National Unit specification

General information

Unit title: Sustainability in the Construction Industry (SCQF level 6)

Unit code: H66C 46

Superclass: TK

Publication date: January 2014

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit aims to introduce learners to the basic principles of sustainability in relation to the construction, operation and demolition of buildings. The Unit is intended to give learners confidence in the qualitative assessment of sustainability in relation to construction, and to develop his or her technical skills to be able to communicate effectively with other members of the construction team.

This Unit is suitable for learners who have limited or no experience of Civil Engineering and the Built Environment, or of sustainability and building performance.

Outcomes

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

1 Explain the basic principles of sustainability in relation to material resources.
2 Explain the basic principles of sustainability in relation to energy used in the construction, operation and demolition of buildings.
3 Explain the basic principles of sustainability in relation to design features.

Credit points and level

1 National Unit credit at SCQF level 6 (6 SCQF credit points at level 6)

National Unit specification: General information (cont)

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Recommended entry to the Unit

Entry is at the discretion of the centre.

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

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 instrument of 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**.

National 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.

Outcome 1

Explain the basic principles of sustainability in relation to material resources.

Performance Criteria

(a) Explain the sources of common materials used in the construction industry.
(b) Explain the basic principles of sustainability in relation to materials used in the construction industry.
(c) Explain the energy aspects of obtaining, refining and transporting raw materials.
(d) Explain the energy requirements associated with recycling materials.
(e) Identify the benefits of using recycled materials.

Outcome 2

Explain the basic principles of sustainability in relation to energy used in the construction, operation and demolition of buildings.

Performance Criteria

(a) Explain the uses of energy in the erection of structures
(b) Explain the uses of energy during a building's operational life.
(c) Explain the uses of energy in the demolition of a building.
(d) Explain the concept of 'embodied energy' and the 'life cycle analysis' of a structure.
(e) Identify the advantages and disadvantages of on-site and off-site methods of construction in terms of energy use.

Outcome 3

Explain the basic principles of sustainability in relation to design features.

Performance Criteria

(a) Explain the effect of location, orientation and building form on sustainable design.
(b) Explain the design features for sustainability in heating, ventilation and lighting.
(c) Explain the design features used to minimise use of and reuse of water.
(d) Explain the design features used to minimise energy loss in design.

National Unit specification: Statement of standards (cont)

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Evidence Requirements for this Unit

Evidence is required to demonstrate that the learner has achieved all Outcomes and Performance Criteria.

Written and/or oral evidence is required to demonstrate that the learner has achieved all Outcomes to the standard specified in the Outcomes and Performance Criteria.

Evidence for these Outcomes should be obtained under controlled, supervised conditions.

An appropriate instrument of assessment will be a question paper consisting of a balance of multiple choice, short answer, restricted response and structured questions based on case study material for a simple domestic building. Learners may use notes, textbooks, hand-outs and internet material in producing the assessment responses, but must provide appropriate bibliographies and references.

Assessment must be manageable and practicable for centres and assessment of all Outcomes should not exceed 2 hours in duration.

Assessment of this Unit should cover the following:

Outcome 1 — learners should be able to demonstrate their knowledge and understanding of sources of common materials used in the construction industry and basic principles of sustainability in relation to their use; energy consumption in obtaining, refining and transporting raw materials; energy requirements associated with recycling materials and identifying the benefits of using recycled materials in construction.

Outcome 2 — learners should be able to demonstrate their knowledge and understanding of energy use throughout the whole life of a building, ie construction phase/operation phase/demolition phase; 'embodied energy', ie all activities involved in the production process both direct and indirect; advantages and disadvantages of on-site and off-site methods of construction relating to energy use.

Outcome 3 — learners should be able to demonstrate their knowledge and understanding of the effect that building location, orientation and form have on sustainable design; design features associated with sustainability in heating, ventilation and lighting systems; design features used to both minimise and reuse water.

