

SUMRAC09 (SQA Unit Code – H9LY 04)

Service and maintain air conditioning and heat pump systems



Overview

This standard is for people who service and maintain air conditioning and heat pump systems.

The person performing this work must be able to comply with the correct procedures and practices for servicing & maintaining air conditioning & heat pump systems. 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 know and understand the types, operation, operating principles and/or applications of:

- methods, procedures and techniques for servicing & maintaining equipment, components and accessories
- site services and system supplies
- air conditioning units
- heat pumps

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.

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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 and system 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
- P3 interpret, as required, **system** information, diagrams and drawings to identify the location of the **equipment, accessories and components** that need servicing and/or maintaining
- P4 select materials, **equipment, components and accessories** needed to complete the service and/or maintenance activity and confirm that they are:
 - P4.1 of the right type and size
 - P4.2 fit for purpose in accordance with the **system** design
 - P4.3 suitable for the **working environment** i
- P5 produce a risk assessment and method statement for the work to be performed, including the identification and use of *personal protective equipment*
- P6 complete safe-isolation, as required, to ensure the safe disconnection, installation and/or connection of electrical equipment, cables/wiring, associated with the **system**
- P7 service and/or maintenance of the **system** and its associated **equipment, accessories and components** in accordance with:
 - P7.1 the **system's** design
 - P7.2 the **working environment**
 - P7.3 manufacturers' instructions
- P8 remove, replace and/or repair, as required, the **system's** associated **equipment, accessories and components**
- P9 confirm the integrity of the **system** and its associated **equipment, accessories and components** on completion of the service and/or maintenance activity
- P10 confirm with the **relevant people**:
 - P10.1 those necessary variations to the planned programme of work

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- P10.2 the actions to be taken to ensure that any variations to the planned programme of work will minimise the potential for hazard and risk
 - P11 obtain *customer/client* acceptance of the serviced and/or maintained **system** and its associated **equipment, accessories and components** in accordance with **organisational procedures**
 - P12 implement **organisational** procedures for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers' and manufacturers' instructions
 - P13 complete relevant documentation in accordance with **organisational procedures**

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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, operations and operating principles, advantages and limitations of different **systems**
- K2 the **appropriate industry standards and regulations** relevant to servicing and maintaining air conditioning and heat pump **systems**
- K3 how to verify that job information and documentation is current and relevant and that the **plant**, instruments, *access equipment* and tools are fit for purpose
- K4 how to 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:
 - K4.1 the **system's** design
 - K4.2 the conditions of the **working environment**
 - K4.3 **organisational procedures**
 - K4.4 activities of other personnel on **site**
- K5 how to select materials, **equipment, accessories and components** needed to complete the service and/or maintenance activity and confirm that they are:
 - K5.1 of the right type and size
 - K5.2 fit for purpose in accordance with the **system's** design
 - K5.3 suitable for the **working environment**
- K6 how to interpret diagrams and drawings for the **system** to identify the location of the **equipment, accessories and components** that need servicing and/or maintaining
- K7 the correct procedures for safe-isolation of electrical supplies to equipment, cables/wiring associated with the **system**
- K8 the methods and techniques for servicing and/or maintaining the **equipment, components and accessories** in accordance with:
 - K8.1 the **system's** design
 - K8.2 the **working environment**
 - K8.3 manufacturers' instructions
- K9 the methods and techniques for removing, replacing and/or repairing, as required, the **system's** associated **equipment, accessories and**

- components** in accordance with:
- K10.1 the **system's** design
 - K10.2 the **working environment**
 - K10.3 manufacturers' instructions
 - K10.4 appropriate **jointing methods**
- K10 the methods, techniques and procedures to confirm the integrity of the **system** and its associated **equipment, accessories and components** on completion of the service and/or maintenance activity
- K11 the methods and techniques for confirming that the system provides cooling and/or heating by measuring air flow temperature difference across relevant key points to determine whether it meets the design *specification*
- K12 the **organisational procedures** for:
- K12.1 confirming with **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 service and/or maintenance work to be undertaken
 - K12.2 confirming with **relevant people** 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 service and/or maintenance work to be undertaken
 - K12.3 obtaining *customer/client* acceptance of the serviced and/or maintained **system** and its associated **equipment, accessories and components**
- K13 how to implement **organisational procedures** for the safe transport and/or disposal of any waste material, substances and liquids in accordance with suppliers' and manufacturers' instructions
- K14 how to complete relevant documentation in accordance with **organisational procedures**

