

SQA Advanced Unit specification

General information for centres

Unit title: Construction Technology: Industrial/Commercial Superstructure (SCQF level 7)

Unit code: HR4G 47

Superclass: TE

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Version: 01

Unit purpose

This Unit is designed to enable learners to gain knowledge and understanding of a range of the more common forms of superstructure construction used in industrial or commercial buildings. The Unit commences with structural frames and continues with the construction of different forms of walls, floors and roofs. This elemental approach to construction will allow learners to build a sound understanding of the fundamental characteristics of the individual components and basic theory before developing awareness of the more complex structural and elemental relationships. The Unit is aimed at learners undertaking the following: SQA Advanced Certificate/SQA Advanced Diploma in Architectural Technology, SQA Advanced Certificate/SQA Advanced Diploma in Construction Management, SQA Advanced Certificate/SQA Advanced Diploma in Quantity Surveying, and SQA Advanced Certificate/SQA Advanced Diploma in Building Surveying. Learners will have previously achieved or will be in the process of completing Construction Technology: Substructure or equal qualification.

Outcomes

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

- 1 Compare different forms of structural frame used in industrial or commercial buildings.
- 2 Compare different forms of wall enclosure suitable for use with structural frames used in industrial or commercial buildings.
- 3 Compare different forms of floor and roof suitable for use with structural frames used in industrial or commercial buildings.

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Credit points and level

1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Recommended entry to the Unit

While entry is at the discretion of Centre, the content of the Unit does rely heavily on the learner having sound knowledge of substructure construction and some appreciation of traditional construction methods. It is therefore recommended that appropriate construction Units have been achieved before commencement or that learner competency is otherwise demonstrated.

Core Skills

There are opportunities to develop aspects in the Core Skills of *Communication*, *ICT* and *Problem Solving*. These are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

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 Unit is a mandatory credit within the SQA Advanced Certificate/SQA Advanced Diploma in Architectural Technology, SQA Advanced Certificate/SQA Advanced Diploma in Construction Management, SQA Advanced Certificate/SQA Advanced Diploma in Quantity Surveying, SQA Advanced Certificate/SQA Advanced Diploma in Building Surveying qualifications.

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.

Unit specification: Statement of standards

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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

Compare different forms of structural frame used in industrial or commercial buildings.

Knowledge and/or Skills

- ◆ Comparative characteristics of structural frames
- ◆ Sustainable design and construction criteria
- ◆ In situ and precast concrete structural frames
- ◆ Steel structural frames
- ◆ Timber structural frames

Outcome 2

Compare different forms of wall enclosure suitable for use with structural frames used in industrial or commercial buildings.

Knowledge and/or Skills

- ◆ Non-loadbearing masonry infill or panel installation
- ◆ Concrete cladding panel installation
- ◆ Metal cladding panel installation
- ◆ Timber cladding panel installation
- ◆ Glazed curtain walling

Outcome 3

Compare different forms of floor and roof suitable for use with structural frames used in industrial or commercial buildings.

Knowledge and/or Skills

- ◆ Long and short span roofing systems
- ◆ Long and short span flooring systems
- ◆ Finishes to pitched and flat roofs
- ◆ Floor and stair finishes used in large industrial or commercial buildings
- ◆ Concrete stair installation

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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 understand the reasons for using:

- ◆ different forms of structural frame found in industrial or commercial buildings and explain the technologies.
- ◆ different forms of wall enclosure found in industrial or commercial buildings and explain the technologies.
- ◆ different forms of floor and roof found in industrial or commercial buildings and explain the technologies.

The whole of the content listed in the Knowledge/Skills section must be taught and be available for assessment.

It is recommended that assessment be undertaken on an Outcome by Outcome basis in the sequence specified.

Each assessment is to be closed-book but might incorporate selected material specified by the assessor and produced by the learner over the period of delivery, for example, complex construction details. Such material, if required, should be identified by the assessor as part of the assessment preparation prior to the event.

Each event should last 1 hour and be carried out under supervised, controlled conditions. All three Outcomes need to be demonstrably achieved through, for example, the use of a 50% Pass mark.

Assessment should be composed of an appropriate balance of short answer, restricted response and structured questions sampling a range of Knowledge and Skills items.

When sampling, the first stated item for all Outcomes must be assessed along with one other item from the list.

Should a second assessment attempt be required, the first stated item should still be used as the testing basis but the other item must be different to those used in the first paper.

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, *Construction Technology: Industrial/Commercial Superstructure*, has been developed as part of a suite of construction technology Units. The other Units are *Construction Technology: Domestic Construction*, *Construction Technology: Substructure*, *Construction Technology: Specialist Systems*, *Sustainability and Modern Methods of Construction*. This Unit at SCQF level 7 is contained within the SQA Advanced Certificate and SQA Advanced Diploma in Built Environment awards with the sole exception of 'SQA Advanced Certificate in the Built Environment'.

