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## Overview

This standard is for people who weld industrial and commercial heating and ventilating pipework.

The person performing this work must be able to comply with the correct procedures and practices for welding industrial and commercial heating and ventilating pipework. This work must be in accordance with the current versions of the appropriate industry standards and regulations; the specification; industry recognised working practices; the working environment and the natural environment. They must have a working understanding of the following pipework welding activities:

- Preparing work locations and welding equipment
- Preparing materials, including welding consumables and pipework
- Preparing and aligning joints using mechanical, abrasive and flame cutting equipment
- Welding low carbon steel and/or stainless-steel pipework joints in various positions
- Visually inspecting and testing the welded joints

## Performance criteria

- You must be able to:*
1. verify that the job information and documentation are current and relevant and that the plant, instruments, access equipment and tools are fit for purpose
  2. confirm before work starts that the work location and work area can be accessed safely and has been checked for the risk to other personnel on the site, and take appropriate action if a risk is present
  3. select welding equipment and associated tools and confirm that they are:
    - of the right type and size
    - fit for purpose in accordance with the pipework being worked upon
    - suitable for the working environment in which they are to be used
  4. produce a risk assessment and method statement for the work to be performed, including the identification and use of personal protective equipment, in accordance with the working environment
  5. determine at the outset, that the plans for welding the pipework are in accordance with:
    - the system design
    - the working environment
  6. comply with industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades
  7. perform appropriate techniques to cut, profile and bevel pipework in preparation for welding
  8. prepare pipework including the pre-treatment, set-up, alignment and tacking for appropriate welds
  9. weld pipework using suitable welding techniques and joints in fixed and rotated positions in open and restricted access positions
  10. perform visual inspection and appropriate tests of completed welds
  11. confirm with the relevant people:
    - those necessary variations to the planned programme of work that may have the potential to introduce a hazard and/or impact on the work to be undertaken
    - the correct actions to be taken to ensure that any variations to the

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planned programme of work will not introduce a hazard and have minimum impact on the work to be undertaken

12. implement organisational procedures for the safe transport and/or disposal of waste material in accordance with supplier and manufacturer instructions

## Knowledge and understanding

*You need to know and understand:*

1. the applications, advantages and limitations of different welding techniques
2. the appropriate industry standards and regulations relevant to welding
3. how to verify that job information and relevant documents are current and relevant and that the plant, instruments, access equipment and tools are fit for purpose
4. the applications, advantages and limitations of different types of welding equipment and how to assemble, adjust, operate and maintain them
5. how to produce a risk assessment and method statement for the work to be carried out, including the identification and use of personal protective equipment, in accordance with:
  - the system's design
  - the conditions of the working environment
  - organisational procedures
6. the organisational procedures for confirming, before work starts, that the work area can be accessed safely and has been checked for the risk to other personnel on the site, and for taking appropriate action if a risk is present
7. the applications, advantages and limitations of different types of welding consumables and fittings
8. how to store welding consumables and materials safely and identify defects
9. how the mechanical properties of materials change through being joined by welding
10. how to apply the appropriate industry standards and regulations for the joining of pipework by welding
11. the methods and procedures for preparing pipework that is to be welded
12. the methods and procedures for controlling and preventing stress and distortion to pipework during welding
13. the different welding techniques and factors associated with the welding of pipework
14. the current ISO standards and symbols for welding

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15. the quality control and test procedures for the detection of defects in welded joints
  16. the different methods of testing completed welded joints
  17. how to interpret diagrams and drawings of the system to locate the pipework that needs to be welded
  18. the organisational procedures for confirming with the relevant people the appropriate actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum negative impact on the welding work to be undertaken
  19. the methods for the safe transport and/or disposal of waste material in accordance with suppliers' and manufacturers' instructions

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**Scope/range related to performance criteria**    **Working Environment (Internal and/or External)**

- commercial
- industrial
  - agricultural
  - horticultural
  - leisure and entertainment
  - residential medical and care facilities
  - public services establishments
  - pre-1919 traditional/historic buildings

**Site services**

- electricity
- water
- gas
- oil

**Organisational Procedures**

- information management
- project management
- risk assessment management
- implementing and monitoring health & safety requirements and issues
- implementing and monitoring issues relating to the natural environment
- customer service
- accident reporting
- emergencies
- communication with relevant people

**Plant**

- generators
- transformers for low voltage hand-tools
- lifting equipment
- access equipment

**Systems**

- hot and cold-water systems

- heating systems
- chilled water systems
- fuel supply and storage systems
- compressed air systems
- fire protection systems
- steam systems

### **Pipework**

- copper
- low carbon steel
- stainless steel
- flanges
- fitting and fixing accessories

### **Welding**

- manual arc welding
- oxy-acetylene welding
- tungsten inert welding

### **Welding equipment**

- AC and DC arc welding sets
- gas welding sets
- generators
- safety equipment/devices

### **Defects**

- lack of roof/side wall penetration
- lack of reinforcement
- irregular surface finish
- undercut/overlap
- porosity
- excessive reinforcement/penetration

### **Techniques to cut, profile and bevel pipework**

- mechanical
- abrasive
- oxy-acetylene

- plasma cutting

### **Relevant people**

- customers/clients
- client representatives
- supervisors
- site/contract manager
- other contractors/trades
- members of the public
- work colleagues

### **Testing**

- destructive (roof bend, face bend, macro-etching)
- non-destructive (hydraulic/pneumatic pressure, visual, ultrasonic, x-ray)

### **Work area**

- open and restricted access
- occupied and unoccupied
- high/low level
- ventilated/unventilated

### **Joints**

- horizontal/ vertical butt welds
- branch on main welds
- slip on and butt-welded flanges

### **Welding techniques**

- down hand
- vertical up
- horizontal vertical
- overhead
- set-on branch
- fillet welding
- multi-run welds

### **Visual inspection of welds**



- profile
- surface finish
- freedom from undercut
- Penetration

### **Stress and distortion**

- longitudinal
- bowing
- angular
- transverse
- residual

BSEHV10

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