

SQA Advanced Unit specification

General information

Unit title: Sustainability and Modern Methods of Construction
(SCQF level 8)

Unit code: HR4K 48

Superclass: TE

Publication date: August 2017

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit has been created for the SQA Advanced Diploma in Built Environment and is designed to address the environmental impact and the appropriate application of new technological developments within the construction industry. Learners will be provided with an understanding of the nature and range of construction options and of relationships between modern building methods and sustainability in its widest sense.

The Unit covers and extends the scope and content of Outcome 4 of *Construction Technology: Specialist Systems*.

Outcomes

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

- 1 Describe the historical evolution of building prefabrication in the 20th Century to present day.
- 2 Describe different forms of off-site manufacture and on-site construction.
- 3 Explain the design and site planning implications associated with modern methods of construction.
- 4 Explain the environmental and sustainability issues associated with modern methods of construction.

Credit points and level

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

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Recommended entry to the Unit

Entry will be at the discretion of the centre. However, it would be advantageous if learners had achieved some level of understanding regarding the nature of sustainability and modern methods of construction. This might be determined through having completed the NC Unit *Modern Methods of Construction: An Introduction* or *Sustainable Design for Architecture: An Introduction*.

Core Skills

Opportunities to develop aspects of Core Skills 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

This Unit will be delivered as part of the SQA Advanced Diploma in Built Environment.

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

Describe the historical evolution of building prefabrication from the 20th Century to present day.

Knowledge and/or Skills

- ◆ Technological developments
- ◆ Socio-economic drivers
- ◆ Historical context
- ◆ Designers
- ◆ Aspiration and need
- ◆ Achievements and failings

Outcome 2

Describe different forms of off-site manufacture and on-site construction.

Knowledge and/or Skills

- ◆ Factory production
- ◆ Benefits of standardisation
- ◆ Modular/volumetric systems
- ◆ Panellised Units
- ◆ SIPS
- ◆ Kits
- ◆ Tunnel form
- ◆ Hybrid
- ◆ Preformed structural elements

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Outcome 3

Explain the design and site planning implications associated with modern methods of construction.

Knowledge and/or Skills

- ◆ Briefing and design stage
- ◆ Construction costs
- ◆ Construction quality
- ◆ Construction planning and programming
- ◆ Construction site safety
- ◆ Labour and plant
- ◆ Logistics

Outcome 4

Explain the environmental and sustainability issues associated with modern methods of construction.

Knowledge and/or Skills

- ◆ Energy use
- ◆ Passivhaus standards
- ◆ Code for Sustainable Homes/BREEAM
- ◆ Waste reduction
- ◆ Recycling
- ◆ Life cycle analysis

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:

- ◆ describe how modern methods of construction have evolved from inception to present day.
- ◆ describe the various forms of modern methods of construction available in both on and off-site contexts.
- ◆ explain the design and site planning implications associated with modern methods of construction.
- ◆ explain the environmental and sustainability issues associated with modern methods of construction.

The whole of the content listed in the knowledge/skills section must be taught and be available for testing. The assessment of each Outcome will be undertaken through sampling of the content. In any Outcome, a minimum of three Knowledge and/or Skill items must be sampled.

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The assessment should be conducted under closed-book conditions but may incorporate material specified by the Centre and produced by the learner over the period of delivery, for example, research and investigation production.

It is recommended that each Outcome is assessed individually but centres may wish to combine Outcomes so long as the total assessment load for all Outcomes be no more than three hours.

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

Outcome 1: (8 Hours)

Describe the historical evolution of building prefabrication from the 20th Century to present day.

For this Outcome, it is suggested that tutors begin by looking at the drivers for prefabricated buildings to facilitate a need after events such as WW2 and natural disasters. The role of prefabricated buildings need not only be discussed in a domestic context but for temporary and permanent buildings (or parts of) within an industrial context. It is also suggested that tutors allow learners the opportunity to investigate historical designers through to more modern pioneers to understand how the process has evolved through new technology and processes whilst acknowledging the failings of traditional methods where hazardous and poor quality materials were prevalent.

Outcome 2: (12 Hours)

Describe different forms of off-site manufacture and on site construction.

It is important that a wide overview of all forms of Modern Methods of Construction are delivered for this Outcome. Tutors should use factory production as a starting point which will look at factory conditions and the benefits they can bring to the methods of construction with advantages of CNC/CAM in terms of delivering non-restrictive material forms.

Cost savings in terms of how high degrees of repetition make more cost effective solutions in the long run rather than bespoke items should be emphasised, perhaps using case studies such as hotels, etc. Tutors should then explore all systems identified in the knowledge/skills section, identifying benefits and constraints of each. Practical considerations such as integration of services as well as a strong regard for technical points surrounding each system.

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An example of this could be looking at Panelised systems where it would be expected to ensure that learners are made aware of the differences between open, closed and concrete panels with acknowledgement of the construction sequences as well as the properties of each. Learners would then be expected to describe common materials use, in the case of SIPS this would be looking at OSB/foam core insulation, etc and ways that the surfaces could be finished both internally and externally.

The structure of this example can be applied across all systems identified in the Knowledge/Skills section for this Unit. There may be an opportunity for a slight crossover between Outcome 2 and Outcome 3 in terms of looking at factory conditions and contributions towards quality, etc tutors must be mindful to differentiate between factory production and quality.

