Overview

This standard identifies the competences you need to assemble and weld fabricated and other components into jig and fixture structures, in accordance with instructions and/or approved welding procedures. You will achieve this by producing fillet welds and/or partial butt welds in plate, sheet, sections, pipe or tube, using a manual welding process such as manual metal arc, MIG, MAG, TIG, flux cored wire, inert shield or gas welding equipment. You will be required to check that all the workholding equipment and manipulating devices required are available and are in a usable condition. You will be expected to check the welding equipment to ensure 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 instructions or 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 required to demonstrate your capability to produce the welds of the required quality, and this could be through tests according to BS 4872 or BS EN ISO 9606-1.

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 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 demonstrate a good understanding of your work, and will provide an informed approach to how the particular welding process works. You will know about the equipment, materials and consumables, in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

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.
SEMET335

Assembling jig and fixture structures using a manual welding process

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
Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when working with the selected welding equipment (such as general workshop and site safety, appropriate personal protective equipment, fire prevention, protecting other workers from arc eye, 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)

2. the correct handling and storage of gas cylinders (such as 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)

3. the hazards associated with the selected welding process (such as 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), and how they can be minimised

4. the manual welding process selected, and an awareness of the different types of welding equipment (such as basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)

5. extracting information required from drawings and welding procedure specifications (such as interpretation of welding symbols, scope, content and application of the welding procedure specification)

6. the consumables associated with the chosen welding process (such as 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)

7. the types and features of welded joints in pipe (such as fillet and butt welds, single and multi-run welds, welding positions, weld quality)

8. methods of setting up and restraining the joint, to achieve correct location of components and control of distortion (such as 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)

9. preparing 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 before use, setting welding
parameters, care and maintenance of the equipment)
10. the techniques of operating the welding equipment to produce a range of joints in the various joint positions (such as fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)
11. the importance of complying with job instructions and the welding procedure specification
12. problems that can occur with the welding activities, and how these can be overcome (such as causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
13. the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests)
14. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
Assembling jig and fixture structures using a manual welding process

Scope/range related to performance criteria

1. Carry out all the following during the jig and fixture assembly activities:
   1. Use the correct issue of drawings, job instructions and procedures
   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. Use relevant COSHH sheets and risk assessments
   7. Dispose of waste items in a safe and environmentally acceptable manner
   8. Shut down the equipment to a safe condition on completion of joining activities and leave the work area in a safe and tidy condition

2. Set up, check, adjust and use welding and related equipment for one of the following welding processes:
   1. Manual metal arc
   2. TIG
   3. Cored wire
   4. MIG/MAG
   5. Plasma arc
   6. Oxy/fuel gas welding

3. Use consumables, as specified in the welding procedure specification, covering either:
   1. Two types of electrode from:
      - Rutile
      - Nickel alloy
      - Basic
      - Stainless steel
      - Cellulosic
      - Other electrode types
   2. Or
      Two types of filler wire from different material groups, using shielding gases (where applicable)

4. Produce fillet welded joints and/or partial butt welds in two of the following forms of material:
   1. Plate
   2. Machined components
   3. Sections
   4. Cast components
5. pipe/tube
6. forged components
7. sheet
8. other forms of material

5. Weld joints according to approved welding procedures, in good access situations, in **two** of the following BS EN ISO 6947 positions:
   1. flat (PA)
   2. horizontal (PC)
   3. horizontal vertical (PB)
   4. vertical upwards (PF)
   5. vertical downwards (PG)
   6. overhead (PE or PD)

6. Weld jig and fixture components which comply with **all** of the following quality and accuracy standards:
   1. achieve a minimum weld quality equivalent to the level given in the relevant European/International standard (such as BS EN ISO 5187 and EN30042/ISO 10042) as required by the application standard or specification
   2. meet the required dimensional accuracy within specified tolerance
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