

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



Overview

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

The person performing this work must be able to comply with the correct procedures and practices for installing 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 and/or application of:

- single and split systems
- heat pumps
- system components
- air handling units

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.

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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 confirm that the site services and system supply are compatible with the air conditioning and heat pump system design
- P4 produce a risk assessment and method statement for the work to be performed, including the identification and use of *personal protective equipment*
- P5 check that **equipment, components and accessories** are:
 - P5.1 of the right type and size
 - P5.2 fit for purpose in accordance with the air conditioning and heat pump system design
 - P5.3 suitable for the **working environment** in which they are to be installed
- P6 determine at the outset, that the plans for positioning and fixing the **equipment, components and accessories** are in accordance with:
 - P6.1 the **system's** design
 - P6.2 the **working environment**
 - P6.3 manufacturer instructions
- P7 comply with industry practices and **organisational procedures** to ensure the co-ordination of site services and the activities of other trades
- P8 measure and mark out locations for fitting and fixing the selected **equipment, components and accessories** in accordance with:
 - P8.1 the **system's** design
 - P8.2 manufacturer instructions

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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- P9 fit, fix and connect the selected **equipment, components and accessories** using suitable **jointing methods** in accordance with:
 - P9.1 the **system's** design
 - P9.2 the **working environment**
 - P9.3 manufacturer instructions
 - P10 confirm with the **relevant people**:
 - P10.1 those necessary variations to the planned programme of work
 - 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 implement **organisational procedures** for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers' and manufacturers' instructions

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



Knowledge and understanding

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 need to know and understand:

- K1 the applications, operation and operating principles, advantages and limitations of different **systems**
- K2 the applications, operation, advantages and limitations of **equipment, components and accessories** in relation to the **working environment**
- K3 the **appropriate industry standards and regulations** relevant to installing air conditioning and heat pump **systems**
- K4 how to verify that job and **system** information and documentation is current and relevant and that the **plant**, instruments, *access equipment* and tools are fit for purpose
- 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**
 - K5.4 activities of other personnel on **site**
- K6 how to check that the identified **equipment, components and accessories** for the system are
 - K6.1 of the right type and size
 - K6.2 fit for purpose in accordance with the system's design
 - K6.3 suitable for the working **environment** in which they are to be installed
- K7 how to interpret diagrams and drawings of the **system** to identify the planned location of the **equipment, components and accessories** to be installed
- K8 the methods, techniques and **jointing methods** for fitting, fixing and connecting the selected **equipment, components and accessories** in accordance with:
 - K8.1 the **system's** design
 - K8.2 the **working environment**
 - K8.3 manufacturer instructions

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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- K9 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 installation work to be undertaken
 - K10 the methods for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers' and manufacturers' instructions

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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

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 Jointing methods

6.1 compression

6.2 threaded

6.3 grooved

6.4 flanges

6.5 soft soldering

6.6 adhesives

6.7 brazing

6.8 welding

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



7 Relevant people

7.1 *customers/clients*

7.2 client representatives

7.3 supervisors

7.4 site/contract manager

7.5 other contractors/trades

7.6 members of the public

7.7 work colleagues

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



3.16 air handling units

3.17 liquid receivers

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4.1 information management

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4.4 implementing and monitoring health & safety requirements and issues

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

4.6 customer services

4.7 accident reporting

4.8 emergencies - fire, flood, explosion, toxic atmosphere, electrical shock,
injury to person

4.9 communication with relevant people

5 Plant

5.1 transformers for low voltage hand-tools

5.2 lifting equipment

5.3 *access equipment*

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6.2 threaded

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SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



- 7.4 site/contract manager
- 7.5 other contractors/trades
- 7.6 members of the public
- 7.7 work colleagues

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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 systems safety
- control of legionella
- hot work
- pressure testing

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).

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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
- 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)
- conducting hot work
- pressure testing

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



- working on electric circuits
- working in extreme temperature environment
- working alone
- working on electrical circuits and equipment
- working in confined spaces

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)

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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=000000000030249959
- air conditioning & heat pump and air conditioning & heat pump 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:

SUMRAC08 (SQA Unit Code – H9LX 04)
Install air conditioning and heat pump systems



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

SUMRAC08 (SQA Unit Code – H9LX 04)

Install air conditioning and heat pump systems



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