

SQA Advanced Unit Specification

General information for centres

Unit title: Building Services: An Introduction

Unit code: HR42 46

Unit purpose: This Unit seeks to provide the candidate with knowledge and understanding of the underlying principles of a range building services. It will enable students to interpret the requirements and propose practical schemes suitable for installations in domestic buildings. The content of the Unit is intended to provide sufficient depth of knowledge and understanding of building services for those following courses in the Built Environment programme. Separate specifications for specialist units are available for those following the Building Services Engineering programme.

On completion of the Unit candidates should be able to:

- 1 Demonstrate an understanding of the selection and design of above and below ground drainage systems.
- 2 Demonstrate an understanding of the selection and design of hot and cold water supply and distribution systems.
- 3 Produce annotated sketches of the supply and distribution of electricity.
- 4 Select and produce annotated sketches of appropriate space heating systems.
- 5 Describe home electronic security systems.

Credit points and level: 1 SQA Credit at SCQF level 6: (8 SCQF credit points at SCQF level 6*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: It would be an advantage for candidates to have a basic knowledge of the services provided in low rise residential buildings although it is not essential because the unit covers all the basic principles. Possession of basic knowledge and understanding may be evidenced by possession of appropriate NC, NQ or SQA Advanced Units.

Core Skills: There are opportunities to develop the Core Skill(s) of Communication, Numeracy, Problem Solving, in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

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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.

Assessment: It is possible to assess candidates either on an individual Outcome basis, combinations of Outcomes or by a single holistic assessment combining all Outcomes. The assessment paper/s should be composed of an appropriate balance of short answer, restricted response and structured questions. Assessment should be conducted under open book supervised, controlled conditions. A single assessment covering all outcomes should not exceed 2 hours in duration. It should be noted that candidates must achieve all the minimum evidence specified for each Outcome in order to pass this 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. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

An exemplar instrument of assessment and marking guidelines have been produced to provide an example of the type of evidence required to demonstrate achievement of the aims of this Unit and to indicate the national standard of achievement at SCQF 6.

Unit specification: statement of standards

Unit title: Building Services: An Introduction

Unit code: HR42 46

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

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. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Throughout the unit emphasis will be placed where appropriate on the application of Health & Safety and Sustainability. Safe working practises should be looked at in accordance with current safety codes of practise and regulations. Sustainability should include reference to criteria affecting sustainability, impact of not implementing sustainability on the environment and the legislation promoting sustainability.

Outcome 1

Demonstrate an understanding of the selection and design of above and below ground drainage systems

Knowledge and/or skills

- ◆ Building requirements, apply design standards and propose practical systems and equipment to satisfy the requirements
- ◆ Above ground single stack waste system
- ◆ Below ground combined and separate drainage systems
- ◆ Private wastewater treatment methods

Evidence Requirements

Evidence for the knowledge and /or skills in this Outcome will be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown above. In any assessment of this Outcome **two out of four** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of **two out of four** knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to the two items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item sampled by showing that the candidate is able to:

- ◆ interpret building requirements, select and propose practical systems and equipment to satisfy the requirements for above and below ground drainage systems

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Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under open book conditions and as such candidates should be allowed to bring any textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this Outcome might be combined with that for Outcomes 2, 3, 4 and 5 to form a single assessment paper of no more than two hours duration. Alternatively the assessment for this Outcome could be a single assessment question paper. The assessment event should be carried out under open book supervised controlled conditions.

Outcome 2

Demonstrate an understanding of the selection and design of hot and cold water supply and distribution systems

Knowledge and/or skills

- ◆ Building requirements, apply design standards and propose practical systems and equipment to satisfy the requirements
- ◆ Cold water supply systems
- ◆ Hot water supply systems

Evidence Requirements

In any assessment of this Outcome **all** knowledge and/or skills items should be included.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ interpret building requirements, select and propose practical systems and equipment to satisfy the requirements for hot and cold water supply systems

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under open book conditions and as such candidates should be allowed to bring any textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 3, 4 and 5 to form a single assessment paper of no more than 2 hours duration. Alternatively the assessment could be combined with Outcome 4 using a single assessment paper. The assessment event should be carried out under open book supervised controlled conditions.

Outcome 3

Produce annotated sketches of the supply and distribution of electricity

Knowledge and/or skills

- ◆ Intake arrangements
- ◆ Consumer control and safety devices
- ◆ Power circuits
- ◆ Lighting circuits

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown above. In any assessment of this Outcome **two out of four** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of **two out of four** knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to the two items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ sketch and describe arrangements for service cable entry , control, earth and safety systems, power circuits and lighting circuits

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under open book conditions and as such candidates should be allowed to bring any textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 2, 4 and 5 to form a single assessment paper of no more than two hours duration. The assessment event should be carried out under open book supervised controlled conditions.

