

SUMHV10 (SQA Unit Code – H9LG 04)

Weld industrial and commercial heating and ventilating pipework



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

Please note that industry specific terminology is identified by *italic* text and its explanation and/or definition can be found in the glossary of this standard.

Performance criteria

To perform this work in accordance with the current versions of *the appropriate industry standards and regulations, the specification, working practices, the working environment and the natural environment*

- You must be able to:
- P1 verify that the job information and documentation are current and relevant and that the **plant**, instruments, *access equipment* and tools are fit for purpose
 - P2 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
 - P3 select **welding equipment** and associated tools and confirm that they are:
 - P3.1 of the right type and size
 - P3.2 fit for purpose in accordance with the **pipework** being worked upon
 - P3.3 suitable for the **working environment** in which they are to be used
 - P4 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**
 - P5 determine at the outset, that the plans for **welding the pipework** are in accordance with:
 - P5.1 the **system** design
 - P5.2 the **working environment**
 - P6 comply with industry practices and **organisational procedures** to ensure the co-ordination of **site services** and the activities of other trades
 - P7 perform appropriate **techniques to cut, profile and bevel pipework** in preparation for **welding**
 - P8 prepare **pipework** including the pre-treatment, set-up, alignment and tacking for appropriate welds
 - P9 weld **pipework** using suitable **welding techniques** and **joints** in fixed and rotated positions in open and restricted access positions
 - P10 perform visual inspection and appropriate **tests** of completed welds

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- P11 confirm with the **relevant people**:
 - P11.1 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
 - P11.2 the correct actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum impact on the work to be undertaken
 - P12 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:

To perform this work in accordance with the current versions of *the appropriate industry standards and regulations, the specification, working practices, the working environment and the natural environment*

- K1 the applications, advantages and limitations of different **welding techniques**
- K2 the **appropriate industry standards and regulations** relevant to **welding**
- K3 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
- K4 the applications, advantages and limitations of different types of **welding equipment** and how to assemble, adjust, operate and maintain them
- K5 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:
 - K5.1 the **system's** design
 - K5.2 the conditions of the **working environment**
 - K5.3 **organisational procedures**
- K6 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
- K7 the applications, advantages and limitations of different types of **welding consumables and fittings**
- K8 how to store **welding** consumables and materials safely and identify defects
- K9 how the mechanical properties of **materials** change through being joined by **welding**
- K10 how to apply the **appropriate industry standards and regulations** for the joining of **pipework** by **welding**
- K11 the methods and procedures for preparing **pipework** that is to be welded
- K12 the methods and procedures for controlling and preventing **stress and distortion** to **pipework** during **welding**
- K13 the different **welding techniques** and factors associated with the **welding** of **pipework**
- K14 the current ISO standards and symbols for **welding**
- K15 the quality control and test procedures for the detection of **defects** in welded joints

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- K16 the different methods of **testing** completed welded joints
 - K17 how to interpret diagrams and drawings of the **system** to locate the **pipework** that needs to be welded
 - K18 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
 - K19 the methods for the safe transport and/or disposal of waste material in accordance with suppliers' and manufacturers' instructions

Additional information

Scope related to performance criteria: The contexts and circumstances below identify where and when the NOS could apply.

1 Working Environment (Internal and/or External)

- 1.1 commercial
- 1.2 industrial
- 1.3 agricultural/horticultural
- 1.4 leisure and entertainment
- 1.5 residential medical and care facilities
- 1.6 *public services establishments*
- 1.7 pre 1919 traditional/historic buildings

2 Site services

- 2.1 electricity
- 2.2 water
- 2.3 gas
- 2.4 oil

3 Organisational procedures

- 3.1 information management
- 3.2 project management
- 3.3 risk assessment/management
- 3.4 implementing and monitoring health & safety requirements and issues
- 3.5 implementing and monitoring issues relating to the *natural environment*
- 3.6 customer service
- 3.7 accident reporting
- 3.8 emergencies
- 3.9 communication with relevant people