Outcome 3: (10 Hours)

Explain the design and site planning implications associated with modern methods of construction.

For this Outcome tutors should look at RIBA plan of work and how consideration for off-site construction is included within Stage 2 following interpretation of clients brief. Awareness should be made regarding early design freezes as modifications after the manufacturing process begins will be costly. Cost comparisons can be made looking at traditional costs as well as initial capital costs against mass production. Learners will be expected to understand the perceived quality benefits associated with factory production in terms of the facilities, climatic considerations as well as a QC procedures which can contribute to less snagging items.

Sequencing of building operations, logistics, transportation/storage of materials/just-in-time will all be covered as part of planning and programming where site specific issues may bring added value to these topics. Evaluating string diagrams may assist learners in understanding the reduction or increase of site traffic due to the presence of static or mobile plant with particular trades perhaps requiring less time on site as a result, it would also be advantageous to ensure the learners understand the constraints associated with all types of plant and logistical arrangements around various greenfield and brownfield sites.

Labour should include skill shortages — skilled/semi-skilled and specialised teams who may not necessarily be geographically convenient to the site where site activities are taking place.

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Outcome 4: (10 Hours)

Explain the environmental and sustainability issues associated with modern methods of construction.

Outcome 4 should be where all Knowledge/Skills are contextualised with statistical information that is available from government and manufacturers literature. Government targets may be used as a basis for emphasising the need for a reduction in carbon emissions and learners will be expected to respond as to how modern methods of construction contribute to this.

Energy use can be analysed during the manufacturing, building and in use phases of a project offering learners the opportunity to understand the importance of a thoughtful design, build and deconstruction/reuse process. Standards, benchmarks and guidelines such as Passivhaus, BREEAM and Code for Sustainable homes should be explained to the extent that the learner understands their principles and how they drive the sustainability and environmental credentials of Modern Methods of Construction.

Life cycle analysis should look at justification of design/construction decisions based on sustainability and not on initial capital cost with regard for deconstruction and recycling reduction of all systems and materials throughout the manufacturing, construction and deconstruction stage.

Guidance on approaches to delivery of this Unit

It is recommended that the Outcomes are learned sequentially from 1 to 4 however, it may be appropriate to combine teaching of Outcomes in order to maintain continuity on a particular subject.

The utilisation of case studies is imperative to contextualise and analyse the theoretical knowledge. With this in mind it is recommended that learners undertake a series of precedence studies and tutorials aimed at collating a portfolio of their own work which may be brought into exams to enhance responses to exam questions.

This portfolio is not assessed but should include a range of technical information, statistics/data, sketches, photographs, etc. These can be collated from class room activities, site visits and general research.

There are various white papers and organisations such as BRE, NHBC who publish up to date statistical and analytical data which could assist with the interpretation of Outcomes 2, 3, and 4. Material for Outcome 1 could be from a research exercise led by the tutor.

All research material could be compiled as individual or group exercises to encourage peer learner. This must be facilitated by the tutor and students should not be left to their own devices to compile portfolio material to ensure quality and consistency.

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 whole of the content listed in the Knowledge/Skills section must be taught and be available for testing. The assessment of each Outcome will be undertaken through sampling of the content. In any Outcome, a minimum of three knowledge and/or skill items must be sampled.

The assessment should be conducted under closed-book conditions but may incorporate material specified by the centre and produced by the learner over the period of delivery, for example, research and investigation portfolio. Questions should be structured to give learners the opportunity to give short and extended responses.

It is recommended that each Outcome is assessed individually but centres may wish to combine Outcomes so long as the total assessment load for all Outcomes be no more than three hours.

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

In this Unit learners will use Critical Thinking skills to analyse scenarios and select appropriate responses to questions in both class and exam work. This will include reviewing and evaluating evidence to propose a range of satisfactory responses to the desired tasks given by the tutor.

Working with Others and contributing to group exercises will play a big part in the delivery of the Unit which will encourage the development of Core Skills in this area.

Learners will be able to extract analyse and interpret graphical information by recording and presenting relevant information through the compilation of a folio of work and responses during tutorial and exam questions.

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Compilation of the portfolio may allow learners the opportunity to use *Information and Communication Technology (ICT)* to access information and carry out a range of processing tasks by researching and formalising responses to tutorial work.

Written Communication will be conducted throughout the assessment of the Unit with opportunities for Oral Communication embedded throughout the learning process.

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

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In this Unit you will learn about the evolution of modern methods of construction and how the emergence of new technology has improved the build-ability and reputation of these methods to the extent that they are now commonplace throughout the construction industry.

You will learn about the drivers and sustainability credentials of modern methods of construction as well as understanding the technical aspects of the different types of systems.

Opportunities to explore the constraints and build-ability issues will be prevalent throughout the Unit giving you a good overall knowledge of the drivers, benefits and constraints associated with modern methods of construction.

You will compile a personal portfolio of different systems and will be expected to research case studies as supplementary work to your core materials.

Assessments will be closed-book but you will be allowed to bring a portfolio of class work and research with you for the purpose of enhancing your responses to your exam questions.

In this Unit you will use critical thinking skills to analyse scenarios and select appropriate responses to questions in both class and exam work. This will include reviewing and evaluating evidence to propose a range of satisfactory responses to the desired tasks given by the tutor.

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