National Unit Support Notes

Unit title: Sustainability in the Construction Industry (SCQF level 6)

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 developed as an optional Unit in the National Certificate Civil Engineering at SCQF level 6 and can also be delivered as a free-standing Unit.

Outcome 1

This Outcome will introduce learners to the basic principles of sustainability arising from use of a range of materials. Assessors should begin with sources of common construction materials, and proceed to consider sustainability of these resources. Energy used to produce these materials should then be considered. Consideration of the energy required and effect on depletion of material resources by use of recycled materials should then be considered.

Outcome 2

This Outcome will provide learners with the basic principles relating to energy use in construction. Assessors should include energy used in the building construction, operation and deconstruction processes including energy used in transportation, processing, erecting and dismantling of structures and proceed to the concept of life cycle assessment and embodied energy. Consideration should be given to how embodied energy could be minimised throughout the construction process by appropriate choice of plant, use of locally sourced materials, waste management plans, re-use or recycling of materials, the use of off-site methods of construction, etc.

Outcome 3

In this Outcome learners will gain the basic Knowledge and Skills required to assess and improve building design in order to improve sustainability. Consideration should be given to location, orientation and building form, heating, ventilation, lighting and water when considering design features.

The objective of this Unit is to assist the learner to develop an overall understanding of sustainability and its importance in the construction industry. Upon completion of the Unit, the learner will have better understanding of the principles of sustainability in relation to resources; energy used and associated design features within construction projects. It is envisaged that learners successfully completing this Unit will have the underpinning knowledge to enable progression to HN in Construction/Civil Engineering, preparing learners for further study or entry into employment at a technical level.

National Unit Support Notes (cont)

Unit title: Sustainability in the Construction Industry (SCQF level 6)

Guidance on approaches to delivery of this Unit

Emphasis in the delivery of the Unit should be on familiarisation with terminology and basic concepts.

The use of case study material is particularly recommended for both the learning and assessment components of this Unit. Study material should provide learners with drawings and/or a site visit to a low-rise domestic building to identify poor sustainability practices, and also drawings and/or a site visit to a low-rise domestic building to identify good sustainability practice. Practical application should be stressed throughout this Unit.

Suggested teaching and learning methods for this Unit could include: the use of visual aids, ICT, group lectures and discussion, practical demonstrations, question and answer sessions, directed study, site visits. It would be suitable for delivery by distance learning or e-learning.

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.

Learners may be assessed on an Outcome by Outcome basis, combinations of Outcomes or by a single, holistic assessment covering all Outcomes. In this Unit an appropriate instrument of assessment could be a question paper consisting of a balance of multiple choice, short answer, restricted response and structured questions based on case study material for a simple low-rise domestic building. Where possible, a single case study should form the basis for all assessments.

Assessments should be conducted under controlled open-book conditions.

Preparation for assessments could include formative work and/or project work.

Planning should allow time for re-assessment.

Where appropriate materials and facilities are available, this Unit could be delivered by distance learning which might include some degree of on-line support.

The Assessment Support Pack for this Unit provides appropriate sample assessment materials. Where centres wish to develop their own assessment materials they should refer to the Assessment Support Pack to ensure a comparable standard.

There may be opportunities for Accreditation of Prior Learning (APL) for learners who have undertaken the previous version of this Unit F3JS 12 *Sustainability in the Construction Industry*. This is at the discretion of delivering centres. There is no automatic credit transfer.

National Unit Support Notes (cont)

Unit title: Sustainability in the Construction Industry (SCQF level 6)

The Assessor must ensure that evidence is authenticated as the learners own work under assessment conditions.

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

All aspects of the Core Skill of *Problem Solving* — Critical Thinking, Planning, Organising, Reviewing and Evaluating could be developed and enhanced in the Unit, which requires the qualitative assessment of sustainability in the context of construction. Identifying and considering a wide range of relevant factors learners will develop the skills required to assess and improve building design.

