ferrous plate
4. weld butt joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
  - 4.1. vertical upwards (PF)  
and **four** other positions chosen from:
  - 4.2. flat (PA)
  - 4.3. horizontal (PC)
  - 4.4. horizontal Vertical (PB)
  - 4.5. vertical Downwards (PG)
  - 4.6. overhead (PE or PD)
5. produce welded components which:
  - 5.1. achieve a minimum 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 EN30042/ISO10042 applies)
  - 5.2. meet the required dimensional accuracy within specified tolerance

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### Welding Plate using Multiple Manual Arc Welding Processes

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**Developed by** SEMTA

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**Version number** 2

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**Date approved** December 2011

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**Indicative review date** December 2016

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**Validity** Current

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**Status** Original

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**Originating organisation** SEMTA

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**Original URN** 9

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**Relevant occupations** Engineering and manufacturing technologies; engineering; Metal Forming, Welding and Related Trades

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**Suite** Fabrication and Welding Engineering Suite 3

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**Key words** engineering, welding, fabrication, machine welding, arc weld, MMA welding, MIG welding, MAG welding, Plasma arc welding, cored wire welding, TIG welding, non-ferrous plate, stainless plate