

SQA Advanced Unit specification

General information for centres

Unit title: Building Services in Large Buildings (SCQF level 8)

Unit code: HR4E 48

Superclass: TH

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Version: 01

Unit purpose

This Unit is designed to provide the learner with an understanding of common building services and their operation in commercial and industrial buildings. The Unit is suitable for learners wishing to develop an understanding of the supply of common building services in commercial, industrial and high-rise buildings.

Outcomes

On successful completion of the Unit the learner will be able to:

- 1 Evaluate strategies for the provision of hot and cold water systems in large buildings.
- 2 Evaluate strategies for space heating and ventilation systems in commercial and industrial buildings.
- 3 Describe methods by which electricity is supplied and distributed within commercial and industrial buildings.
- 4 Identify automatic fire detection and control systems for commercial and industrial buildings.
- 5 Describe 'builders work' associated with lift and escalator installations.

Credit points and level

1 SQA Advanced Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8)

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Recommended entry to the Unit

It is strongly recommended that learners have a basic knowledge of domestic building services prior to undertaking this Unit. Such knowledge and understanding might be evidenced by the possession of appropriate Units at NC and SQA Advanced Certificate level.

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill	None
Core Skill component	Critical Thinking at SCQF level 6

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website (<http://www.sqa.org.uk/sqa/46233.2769.html>).

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

SQA Advanced Certificate Unit specification: statement of standards

Unit title: Building Services in Large Buildings (SCQF level 8)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Evaluate strategies for the provision of hot and cold water systems in large buildings.

Knowledge and/or skills

- ◆ hot and cold water supply requirements
- ◆ boosted cold water systems from storage cisterns
- ◆ staged pumping cold water supply
- ◆ staged pumping hot water supply from communal sources

Outcome 2

Evaluate strategies for space heating and ventilation systems in commercial and industrial buildings.

Knowledge and/or skills

- ◆ warm air systems
- ◆ low, medium and high temperature hot water systems
- ◆ control of legionella bacteria in water systems
- ◆ mechanical extraction/inlet system

Outcome 3

Describe methods by which electricity is supplied and distributed within commercial and industrial buildings.

Knowledge and/or skills

- ◆ star/delta arrangements
- ◆ service head intake arrangements
- ◆ 3-phase supply to plant
- ◆ rising main busbar for 400v and 230v supply

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Outcome 4

Identify automatic fire detection and control systems for commercial and industrial buildings.

Knowledge and/or skills

- ◆ products of fire
- ◆ fire detectors
- ◆ automatic fire sprinklers systems
- ◆ integration with passive protection

Outcome 5

Describe builders work associated with lift and escalator installations.

Knowledge and/or skills

- ◆ pit construction
- ◆ construction of lift shaft and openings
- ◆ overrun and plant room construction
- ◆ escalator housing

Evidence Requirements for this Unit

Learners will need to provide evidence to demonstrate their knowledge and/or skills across all Outcomes by showing that they can:

- ◆ analyse and explain requirements for, and methods of providing, hot or cold water supplies in large buildings
- ◆ analyse and explain the requirements for, and provision of, air or water heating systems for large buildings
- ◆ analyse and explain the requirements for, and provision of, electricity in large buildings
- ◆ analyse, describe and explain the requirements for, and provision of, fire detection and control systems for large buildings
- ◆ describe 'builders work' related to lift installations

The assessment for all Outcomes may be undertaken separately or alternatively as two separate assessments comprising Outcomes 1 and 2 and Outcomes 3, 4 and 5.

Assessment should place emphasis upon description and sketching of the services layouts. Detailed design, such as, pipe, cable sizing, etc is not part of the assessment scope. Assessments should be conducted under supervised, controlled conditions. Individual Outcome assessments should not exceed 45 minutes each. Assessment covering Outcomes 1 and 2 and also that for Outcomes 3, 4 and 5 should not exceed 90 minutes duration each. It should be noted that learners must achieve all the minimum evidence specified for each Outcome in order to pass the Unit.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Items being assessed should not be known to learners in advance and different items should be sampled on each assessment occasion.

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An exemplar instrument of assessment and marking guidelines have been produced to provide an example of the scope of evidence required to demonstrate achievement of the aims of this Unit and to indicate the national standard of achievement at SCQF level 8.

- ◆ *Outcome by Outcome*
- ◆ *Two or more Outcomes together*
- ◆ *All Outcomes together — holistic assessment of the Unit*

SQA Advanced Unit support notes

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Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit has been written in order to allow learners to develop knowledge, understanding and skills in the following areas:

- 1 Evaluate strategies for the provision of hot and cold water systems in large buildings.
- 2 Evaluate strategies for space heating and ventilation systems in commercial and industrial buildings.
- 3 Describe methods by which electricity is supplied and distributed within commercial and industrial buildings.
- 4 Identify automatic fire detection and control systems for commercial and industrial buildings.
- 5 Describe 'builders work' associated with lift and escalator installations.

This Unit has been developed to further enhance the knowledge and skills gained by learners who have studied building services in low rise buildings. It is part of a suite of building services Units within the SQA Advanced Certificate/Diploma Built Environment frameworks. In addition to that mentioned above, there are also Units entitled *Building Services: Heating, Lighting and Acoustics* and *Building Services: Ventilation and Air Conditioning*.

In designing this Unit the writers have identified the range of topics expected to be covered by lecturers. The writers have also given recommendations on time allocated to each Outcome. This will assist lecturers in planning lessons and preparing schedules of work. Whilst it is not mandatory for a centre to use this list of topics, it is strongly recommended that it does. This will provide consistency of delivery and learner knowledge and understanding of building services.

The list of topics is given below. Delivering lecturers are advised to study this list of topics in conjunction with the assessment exemplar pack. This will provide a clear indication of the standard of achievement expected of the learner undertaking this Unit.