Exploring ways to maximise the benefits of sustainability and overcome potential difficulties or limitations will involve a high level of critical and creative thinking. A focus on case studies in formative work for the Unit will give learners confidence in their ability to analyse issues, and to devise, justify and explain effective strategies for sustainability. Group discussion of construction design, energy and waste management solutions observed during site visits could be used to evaluate the strengths and limitations of various approaches to sustainability.

Essential Skills

The Unit should provide learners with an opportunity to develop the following essential skills for life, learning and work:

Employability — the Unit helps develop knowledge and understanding of industry standards, possibly encouraging basic IT skills in carrying out research for project work.

Citizenship — the Unit could provide opportunities to demonstrate citizenship skills through developing knowledge and understanding of roles and responsibilities of personnel within the construction industry.

Sustainability — the Unit provides specific scope for developing skills in sustainable development.

Enterprise — the Unit provides the opportunity to encourage the use of initiative, creative thinking and problem solving abilities.

History of changes to Unit

Version	Description of change	Date

General information for learners

Unit title: Sustainability in the Construction Industry (SCQF level 6)

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.

Sustainability is a concept which deals with mankind's impact, through development, on the environment. Today's environmental problems, like air pollution and energy use are largely a consequence of the unsustainable consumption of natural resources and the mismanagement of waste products. Sustainable construction addresses factors dealing with environmental protection, sustained economic growth and social equity.

Most societies want to achieve economic development to ensure higher standards of living now and in the future. Additionally most societies wish to protect and enhance their environment, both now and for their children. Sustainable construction is an attempt to reconcile these two objectives.

This Unit aims to develop the learner's ability to understand the reasons behind sustainable construction, incorporating material resources, energy uses and design solutions. By exploring ways to maximise the benefits of sustainability, you will develop the skills required to assess and improve building design, enhancing critical and creative thinking skills. Group discussion of construction design, energy and waste management solutions observed during site visits could also be used to evaluate the strengths and limitations of various approaches to sustainability.

The National Certificate programme which this Unit falls under is suitable for a wide range of learners including:

- School leavers
- Learners with a national certificate in a related discipline who wish to retrain in one of the technical disciplines
- Adult returners to education
- Learners in employment who wish to enhance their career prospects
- Learners with craft qualifications who wish to transfer to technical and managerial roles

Evidence is required to demonstrate that the learner has achieved all Outcomes and Performance Criteria covered in this Unit:

Outcome 1 — You should be able to demonstrate your knowledge and understanding of sources of common materials used in the construction industry and basic principles of sustainability in relation to their use; energy consumption in obtaining, refining and transporting raw materials; energy requirements associated with recycling materials and identifying the benefits of using recycled materials in construction.

Outcome 2 — You should be able to demonstrate your knowledge and understanding of energy use throughout the whole life of a building, ie construction phase/operation phase/demolition phase; 'embodied energy', ie all activities involved in the production process both direct and indirect; advantages and disadvantages of on-site and off-site methods of construction relating to energy use.

General information for learners (cont)

Unit title: Sustainability in the Construction Industry (SCQF level 6)

Outcome 3 — You should be able to demonstrate your knowledge and understanding of the effect that building location, orientation and form have on sustainable design; design features associated with sustainability in heating, ventilation and lighting systems; design features used to both minimise and reuse water.

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

Upon completion of the Unit, you will have better understanding of the principles of sustainability in relation to resources; energy used and associated design features within construction projects. It is envisaged that learners successfully completing this Unit will have the underpinning knowledge to enable progression to HN in Construction/Civil Engineering, preparing learners for further study or entry into employment at a technical level.

All aspects of the Core Skill of *Problem Solving* — Critical Thinking, Planning, Organising, Reviewing and Evaluating could be developed and enhanced in the Unit, which requires the qualitative assessment of sustainability in the context of construction. Identifying and considering a wide range of relevant factors learners will develop the skills required to assess and improve building design.