Outcome 4

Select and produce annotated sketches of appropriate space heating systems

Knowledge and/or skills

- ◆ Building requirements and propose practical systems and equipment to satisfy the requirements
- ◆ Types of fuel available
- ◆ Central heating systems
- ◆ Control system

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown above. In any assessment of this Outcome **three out of four** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of **three out of four** knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all three items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ interpret building requirements, select and propose practical systems and equipment to satisfy the requirements for a space heating system

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under open book conditions and as such candidates should be allowed to bring any textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 2, 3 and 5 to form a single assessment paper of no more than two hours duration. Alternatively the assessment could be combined with Outcome 2 using a single assessment paper. The assessment event should be carried out under open book supervised controlled conditions.

Outcome 5

Describe home electronic security systems

Knowledge and/or skills

- ◆ Bell only and monitored intruder alarm systems
- ◆ Security lighting
- ◆ CCTV systems

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown above. In any assessment of this Outcome **two out of three** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of two out of three knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to the two items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ list the principal components of an intruder alarm and CCTV systems and identify different types of security lighting

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under open book conditions and as such candidates should be allowed to bring any textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 2, 3, and 4 to form a single assessment paper of no more than two hours duration. Alternatively the assessment for this outcome could be a single assessment question paper. The assessment event should be carried out under open book supervised controlled conditions.

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Administrative Information

Unit code:	HR42 46
Unit title:	Building Services: An Introduction
Superclass category:	TH
Date of publication:	August 2017
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Unit specification: support notes

Unit title: Building Services: An Introduction

This part of the Unit specification is offered as guidance. The support notes 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 candidates to develop knowledge, understanding and skills in the following areas:

- 1 Demonstrate an understanding of the selection and design of above and below ground drainage systems.
- 2 Demonstrate an understanding of the selection and design of hot and cold water supply and distribution systems.
- 3 Produce annotated sketches of the supply and distribution of electricity.
- 4 Select and produce annotated sketches of appropriate space heating systems.
- 5 Describe home electronic security systems.

This Unit has been developed as part of a group of building services units. There are three other units in the group entitled Building Services in Commercial and Industrial Buildings, Building Services Design: Heating, Lighting and Acoustics and Building Services Design: Ventilation & Air Conditioning. This Unit at SCQF level 6 is included within the SQA Advanced Certificate and SQA Advanced Diploma in Built Environment and Civil Engineering awards.

The three units mentioned in the previous paragraph have been developed as an integrated suite of units to meet all the building services requirements of the SQA Advanced Certificate and SQA Advanced Diploma in Built Environment awards. However, this does not preclude the use of one or more of these units in other awards where award designers feel this to be appropriate. As well as providing a substantial course in building services principles these units also provide important underpinning knowledge, understanding and skills for other parts of the SQA Advanced Certificate and SQA Advanced Diploma in Built Environment awards

In designing this Unit the unit writers have identified the range of topics they would expect to be covered by lecturers. The writers have also given recommendations as to how much time should be spent on each outcome. This has been done to help lecturers to decide what depth of treatment should be given to the topics attached to each of the outcomes. Whilst it is not mandatory for a centre to use this list of topics it is strongly recommended that it does so to ensure continuity of teaching and learning across the Building Services units and because the assessment exemplar pack for this Unit is based on the knowledge and/or skills and list of topics in each of the Outcomes.

The list of topics is given below. Lecturers are advised to study this list of topics in conjunction with the assessment exemplar pack so that they can get a clear indication of the standard of achievement expected of candidates in this Unit.

1 Demonstrate an understanding of the selection and design of above and below ground drainage systems (10 hours)

- ◆ **Interpret building requirements, apply design standards and propose practical systems and equipment to satisfy the requirements**
 - interpretation of building operational requirements, recognition of the balance between statutory, health, safety and welfare arrangements and aesthetic considerations
 - proposals regarding the number and location of soil vent pipes and branch pipes
 - selection of number and type of sanitary fittings and components
 - selection of combined or separate drainage system

- ◆ **Design standards**
 - Building Standards Part M – Regulations 24 & 25.
 - BS EN 12056: Gravity drainage systems inside buildings.
 - BS EN 752: Drain and Sewer systems outside buildings.
 - BS EN 1610: Construction and testing of drains and sewers.
 - BS EN 12566: Small wastewater treatment plants.
 - Design considerations to include: layout, specification notes, implications on space and maintenance requirements as well as capital and operating costs for the systems listed below

- ◆ **Above ground single stack waste system**
 - sanitary pipework — single stack system
 - soil and waste pipework
 - external and internal stacks
 - sanitary appliances — number, type and location of sanitary appliances
 - materials — plastics only
 - tests — soundness and performance

- ◆ **Below ground combined and separate systems**
 - choice of system advantages/disadvantages
 - system requirements
 - pipe gradients and self — cleansing velocity
 - choice of materials: uPVC, cast iron or clay
 - bedding materials and backfilling trenches
 - access to drains
 - testing drains: air and water tests

- ◆ **Private wastewater treatment methods**
 - cesspool
 - septic tank
 - packaged treatment plant

