

# Higher National Unit Specification



## General information for centres

**Unit title:** Built and Natural Environment Integration

**Unit code:** F780 34

**Unit purpose:** This Unit is aimed at understanding the importance of site location and having, in general, a natural strategy, when developing buildings. It will encourage candidates to think of built environment design as a chance to protect and, perhaps, enhance the ecological value of the site by, for example, targeting low and zero carbon technical solutions, making use of locally-available materials in any proposed building and using local, natural water table levels for surface water drainage end points. Land ecology and other natural habitats as well as issues such as potential shadowing effects from new structures are important areas of study.

On completion of the Unit the candidate should be able to:

- 1 Explain the design principles and philosophy of a natural building.
- 2 Explain options for natural building design and construction.
- 3 Explain options for autonomy in building energy use and water.

**Credit points and level:** 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7\*)

*\*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 Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** Prior knowledge or skills are not essential for this Unit. However, it will be beneficial for candidates to have a basic knowledge of the way in which buildings affect the natural environment of their site location. This may be evidenced by possession of F4AK 34 *Scottish Rural Development*.

**Core Skills:** There are opportunities to develop Core Skills in this Unit. In particular, *Numeracy*, *Communication* and *Problem Solving* can all be developed to SCQF level 6. However, there is no automatic certification of Core Skills or Core Skills components.

**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:** The assessment of this Unit can reflect the teaching approach taken by a particular centre, however it is recommended that Outcome 1 is assessed separately using either an assignment question or short-answer questions based upon a previously-considered case study. Outcomes 2 and 3 could be assessed in combination, for example by means of a written report, supported by a case study analysis related to building project example.

## **Higher National Unit specification: statement of standards**

**Unit title:** Built and Natural Environment Integration

**Unit code:** F780 34

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.

### **Outcome 1**

Explain the design principles and philosophy of a natural building

#### **Knowledge and/or Skills**

- ◆ Building energy use and carbon emissions
- ◆ The natural environment and low and zero carbon technology building design
- ◆ Low environmental impact construction materials
- ◆ Sustainable gardens and landscapes

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the connection between building energy use and carbon emissions by citing two examples of a low carbon design strategy
- ◆ explain four benefits to the natural environment of low and zero carbon strategies applied to built environment projects
- ◆ compare the embodied energy of two building materials that perform the same function
- ◆ explain two ways in which gardens or landscapes adjacent to buildings can be used to enhance the sustainability of a building project

#### **Assessment Guidelines**

This Outcome could be assessed on its own. It could be assessed by means of an assignment question or short-answer questions based upon a previously-considered case study.

## **Higher National Unit specification: statement of standards (cont)**

**Unit title:** Built and Natural Environment Integration

### **Outcome 2**

Explain options for natural building design and construction

#### **Knowledge and/or Skills**

- ◆ Locally-available, sustainable building materials
- ◆ Natural materials in the wall structure and fabric
- ◆ Natural materials as rendering
- ◆ Green and natural roofs

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the potential applications for sustainable environmental building materials
- ◆ discuss the advantages and disadvantages of using two contrasting natural materials in the structure and fabric of walls
- ◆ assess in qualitative terms the effectiveness of one type of natural wall internal or external render material
- ◆ describe the technical properties of two different types of natural roof surface materials

#### **Assessment Guidelines**

Outcome 2 may be best assessed as part of a combined submission with Outcome 3. This submission is to be a report of approximately 1,500 words, supported by graphical material and appropriate natural building design ideas and practices, based upon a building project case study.

## **Higher National Unit specification: statement of standards (cont)**

**Unit title:** Built and Natural Environment Integration

### **Outcome 3**

Explain options for autonomy in building energy use and water

#### **Knowledge and/or Skills**

- ◆ Environmentally sensitive methods of heating buildings
- ◆ Low environmental impact methods of cooling buildings
- ◆ Water conservation
- ◆ Sustainable urban drainage systems
- ◆ Sustainable on-site sewage treatment systems

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain two methods of providing environmentally sensitive heating systems
- ◆ explain two low environmental impact methods of cooling buildings
- ◆ explain three ways in which water conservation can be enhanced by building design
- ◆ describe two sustainable methods of handling surface water in and around buildings
- ◆ explain the advantages and disadvantages of one method of sustainable on-site sewage treatment

#### **Assessment Guidelines**

Outcome 3 may be best assessed as part of a combined submission with Outcome 2. This submission is to be a report of approximately 1,500 words, supported by graphical material and appropriate natural building design ideas and practices, based upon a building project case study.

## Administrative Information

**Unit code:** F780 34  
**Unit title:** Built and Natural Environment Integration  
**Superclass category:** TA  
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### History of changes:

Version	Description of change	Date

**Source:** SQA

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## Higher National Unit specification: support notes

### Unit title: Built and Natural Environment Integration

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

Built and Natural Environment Integration might also be described as natural building. It is concerned with the materials used to build, energy use and avoiding, or at least minimising, negative impacts from building waste water. Materials choice is the principal influence upon the quality of a built project. Materials affect structure, aesthetic value, budget, construction time and method and the ease with which the internal environment is controlled.

Outcome 1 covers the fundamental strategies associated with sustainable or natural building design and the options that exist to achieve high quality in this regard. Awareness of performance variability and of technical improvements in time, after a period of use *in situ*, will be important. Topics to be covered include the connection between building energy use and carbon emissions, for example, in heating and hot water systems, lighting, carbon neutral design strategies, benefits to the local natural environment of low and zero carbon strategies applied to built environment projects and measurable embodied energy of building materials, which will include assessment of quarrying, processing, harvesting and manufacturing and transporting. Finally, gardens and landscapes have an important role to play in sustainable building design, in that trees and other planting can reduce the negative effects of wind and can assist in summer shading and cooling strategies.

