

# SEMFWE3-07 – SQA Unit Code HE8X 04

## Welding materials by the Manual Oxy/Fuel gas welding process



### Overview

This standard identifies the competencies you need to prepare and operate manual oxy/fuel gas welding equipment in accordance with approved welding procedures. You will be required to set up and check the welding equipment and associated work holding and manipulating devices required. In setting up the equipment you will need to connect all the required regulators/gauges, flashback arrestors, hoses and welding torch ready for use, and set and adjust the gas pressures/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 gas 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 the work output is produced to the required specification. 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 gas welding equipment (general workshop and site safety; cylinder handling and storage; appropriate personal protective equipment (PPE); fire and explosion prevention; protecting other workers; 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 gas welding and how they can be minimised (high pressure cylinders and gas supply systems; naked flames; fumes and gases; explosive gas mixtures; oxygen enrichment; 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 oxy/fuel gas welding, the equipment and its operation (gas welding principles, supply of compressed gases, characteristics of welding flames, typical equipment, care of equipment, terminology used in gas 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 filler rods and fluxes; control and storage of consumables
- K7 types and features of welded joints in sheet, plate 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 (correct joint set-up; cleanliness of materials used; edge preparation; 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)
- K10 setting up the welding equipment and checks that need to be made to

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- ensure that it is safe and ready to use (connection of hoses, torch, flash-back arrestors, hose check valves and regulators; checking connections for leaks; setting welding parameters)
- K11 the techniques of operating the welding equipment to produce a range of joints in the various joint positions (selection of nozzle, application of flux, manipulation of torch and filler rods, 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 oxy/fuel gas welding and related equipment to include **all** of the following:
  - 1.1 correct handling and storage of cylinders
  - 1.2 connecting regulators, hoses and valves
  - 1.3 connecting the welding torch and selecting and fitting the correct size nozzle
  - 1.3 fitting a flash back arrestor
  - 1.4 setting appropriate gas pressures
  - 1.5 using the correct procedure for lighting, adjusting and extinguishing the welding flame
2. use a range of filler wire to include:
  - 2.1 two different sizes
  - 2.2 two different filler wire properties/composition
3. produce welded joints which incorporates the following:
  - 3.1 butt welds  
and either
  - 3.2 fillet welds     OR
  - 3.3 welds made autogenously (without filler wire)
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 specific 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)

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- 5.6 vertical downwards (PG)
- 5.7 inclined pipe/tube (H-LO45 or J-LO45)
  
- 6. produce welded components which:
  - 6.1 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)
  - 6.2 meet the required dimensional accuracy within specified tolerances

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### Welding materials by the Manual Oxy/Fuel gas welding process

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**Suite** Fabrication and Welding Engineering Suite 3

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