2 Demonstrate an understanding of the selection and design of hot and cold water supply and distribution systems (8 hours)

- ◆ **Interpret building requirements, apply design standards and propose practical systems and equipment to satisfy the requirements**
 - interpretation of building operational requirements, recognition of the balance between client, statutory, health, safety and welfare arrangements and aesthetic considerations
 - proposals regarding the suitability of a particular type of hot and cold water supply system

- ◆ **Design Standards**
 - BS EN 805: Water supply — requirements for systems and components outside buildings
 - BS EN 806: Specification for installations inside buildings conveying water for human consumption
 - Interpretation and application of statutory requirements, design standards and relevant publications for domestic buildings
 - Design of hot and cold water supply systems for domestic buildings containing a wide variety of environments and requirements
 - Design considerations to include: layout, specification notes, implications on space and maintenance requirements as well as capital and operating costs for the systems listed below:
 - cistern feed — indirect cold water supply
 - mains pressure — direct cold water supply
 - indirect hot water supply (storage)
 - direct hot water supply (instantaneous)

3 Produce annotated sketches of the supply and distribution of electricity (8 hours)

- ◆ **Intake arrangements**
Service cable entry, termination and metering details

- ◆ **Consumer control, earth system and safety arrangements**
Main isolation switch, RCD's, over current protective devices and type of earth system

- ◆ **Power circuits**
Ring circuits, spur outlets from ring main and radial circuits

- ◆ **Lighting circuits**
'Loop in' circuits and junction box circuits

- ◆ **Cable specification**
Type of cable and current carrying capacity

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4 Select and produce annotated sketches of appropriate space heating systems (8 hours)

- ◆ **Interpret building requirements and propose practical systems and equipment to satisfy the requirements**
 - interpretation of building operational requirements, recognition of the balance between client, statutory, health, safety and welfare arrangements and aesthetic considerations
 - proposals regarding the suitability of a particular type of space heating system
- ◆ **Types of fuel available**
Natural gas, oil, LPG, coal and electricity
- ◆ **Central heating systems**
With boilers (regular, condensing and combi), with ducted warm air, with underfloor heating and with electric storage heating
- ◆ **Control systems**
Room thermostats, programmer, motorised valves and boiler interlock

5 Describe home electronic security systems (4 hours)

- ◆ **Bell only and monitored intruder alarm systems**
Bell, door contacts, keypad, internal sounder, control panel, movement detector, breaking glass detector and smoke detector
- ◆ **Security lighting**
Dusk to dawn lighting and movement activated lighting
- ◆ **CCTV systems**
Cameras, recording/storage devices, monitors, power supply and cabling

Unit Assessment — single assessment two hours maximum total

This takes the form of one combined assessment covering the content of all outcomes or alternatively four separate assessment papers.

If all outcomes are assessed in a single event this should take place over no longer than two hours

Guidance on the delivery and assessment of this Unit

As this Unit provides core building services which underpins much of the studies done in the other building services of SQA Advanced Certificate and SQA Advanced Diploma in Built environment awards it is recommended that the Unit be delivered towards the start of these awards.

Where this Unit is incorporated into other group awards it is recommended that it be delivered in the context of the specific occupational area(s) that the award is designed to cover.

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the SQA Advanced Unit specification: statement of standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates.

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Opportunities for developing Core Skills

Core Skills Signposting

The following grid provides a general guide to opportunities for the development of Core Skills in this Unit. Opportunities for the development of Core Skills at the output level are more fully identified in the Core Skills Signposting Guide.

Core Skill	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5
1 Communication					
Reading	3	3	3	3	3
Writing	3	3	3	3	3
Oral					
2 Numeracy					
Using Number					
Using Graphical Information					
3 IT					
Using Information Technology					
4 Problem Solving					
Critical Thinking	3	3		3	
Planning and Organising					
Reviewing and Evaluating	3	3		3	
5 Working with Others					

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Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. However, with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangement would be required to be put in place to ensure that the assessment, which is required to be at a single event, was conducted under controlled, supervised conditions.

For information on normal open learning arrangements, please refer to the SQA guide *Assessment and Quality Assurance of Open and Distance Learning* (SQA 2000).

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.

General information for candidates

Unit title: Building Services: An Introduction

This Unit has been designed to allow you to develop knowledge, understanding and skills in a range of building services provided in domestic buildings. It will enable you to interpret the requirements and propose practical schemes suitable for installations in domestic buildings. The content of the unit is intended to provide sufficient depth of knowledge and understanding of building services for those following courses in the Built Environment programme. Separate specifications for specialist units are available for those following the Building Services Engineering programme.

On completion of the Unit you should be able to:

- 1 Demonstrate an understanding of the selection and design of above and below ground drainage systems.
- 2 Demonstrate an understanding of the selection and design of hot and cold water supply and distribution systems.
- 3 Produce annotated sketches of the supply and distribution of electricity.
- 4 Select and produce annotated sketches of appropriate space heating systems.
- 5 Describe home electronic security systems.