The Units mentioned above have been developed as an integrated suite to meet all the construction technology 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 the content to be appropriate. As well as providing a substantial course in construction technology 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 writer has identified a wide range of topics which might be sampled by lecturers as deemed appropriate to learner and course requirements. It is not mandatory for a centre to use the full list of topics. It is recommended sufficient coverage is provided to ensure continuity of teaching and learning across the technology spectrum. The Assessment Support Pack for this Unit is based on the Knowledge/Skills and sampling from the list of topics in each of the Outcomes. There is also recommendation as to how much time should be spent on each Outcome.

The list of topics is given below. Lecturers are advised to study this list of topics in conjunction with the Assessment Support Pack to get a clear indication of the standard of achievement expected of learners in this Unit.

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Outcome 1: (16 hours)

Compare different forms of structural frame used in industrial or commercial buildings.

- ◆ **Comparative characteristics of structural frames:**
 - Comparing structural characteristics of frame construction and masonry construction
 - Comparing advantages and disadvantages of long and short span structural frames
 - Comparing principles of Pin jointed systems and Rigid jointed systems
- ◆ **Sustainable design and construction criteria:**
 - Structural stability — foundations, bracing techniques, dead and live loadings
 - Structural frame design — materials, manufacture, transportation, life cycle appraisal
 - Structural frame construction — site planning/control, frame erection, site plant, H & S
 - Typical setting out criteria for frame and foundations
- ◆ **In situ and precast concrete structural frames:**
 - Production and manufacture of the two systems
 - Principles of basic reinforced concrete and pre-stressing/post tensioning
 - Beam, slab and column formwork and falsework
 - Skeleton frames
 - Portal frames
- ◆ **Steel structural frames:**
 - Comparing strength, cost, adaptability, sustainability
 - Skeleton frames
 - Portal frames
 - Prefabrication
- ◆ **Timber structural frames:**
 - Comparing strength, cost, adaptability, sustainability
 - Skeleton frames
 - Portal frames
 - Prefabrication

Outcome 2: (14 hours)

Compare different forms of wall enclosure suitable for use with structural frames used in industrial or commercial buildings.

- ◆ **Non-loadbearing masonry infill or panel installation:**
 - Relationship between infill or panel and the structural frame
 - Installation and frame connection details
 - Provision of movement/fabrication joints and critical detail specification
 - Construction implications of using infill/panel systems
 - Manufacture
 - Insulation requirements
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance
- ◆ **Concrete cladding panel installation:**
 - Relationship between concrete cladding panel and the structural frame
 - Installation and frame connection details
 - Provision of movement/fabrication joints and critical detail specification

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- Construction implications of using concrete cladding systems
 - Manufacture
 - Insulation Requirements
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance
- ◆ **Metal cladding panel installation:**
- Relationship between metal cladding panel and the structural frame
 - Installation and frame connection details
 - Provision of movement/fabrication joints and critical detail specification
 - Construction implications of using metal cladding systems
 - Manufacture
 - Insulation requirements
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance
- ◆ **Timber cladding panel installation:**
- Relationship between timber cladding panel and the structural frame
 - Installation and frame connection details
 - Provision of movement/fabrication joints and critical detail specification
 - Construction implications of using timber cladding systems
 - Manufacture
 - Insulation Requirements
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance
- ◆ **Glazed curtain walling:**
- Relationship between curtain wall and the structural frame
 - Installation and frame connection details
 - Provision of movement/fabrication joints and critical detail specification
 - Construction implications of using timber cladding systems
 - Manufacture
 - Insulation Requirements
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance

Outcome 3: (10 hours)

Compare different forms of floor and roof suitable for use with structural frames used in industrial or commercial buildings.

- ◆ **Long and short span roofing systems:**
- Pitched triangular frame trusses
 - Flat top girders and lattice beams
 - Arch/vault/dome
 - Frame connection/edge fixing details
 - Sustainability — source, embodied carbon, energy use/efficiency, maintenance
 - Construction implications
 - Manufacture
- ◆ **Long and short span flooring systems:**
- Precast concrete and pre-stressed Units
 - In-situ concrete construction — flat slab, beam and slab, ribbed, waffle, ground supported long strip and large area floor slabs
 - Steel and concrete composite floors

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- ◆ **Finishes to pitched and flat roofs:**
 - Steel, aluminium, lead, slates and tiles, membranes, asphalt, green systems
 - Weather protection and rainwater discharge
 - Insulation requirements
 - Ridge, eaves and ventilation details
- ◆ **Floor and stair finishes used in large industrial or commercial buildings:**
 - Services and communications provision — heating, lighting, ventilation, IT
 - Screeds/tiles/sheets, raised access floors, Health and Safety, spread of flame
- ◆ **Concrete stair installation:**
 - Stair terminology reviewed and expanded
 - Formation and protection of opening in floor for stair installation
 - Stair geometry and compliance with Building Regulations and escape criteria
 - Stair construction and reinforcement — in situ and precast
 - Stair landing connection details — in situ and precast

Guidance on approaches to delivery of this Unit

This Unit provides the core construction technology of superstructure which underpins much of the study done in other areas of SQA Advanced Certificate and SQA Advanced Diploma in Built Environment awards. Its logical delivery will be following completion of *Construction Technology: Domestic Construction* and *Construction Technology: Substructure* although it could reasonably be offered alongside the latter. Dealing with some complex technological theory and elemental relationships it is suggested that the Unit would be best accommodated well in to the programme but prior to, or in support of, the second year *Graded Unit*.