4 Plant

- 4.1 generators
- 4.2 transformers for low voltage hand-tools

4.3 lifting equipment

4.4 *access equipment*

5 Systems

5.1 hot and cold water systems

5.2 heating systems

5.3 chilled water systems

5.4 fuel supply and storage systems

5.5 compressed air systems

5.6 fire protection systems

5.7 steam systems

6 Pipework

6.1 copper

6.2 low carbon steel

6.3 stainless steel

6.4 flanges

6.5 fitting and fixing accessories

7 Welding

7.1 manual arc welding

7.2 oxy-acetylene welding

7.3 tungsten inert welding

8 Welding equipment

8.1 AC and DC arc welding sets

8.2 gas welding sets

8.3 generators

8.4 safety equipment/devices

9 Defects

9.1 lack of roof/side wall penetration

9.2 lack of reinforcement

9.3 irregular surface finish

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9.4 undercut/overlap

9.5 porosity

9.6 excessive reinforcement/penetration

10 Tests and testing

10.1 destructive (roof bend, face bend, macro-etching)

10.2 non-destructive (hydraulic/pneumatic pressure, visual, ultra-sonic, x-ray)

11 Techniques to cut, profile and bevel pipework

11.1 mechanical

11.2 abrasive

11.3 oxy-acetylene

11.4 plasma cutting

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Range related to performance criteria: The contexts and circumstances below identify where and when the NOS must apply

1 Relevant people

- 1.1 *customers/clients*
- 1.2 client representatives
- 1.3 supervisors
- 1.4 site/contract manager
- 1.5 other contractors/trades
- 1.6 members of the public
- 1.7 work colleagues

2 Work area

- 2.1 open and restricted access
- 2.2 occupied and unoccupied
- 2.3 high/low level
- 2.4 ventilated/unventilated

3 Joints

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

4 Welding techniques

- 4.1 down hand
- 4.2 vertical up
- 4.3 horizontal vertical
- 4.4 overhead
- 4.5 set-on branch
- 4.6 fillet welding
- 4.7 multi-run welds

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5 Visual inspection of welds

5.1 profile

5.2 surface finish

5.3 freedom from undercut

5.4 penetration

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Scope related to knowledge and understanding:

The contexts and circumstances below identify where and when the NOS could apply.

1 Working environments (internal and/or external)

- 1.1 commercial
- 1.2 industrial
- 1.3 agricultural/horticultural
- 1.4 leisure and entertainment
- 1.5 residential medical and care facilities
- 1.6 *public services establishments*
- 1.7 pre 1919 traditional/historic buildings

2 Site services

- 2.1 electricity
- 2.2 water
- 2.3 gas
- 2.4 oil

3 Organisational procedures

- 3.1 information management
- 3.2 project management
- 3.3 risk assessment/management
- 3.4 implementing and monitoring health & safety requirements and issues
- 3.5 implementing and monitoring issues relating to the *natural environment*
- 3.6 customer services
- 3.7 accident reporting
- 3.8 emergencies - fire, flood, explosion, toxic atmosphere, electrical shock, injury to person
- 3.9 communication with relevant people

4 Plant

- 4.1 generators
- 4.2 transformers for low voltage hand-tools
- 4.3 lifting equipment

4.4 *access equipment*

5 Systems

5.1 hot and cold water systems

5.2 heating systems

5.3 chilled water systems

5.4 fuel systems

5.5 warm air systems

5.6 compressed air systems

5.7 fire protection systems

5.8 steam systems

6 Pipework

6.1 copper

6.2 low carbon steel

6.3 stainless steel

6.4 flanges

6.5 fitting and fixing accessories

7 Welding

7.1 manual arc welding

7.2 oxy-acetylene welding

7.3 tungsten inert welding

8 Welding equipment

8.1 AC and DC arc welding sets

8.2 gas welding sets

8.3 generators

9 Welding consumables and fittings

9.1 weld on fittings

9.2 pipe headers

9.3 welding rods and consumables

9.4 welding filler wire and consumables

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9.5 steel welding electrodes

10 Techniques to cut, profile and bevel pipework

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- 1.5 other contractors/trades
- 1.6 members of the public
- 1.7 work colleagues

2 Stress and distortion

- 2.1 longitudinal
- 2.2 bowing
- 2.3 angular
- 2.4 transverse
- 2.5 residual

3 Welding techniques

- 3.1 down hand
- 3.2 vertical up
- 3.3 horizontal vertical
- 3.4 overhead
- 3.5 set-on branch
- 3.6 fillet welding
- 3.7 multi-run welds

