



National Unit specification

General information

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

Unit code: H66F 46

Superclass: TH

Publication date: January 2014

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

The target learner group for this Unit is NC Built Environment learners. This Unit is an optional Unit within the NC Built Environment framework.

The purpose of this unit is to prepare learners for careers in the construction industry as technicians, technologists or other related professions in the fields of architecture, surveying, construction management and civil engineering, but not restricted to these fields.

The Unit introduces the basic principles of heat, sound and light relevant to construction and develops skills in completing calculations in relation to these principles. It includes the understanding of units and quantities in heat, light and sound and their application to basic problem solving. Learners will be introduced to basic problems relating to heat energy and transfer, natural and artificial lighting and sound generation, propagation and attenuation, together with their application in elements building science.

Outcomes

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

- 1 Explain and calculate heat transfer in buildings.
- 2 Explain and calculate sound intensity levels in buildings.
- 3 Explain and calculate light levels in buildings.

National Unit specification: General information (cont)

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

Credit points and level

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

Recommended entry to the Unit

Entry is at the discretion of the centre, however, learners would normally be expected to have attained the following, or equivalent:

- ◆ Intermediate 2 or above in Mathematics or Physics

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill	None
Core Skill component	Critical Thinking at SCQF level 5 Using Number at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Context for delivery

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

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

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 and calculate heat transfer in buildings.

Performance Criteria

- (a) Explain quantities and scales related to work, energy, power and heat transfer.
- (b) Identify heat transfer mechanisms.
- (c) Calculate total heat transfer and thermal transmittance co-efficients (U-Values).

Outcome 2

Explain and calculate sound intensity levels in buildings.

Performance Criteria

- (a) Identify and interpret units, quantities and scales in sound.
- (b) Describe sound transfer and sound insulation in buildings.
- (c) Calculate sound and intensity levels within buildings.

Outcome 3

Explain and calculate light levels in buildings.

Performance Criteria

- (a) Explain terminology and units for natural and artificial light.
- (b) Identify appropriate artificial lighting levels for buildings.
- (c) Calculate light levels in buildings.

National Unit specification: Statement of standards (cont)

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

Evidence Requirements for this Unit

Evidence is required to demonstrate that learners have achieved all Outcomes and Performance Criteria.

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

Assessment of this Unit should be a combination of descriptive answers, identification of units and solving by calculations. Assessment should be undertaken under closed book conditions. Learners should not make reference to class notes or any other text, however, calculators may be used.

A total duration of 3 hours for assessment should not be exceeded.

Evidence produced must include the following:

Outcome 1

- ◆ SI units for work, energy and power
- ◆ Heat transfer mechanisms
- ◆ Thermal conductivity (K-value)
- ◆ Thermal transmittance (U-value) — calculation
- ◆ Total heat loss — calculation

Outcome 2

- ◆ Nature of sound
- ◆ Conversion of sound pressure and sound intensity levels to decibels — calculation
- ◆ Sound transfer (airborne and impact)
- ◆ Sound insulation of party walls and floors

Outcome 3

- ◆ Factors affecting lighting level in buildings
- ◆ Terminology and units of artificial and natural light
- ◆ Calculation of light levels
- ◆ Inter-relationship between illuminance level and daylight factor

In the event of reassessment being required, learners should be assessed using an alternative instrument.



National Unit Support Notes

Unit title: Environmental Building Science: An Introduction
(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 is an optional Unit in the National Certificate in Built Environment and Civil Engineering at SCQF level 6 and can also be taken as a free-standing Unit.

This Unit is set in an introductory context in relation to environmental building science. The contexts to be illustrated will provide the learner with an appreciation of the application of the principles of heat, light and sound in a range of situations relating to buildings. This Unit forms a basic introduction to the topics and learners may explore these topics and their applications in greater depth at HN level, in a degree programme or in employment.

Outcome 1 enables learners to gain knowledge and understanding of the, units, quantities and scales associated with the expression of heat. Learners will apply this knowledge to produce technical solutions to heat transfer conditions using calculations.

Outcome 2 enables learners to gain knowledge and understanding of the, units, quantities and scales associated with sound and noise. Learners will apply this knowledge to produce technical solutions to sound conditions using calculations.

In Outcome 3 enables learners to gain knowledge and understanding of the terminology, units, quantities and scales associated with the expression of light. Learners will apply this knowledge to produce technical solutions to lighting conditions using calculations.

Guidance on approaches to delivery of this Unit

A suitable approach would be the use of illustrative methods, citing as many in-service situations as possible. The approach should be practice-based with, where possible, a considerable practical demonstration element in the teaching framework. At this level, the use of computer based teaching packages may be advantageous as a back-up to tutor-learner interaction.

National Unit Support Notes (cont)

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

The centre environment could be used to ascertain environmental conditions by using simple environmental equipment to measure air temperature, sound levels and lighting levels.

Where equipment-based measuring equipment is unavailable, profitable use of video, DVD, or online resources could be used to enhance 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.

In this Unit, the instrument of assessment could be a question paper consisting of short answer, restricted response questions and calculations. Evidence may be gathered using a single assessment to cover all Outcomes or alternatively, by assessing on an Outcome by Outcome basis. In any case the total assessment duration should not exceed 3 hours. Assessment will be conducted under closed book conditions without access to text or class notes.

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 F3JP 12 *Properties of Heat, Light and Sound in Construction*. This is at the discretion of delivering centres. There is no automatic credit transfer.

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.

National Unit Support Notes (cont)

Unit title: Environmental Building Science: An Introduction
(SCQF level 6)

Opportunities for developing Core and other essential skills

In this Unit learners will:

- ◆ demonstrate their understanding of the physical laws relating to the nature of heat, light and sound.
- ◆ complete calculations as they apply these principles to construction scenarios.

This will enable learners to develop further Core Skills in:

- ◆ *Numeracy*
- ◆ *Problem Solving*

Learners will be encouraged to consider sustainable development opportunities related to heat, light and sound in buildings through comparison of energy sources, consumption of energy and selection of insulation materials.

This Unit has the Critical Thinking component of Problem Solving and the Using Number component of Numeracy embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 5 and Numeracy at SCQF level 5.

History of changes to Unit

Version	Description of change	Date

© Scottish Qualifications Authority [year]

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Business Development and Customer Support team, telephone 0303 333 0330.

General information for learners

Unit title: Environmental Building Science: An Introduction (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.

This Unit will provide you with an introductory experience in the principles of heat, light and sound as applied to situations relevant to the building environment. You will develop a knowledge and understanding of basic principles, terminology, units and quantities as well as elements of practical application; however, the assessment instruments for this Unit will focus upon the application of that knowledge and understanding to solve problems.

Outcomes should be assessed through a series of short answer and/or restricted response questions involving quantities, scales, use of units and calculations in relation to heat, light and sound.

Assessment will normally be undertaken under closed book, timed conditions and will involve combinations of short answer and/or restricted response questions that will include calculations. Assessments could take the format of a single holistic assessment covering all three outcomes or alternatively it could be in the form of three separate outcome by outcome assessments.

On successful completion of this unit, you may be able to progress to further study of Building Science at HNC/HND or a similar subject at degree level.

In this Unit learners will:

- ◆ demonstrate their understanding of the physical laws relating to the nature of heat, light and sound.
- ◆ complete calculations as they apply these principles to construction scenarios.

This will enable learners to develop further Core Skills in:

- ◆ *Numeracy*
- ◆ *Problem Solving*

Learners will be encouraged to consider sustainable development opportunities related to heat, light and sound in buildings through comparison of energy sources, consumption of energy and selection of insulation materials.