Centres are asked to consider imaginative ways in which to contextualise learning when delivering this Unit and of supporting the learner in developing an embedded understanding of fundamental principles inherent in superstructure construction. The aim should be to encourage the use of learning and teaching approaches that are varied and appropriate to the aims of the Unit. This might be facilitated by visiting construction sites where appropriate work is being carried out or by carrying out assessor structured internet based investigation into specific technological aspects. There is also perhaps opportunity of integrating or developing knowledge within other components of the programme such as in the use of CAD or when generating evidence within the second year *Graded Unit*.

Guidance on approaches to assessment of this Unit

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

Given the complex nature of much of the technological content and the stated assessment requirements guidance should be given to the learner by way of pre-assessment review prior to the event. It may be that the core of the assessment is based on a product developed by the learner and this would need to be identified and explained. This might be, for example, a portfolio of construction details or some investigative report but must be only authentic learner-centred materials produced in tutorial or formative development and examination. All assessments being closed-book, reference to centre generated materials or class notes or textbooks, etc is not permitted.

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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.

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 aspects in the Core Skills of *Communication, Information and Communication Technology (ICT) and Problem Solving*.

The evidence produced through undertaking all three Outcomes will require the learner to demonstrate competency in using and writing technical language and of showing a proper understanding when reading the task requirements.

The use of *ICT* and *CAL* may be found to be appropriate in developing the learner's knowledge and understanding of the subject matter should centres find this to be an appropriate teaching vehicle.

Assessment responses required throughout will demand of the learner an ability to analyse technical information and to make correct decisions based on the sound application of knowledge to a question, postulation or hypothesis. A range of problems to be solved will be inherent in the assessment content.

Sustainability aspects are available to be explored by the learner within all three Outcomes. These are integrated into the expanded topics within the Support Notes and should be so contextualised into the assessment instrument produced by the centre.

History of changes to Unit

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: Construction Technology: Industrial/Commercial Superstructure (SCQF level 7)

This section will help you decide whether this Unit is for you by explaining what it 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.

It is designed to enable you to gain knowledge and understanding of a range of the more common forms of superstructure construction used in large industrial or commercial buildings. The Unit commences with structural frames and continues with the construction of different forms of walls, floors and roofs.

The Unit is aimed at learners undertaking SQA Advanced Certificate/SQA Advanced Diploma in Architectural Technology, SQA Advanced Certificate/SQA Advanced Diploma in Construction Management, SQA Advanced Certificate/SQA Advanced Diploma in Quantity Surveying, SQA Advanced Certificate/SQA Advanced Diploma in Building Surveying. You will have previously achieved or will be in the process of completing *Construction Technology: Substructure* or another appropriate qualification.

The level of this SQA Advanced Unit is 1-SQA-Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7) and is a mandatory component of the above mentioned qualifications all of which are fully articulated into Honours Degree awards offered by Scottish universities. These qualifications are also recognised by industry lead bodies such as CIAT, RICS, CIOB.

The testing of your competency will be by closed-book assessment but might incorporate selected material specified by your assessor and produced by yourself over the period of delivery, for example, complex construction details. Such material, if required, would be identified by the assessor as part of the assessment preparation prior to the event. Each assessment would last 1 hour and be carried out under supervised, controlled conditions. The three assessments need to be fully achieved through, for example, the use of a 50% Pass mark and covering the following topics:

- 1 Compare different forms of structural frame used in industrial or commercial buildings.
- 2 Compare different forms of wall enclosure suitable for use with structural frames used in industrial or commercial buildings.
- 3 Compare different forms of floor and roof suitable for use with structural frames used in industrial or commercial buildings.

When doing this Unit you will be challenged with a wide range of technical demands relying on your developing knowledge and skills in the production and use of construction details, structurally sound concepts, technical specification and terminology, and the application of this knowledge into other areas of your qualifications or your employment.

There are also opportunities to develop aspects in the Core Skills of *Communication*, *ICT* and *Problem Solving*. This will require you to demonstrate competency in using and writing technical language. The use of *ICT* and *CAL* may be found to be appropriate in developing your knowledge and understanding of the subject matter should the centre find this to be an appropriate teaching vehicle. Assessment responses required throughout will demand of you an ability to analyse technical information and to make correct decisions based on the sound application of knowledge to a question, postulation or hypothesis. Sustainability aspects are available to be explored within the scope of the various technical studies.