Outcome 2 will develop the detail of materials choices for sustainable building structure and fabric. With the important pre-requisite understanding of the changing nature of construction materials applications as more is learned about their performance, the learning topics will include cob and rammed earth walls, earthships, straw bales walls, appropriate renders for these walls, such as clay and lime products. In addition, the widely varied application of timber to building design and construction will be a key aspect of Outcome 2, with analysis of timber sections for frames compared to using timber logs (ie in-the-round). Finally, in Outcome 2, roof design will be studied. Natural building roof materials examples are thatch, slate, timber shingles and, more recently, planted or 'green' roofs. The technical performance details of all of these will be analysed and discussed.

Outcome 3, after a general consideration of the concepts of building energy autonomy, super-insulation as a means towards passivity, allows for mechanisation in the sustainable sense. Heat, power, water and sewage are all still required in any climatically-controlled space. Candidates will be encouraged to appreciate this apparent conflict and discuss the technological options that can minimise the carbon footprint. Learning topics will be heating fuel choices based upon technical and environmental specifications, natural ventilation and other sustainable methods of cooling buildings, water conservation (collecting rainwater, re-claiming building waste water), sustainable urban drainage systems (SUDS), composting toilets and other sustainable methods of on-site or near-site sewage treatment.

## Higher National Unit specification: support notes (cont)

**Unit title:** Built and Natural Environment Integration

### Guidance on the delivery and assessment of this Unit

The delivery of this Unit will be by a range of teaching methods, including formal lectures, tutorial discussions, workshop experimental exercises, built environment design strategy discussions and construction practicals. In addition, visits to building project or other relevant sites or visits from industry practitioners are encouraged.

It may be appropriate in the assessment for Outcome 1 to be innovative in the approaches taken to generate evidence of competence. An assessment method that may be effective is an assignment report followed by peer assessment of work. With guidance from academic staff, a candidate's written work, or oral report, could be assessed by the student body.

#### *Opportunities for developing Core Skills*

Outcome 1 presents several opportunities to develop the *Numeracy* Core Skill. For example the determination of the embodied energy of building materials, the evaluation of wind speeds and pressures over buildings with roofs of different pitch and their impact on natural ventilation rates, and carbon emission determinations all present worthwhile opportunities.

Outcomes 2 and 3 have opportunities to develop all components of the Core Skill of *Problem Solving* as these Outcomes could involve the candidates investigating parameters and resolving appropriate outline designs from a range of options. For example candidates may be asked to propose a waste water system for a small guest house without the use of mains water.

The examination of the impact of building materials on the performance of the building will present several opportunities for the development of the Core Skill of *Numeracy*. For example, life cycle analyses, cost benefit evaluations and determinations of embodied energies of materials would all present appropriate opportunities for Using Numbers and Graphical Information.

In addition the assessment of Outcomes 2 and 3 entails the production of a report that may be used to further developing the Core Skills of *Communication* (potentially both Written and Oral Communication).

There is also the potential that some exercises could be undertaken as a group exercise for example to evaluate options and pool information with other candidates and this could be used to assist the development of the Core Skill of *Working with Others*.

### Open learning

This Unit could be delivered by distance or flexible learning. Although it would be beneficial for the candidate to attend the centre for supervised assessment, this could be done in off-centre locations with appropriate arrangements.

## **Higher National Unit specification: support notes (cont)**

**Unit title:** Built and Natural Environment Integration

### **Disabled candidates and/or those with additional support needs**

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website

**[www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements)**

## General information for candidates

### Unit title: Built and Natural Environment Integration

This Unit has been written to provide you, the candidate, with an understanding of the factors of influence in sustainable building design and construction and a broad understanding of the major functional characteristics of a sustainable built environment. The main learning topics include buildings energy use and carbon emissions, the local natural environment and low and zero carbon technologies, embodied energy of materials, local supply of materials, earth walls, straw bale walls, natural materials rendering, timber log buildings, green roofs, local sustainable heating fuels, sustainable water supply, sustainable drainage systems and on-site sewage treatment. The Unit is intended for candidates targeting a career in, or associated with, the low impact built environment sector.

On successfully completing the Unit you should be able to:

- 1 Explain the design principles and philosophy of a natural building.
- 2 Explain options for natural building design and construction.
- 3 Explain options for autonomy in building energy use and water.

The Unit is likely to be delivered using lectures, site visits, practicals, group work, investigation, including the use of technical journals and a range of other written and electronic media, and building project case studies.

The formal assessment for this Unit could consist of a single assignment project, or of separate pieces of work to become evidence of competence on your part. The assessments will be conducted under controlled conditions of timescale and other aspects of education quality. You should expect to have to submit work at the end of relevant Outcome teaching or at the end of the Unit teaching as a whole.

Whilst completing the work for this Unit there may be opportunities to develop Core Skills in the areas of *Communication*, *Problem Solving* and *Numeracy*. As an example communication could be developed within this Unit whilst studying the design principles of buildings, and when explaining these during the related assessments. Candidates completing their responses to Outcomes will also have to present essential ideas/information relating to both philosophy and technology and provide supporting detail in a logical and effective order. Some of this information may be numerical in nature that will enable aspects of both *Communication* and *Numeracy* to be developed. The assessment for the final Outcome may be in the form of a Case Study that may be structured to enable the Core Skill of *Problem Solving* to be developed.