Guidance on approaches to delivery of this Unit

In designing this Unit the writers have identified the range of topics expected to be covered by lecturers. The writers have also given recommendations on time allocated to each Outcome. This will assist lecturers in planning lessons and preparing delivery schedules. Whilst it is not mandatory for a centre to use this list of topics, it is strongly recommended that it does. This will provide consistency of delivery and learner knowledge and understanding of building services.

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The list of topics is given below. Delivering lecturers are advised to study this list of topics in conjunction with the assessment exemplar pack. This will provide a clear indication of the standard of achievement expected of learners undertaking this Unit.

Outcome 1: Layout and provision of hot and cold water in high-rise and other large buildings. **(9 hours)**

Cold water supply: demand requirements, break cisterns, header pipes, pneumatic cylinders, staged pumping.

Hot water supply: demand requirements, communal hot water calorifiers, bacteria control, staged pumping, recirculation and dead legs.

Outcome 2: Typical space heating and ventilation systems in commercial and industrial buildings. **(9 hours)**

Heating systems: warm air, LTHW/MTHW/HTHW, Controllability of systems
BMS/BEMS

Ventilation systems: natural ventilation problems in high-rise buildings, full fresh air systems in commercial buildings use of fresh and recirculated air.

Outcome 3: Methods by which electricity is supplied and distributed within commercial and industrial buildings. **(6 hours)**

Three phase supply: purpose of 3-phase supplies, star/delta transformer arrangement service head arrangement, vertical distribution in high-rise buildings, horizontal distribution in high-rise buildings, distribution from service head to a 3-phase machine.

Outcome 4: Identify automatic fire detection and control systems for commercial and industrial buildings. **(6 hours)**

Products of fire: smoke, toxic gases, heat and radiation
Choice of detectors: smoke: ionisation/optical, heat, radiation, VESDA
Classification of detectors: L1, L2, L3, P1, P2, P3, Manual
Operation of sprinkler system: water sources: tanks, reservoirs, rivers, lakes, canals
components of a dry system, components of a wet system

Outcome 5: Understand building work associated with lifts and escalator installations in buildings. **(6 hours)**

Electric and Hydraulic lifts: pit construction, shaft/well construction, overrun construction, plant room requirements, ventilation, fire resistance, openings in shafts/wells.

Escalators: Pit construction, headroom, fire resistance.

This Unit is designed to further develop knowledge and understanding of building services. This Unit should also reinforce the importance of the building services interface with the construction of buildings, ie how services may be distributed throughout buildings without the need for retrospective work.

It is recommended that learners visit plant rooms and/or building energy management offices, perhaps within a college environment, to gain further understanding of the operation of building services systems in practice.

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Learners should be made aware of the importance of BIM (Building Information Modelling) to the design of building services.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

The assessment for all Outcomes may be undertaken separately or alternatively as two separate assessments comprising Outcomes 1 and 2 and Outcomes 3, 4 and 5.

Assessment should place emphasis upon description and sketching of the services layouts.

Assessments should be conducted under supervised, controlled open-book conditions.

Individual Outcome assessments should not exceed 45 minutes each. Combined assessment covering Outcomes 1 and 2 and Outcomes 3, 4 and 5 should not exceed 90 minutes each. It should be noted that learners must achieve all the minimum evidence specified for each Outcome in order to pass the Unit.

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis as follows:

- Outcome 1: three from four knowledge and/or skills items should be sampled.
- Outcome 2: three from four knowledge and/or skills items should be sampled.
- Outcome 3: three from four knowledge and/or skills items should be sampled.
- Outcome 4: two from four knowledge and/or skills items should be sampled.
- Outcome 5: two from four knowledge and/or skills items should be sampled.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Items being assessed should not be known to learners in advance and different items should be sampled on each assessment occasion.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

There are opportunities to develop the Core Skills in *Communication* and *Problem Solving* in this Unit, however, there is no automatic certification of Core Skills or Core Skills components.

There are also opportunities to develop skills relating to sustainability through the use of energy efficiency and energy conservation in building services systems.

This Unit has the Critical Thinking component of Problem Solving embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 6.

History of changes

Version	Description of change	Date

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our [Centre Feedback Form](#).

General information for learners

Unit title: Building Services in Large Buildings (SCQF level 8)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This Unit is suitable for learners with limited experience in the construction industry aiming for a career as a technician, technologist or other construction professional. The Unit forms part of a Group Award designed to provide learners with technical and professional knowledge and skills when working within the built environment arena.

The Unit will enable learners to develop a knowledge and understanding of the operation of common building services systems used in large and multi storey buildings and how these services are located and distributed throughout buildings.

The principal aims are to:

- ◆ Prepare learners for employment as technicians in the construction industry with a range of disciplines, including architects, contractors, building surveyors, quantity surveyors, energy efficiency officers.
- ◆ Provide built environment learners with knowledge and understanding of integration of building services systems in large buildings.
- ◆ Enable learners to pursue appropriate professional body recognition, such as Chartered Institute of Building, Chartered Institute of Architectural Technologists, Royal Institute of Chartered Surveyors.
- ◆ Provide learners with increased awareness of sustainable sources of energy and efficiency of energy use in buildings.

This Unit has been developed to further enhance the knowledge and skills gained by learners in their studies of the Unit, *Building Services in Low Rise Buildings*. It is part of a group of building services Units within the Built Environment frameworks. The other Units are entitled *Building Services: Heating, Lighting and Acoustics* and *Building Services: Ventilation and Air Conditioning*.

There are opportunities to develop the Core Skills in *Communication* and *Problem Solving* in this Unit.

There are also opportunities to develop skills relating to sustainability through the use of energy efficiency and energy conservation in building services systems.