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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 domestic
- 1.4 agricultural/horticultural
- 1.5 leisure and entertainment
- 1.6 residential medical and care facilities
- 1.7 *public services establishments*
- 1.8 pre 1919 traditional/historic buildings

2 Systems

- 2.1 single
- 2.2 split
- 2.3 multi split

3 Equipment, components and accessories

- 3.1 heat pumps
- 3.2 condensers
- 3.3 evaporators
- 3.4 compressors
- 3.5 expansion devices
- 3.6 accumulators
- 3.7 filters
- 3.8 pressure controls
- 3.9 temperature controls
- 3.10 line and regulating valves
- 3.11 sensors and gauges
- 3.12 vacuum pumps
- 3.13 condensate pumps

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3.14 grilles/diffusers/fans/filters

3.15 heat exchangers

3.16 air handling units

3.17 liquid receivers

4 **Organisational procedures**

4.1 information management

4.2 project management

4.3 risk assessment and management

4.4 implementing and monitoring health & safety requirements and issues

4.5 implementing and monitoring issues relating to the *natural environment*

4.6 customer service

4.7 accident reporting

4.8 emergencies

4.9 communication with relevant people

5 **Plant**

5.1 transformers for low voltage hand-tools

5.2 lifting equipment

5.3 *access equipment*

6 **Relevant people**

6.1 *customers/clients*

6.2 client representatives

6.3 supervisors

6.4 site/contract manager

6.5 other contractors/trades

6.6 members of the public

6.7 work colleagues

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7 Jointing methods

7.1 compression

7.2 threaded

7.3 grooved

7.4 flanges

7.5 soft soldering

7.6 adhesives

7.7 brazing

7.8 welding

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Scope related to knowledge and understanding

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

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- 1.1 commercial
- 1.2 industrial
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2 Systems

- 2.1 single
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3 Equipment, components and accessories

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- 3.14 grilles/diffusers/fans/filters
- 3.15 heat exchangers

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3.16 air handling units

3.17 liquid receivers

4 **Organisational procedures**

4.1 information management

4.2 project management

4.3 risk assessment/management

4.4 implementing and monitoring health & safety requirements and issues

4.5 implementing and monitoring issues relating to the *natural environment*

4.6 customer service

4.7 accident reporting

4.8 emergencies

4.9 communication with relevant people

5 **Plant**

5.1 transformers for low voltage hand-tools

5.2 lifting equipment

5.3 *access equipment*

5.4 hot work equipment

6 **Relevant people**

6.1 *customers/clients*

6.2 client representatives

6.3 supervisors

6.4 site/contract manager

6.5 other contractors/trades

6.6 members of the public

6.7 work colleagues

7 **Joining methods**

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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
- pressure testing
- hot work

Specification

A verbal and/or documented instruction that is an explicit set of requirements for servicing and maintaining 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

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- 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
- place 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)
- pressure testing
- working on electrical circuits and equipment
- working in extreme temperature environment
- working in confined spaces

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Access equipment

- scaffold
- ladders
- steps
- staging
- 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

- 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>
- British Standard 7671: – Requirements for Electrical Installations
<http://www.theiet.org/resources/wiring-regulations/>
- Carriage of dangerous goods authorisations
<https://www.gov.uk/government/publications/carriage-of-dangerous-goods-authorisations>
- Refrigerating systems and heat pumps
www.shop.bsigroup.com/ProductDetail/?pid=00000000030249959
- Air Conditioning & Heat Pump and Air Conditioning Standards
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=50356
- F-Gas guidance - <https://www.gov.uk/managing-fluorinated-gases-and-ozone-depleting-substances>
- BRA Jointing of Copper Pipework Guide
<http://www.feta.co.uk/associations/bra/downloads>
- Waste Electrical and Electronic Equipment recycling (WEEE):
www.hse.gov.uk/waste/waste-electrical.htm
- Control of Substances Hazardous to Health (COSHH): www.hse.gov.uk/coshh
- Construction (Design and Management) Regulations:

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<http://www.hse.gov.uk/construction/cdm.htm>

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