4 Relevant documents

- 4.1 drawings
- 4.2 *specification*
- 4.3 manufacturer's instructions
- 4.4 company procedures
- 4.5 test certificates

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4.6 industry standards and codes of practice

4.7 hot work permits

5 **Testing**

5.1 destructive (root bend, face bend, macro-etching)

5.2 non-destructive (hydraulic/pneumatic pressure, visual, ultra-sonic, x-ray)

6 **Work area:**

6.1 open and restricted access

6.2 occupied and unoccupied

6.3 high/low level

6.4 ventilated/unventilated

Glossary

Appropriate industry standards and regulations for:

- construction design and management
- controlling noise at work
- controlling asbestos in the work place
- controlling substances hazardous to health
- electricity at work
- managing health and safety at work
- manual handling operations
- personal protection at work
- provision and use of work equipment
- recycling and disposal of waste electrical and electronic equipment
- the quality of buildings and building work in England, Northern Ireland, Scotland and Wales
- working at heights
- workplace health and safety and welfare
- environmental protection
- heritage/historic building requirements
- brazing/jointing standards
- requirements for electrical installations
- carriage of Dangerous Goods (Classification, Packaging and Labelling) and use of transportable pressure receptacles

Specification

A verbal and/or documented instruction that is an explicit set of requirements for installing identified systems, equipment or products, to be satisfied by materials, components, design, processes, procedures, data management and/or service(s).

Clients and customers

- purchaser of installation services
- other trades and services at the work site
- colleagues within the same organisation
- architect
- contract manager

- main/sub-contractor
- consultant
- local authority representatives
- work colleagues

A public services establishment can be a:

- hospital/medical centre
- school/college/university
- museum/library
- prison
- military base
- car park
- places of worship

Natural environment

The climate, weather and natural resources that effect and are affected by human life and economic activity

Working practices

Methods, techniques and procedures that are adopted for carrying out specific tasks that ensures workers' exposure to hazardous situations is controlled in a safe manner when:

- working with equipment, tools and plant
- working with materials and substances (hazardous and non-hazardous)
- manual handling lifting
- using lifting equipment
- using personal protective equipment (PPE)

Access equipment

- scaffold
- ladders
- steps
- staging

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- trestles
- mobile elevated work platform (MEWP)

Personal protective equipment (PPE)

- safety helmets/hats
- hairnets
- gloves
- safety steel toe capped boots/shoes
- safety spectacles/goggles
- face shields/visors
- ear plugs/muffs
- conventional or disposable overalls, boiler suits, aprons, chemical suits
- respiratory protective equipment (RPE)

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Links to other NOS

EUSDSG3.10 – Install gas warm air central heating systems and appliances
EUSDSG3.11 - Maintain gas warm air central heating systems and appliances
EUSDSG3.3 – Install gas water heating and wet central heating appliances
EUSDSG3.5 – Install gas pipework up to 35mm BS6891
EUSDSG3.60 – Gas tightness testing and direct purging – IGE/UP/1B
SUMETS1 Plan, prepare and install Environmental Technology Systems
SUMETS7 Service and Maintain Environmental Technology Systems
SUMETS10 Inspect & Commission Environmental Technology Systems
SUMETS11 Diagnose & Rectify Faults in Environmental Technology Systems

External Links

Links current at time of NOS approval:

- Health & Safety Executive Documents <http://www.hse.gov.uk/pubns>
- The quality of buildings and building work in England
<https://www.gov.uk/government/policies/providing-effective-building-regulations-so-that-new-and-altered-buildings-are-safe-accessible-and-efficient>
- The quality of buildings and building work in Wales
<http://wales.gov.uk/topics/planning/buildingregs/?lang=en>
- The quality of buildings and building work in Northern Ireland
<http://www.dfpni.gov.uk/building-regulations>
- The quality of buildings and building work in Scotland
<http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards>
- Carriage of dangerous goods authorisations
<https://www.gov.uk/government/publications/carriage-of-dangerous-goods-authorisations>
- BRA Jointing of Copper Pipework Guide
<http://www.feta.co.uk/associations/bra/downloads>
- Control of Substances Hazardous to Health (COSHH):
www.hse.gov.uk/coshh

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Suite	Heating and Ventilating
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