Unit 2: Construction and the Environment

NQF Level 3: BTEC National

Guided learning hours: 60

Unit abstract

The construction industry poses a major potential pollution threat to our environment and is responsible for many pollution incidents. The implications of this must be taken to include possible less-evident, longer-term or indirect effects on succeeding generations, other species and biodiversity in general.

These incidents may arise out of ignorance, apathy, neglect, accident, vandalism or theft, and we must address all of these causes. This is a challenge, but responding to it should not be looked upon as a burden. The costs of non-compliance with increasingly demanding environmental legislation will be very high, and the construction industry must carry with them both the public and the institutions that provide its financial backing if it is to prosper.

Learners will understand the important features of the natural environment and the relationship between the natural and the built environment. The unit provides a fundamental understanding of the ways in which the activities of the construction sector impact upon the natural environment. The techniques, processes and procedures used to protect the natural environment are investigated, the advantages of adopting a sustainable approach to construction work are explored in the contexts of energy, materials and waste.

Learning outcomes

On completion of this unit a learner should:

1 Know the important features of the natural environment that need to be protected

2 Understand how the activities of the construction and built environment sector impact on the natural environment

3 Understand how the natural environment can be protected against the activities of the construction and built environment sector

4 Be able to select sustainable construction techniques that are fit for purpose.

Unit content

1 **Know the important features of the natural environment that need to be protected**

Features: air quality; ozone quality; soil quality; natural drainage landscape; natural amenities; land use; green belts; agriculture; forestry; countryside; heritage; water (resources, quality); marine environment; wildlife; biodiversity; natural habitat

2 **Understand how the activities of the construction and built environment sector impact on the natural environment**

Globally: build-up of greenhouse gases causing global warming; polluting emissions to air causing acid rain; ozone depletion due to use of chlorofluorocarbons (CFCs); over-extraction (of water; fossil fuels and raw materials), increased energy consumption; electricity generation; deforestation; loss of natural habitat; reduction in biodiversity

Locally: air pollution by combustion products and volatile organic compounds (VOCs); polluting discharges to water by communities, industry and agriculture, contaminated land; waste disposal; existing site dereliction; comfort disturbance (traffic, smells, noise, dust and dirt); increased pressure upon existing services and infrastructure; specification of hazardous materials, eg lead and asbestos; extraction of raw materials (by drilling, mining and quarrying); electromagnetic radiation from overhead power lines: sick building syndrome

3 **Understand how the natural environment can be protected against the activities of the construction and built environment sector**

By legislation: relevant Acts of Parliament; UK regulations; European directives

By control: Health and Safety Executive (HSE); Environment Agency (EA); local authorities (eg environmental services, planning, building control departments)

By design and specification: reduction in energy usage; minimisation of pollution; reduction in embedded energy; specification of environmentally friendly/renewable materials; re-use of existing buildings and sites

By management: simple environmental impact assessments (EIAs); improved management of construction sites; clear policies and objectives (eg reduction in wastage, increase in recycling, noise management, dust and dirt control); sharing of good practice; raising of awareness; communication of information

4 **Be able to select sustainable construction techniques that are fit for purpose**

Fit for purpose: to meet the needs of the present without compromising the ability of future generations to meet their own needs, eg social progress that recognises the needs of everyone, effective protection of the environment, prudent use of natural resources, maintenance of high and stable levels of economic growth and employment

Techniques: energy-based, eg reduced energy consumption, improved energy efficiency, use of renewable and alternative sources of energy; materials-based, eg specification of renewable materials, consideration of embodied energy and low-energy manufacture of materials and components; waste-based, eg producing less waste and re-cycling more, off-site prefabrication, modern methods of construction

Grading grid

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all of the learning outcomes for the unit. The criteria for a pass grade describe the level of achievement required to pass this unit.

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 identify and describe four different features of the natural environment that must be considered at the planning stage	M1 assess the potential environmental impact of a proposed construction project, either real or virtual, on the local natural environment	
P2 identify two different forms of global pollution and describe how each may harm the local environment		
P3 identify two different forms of local pollution and describe how each may harm the local environment		
P4 describe how legislation and control are used to reduce the environmental impact of the construction and built environment sector	M2 compare the four key methods used to protect the natural environment in terms of cost, effectiveness and public perception of the construction and built environment sector	D1 evaluate methods used to protect the natural environment against the potential environmental impacts of a tutor-specified 'real or virtual' construction project
P5 describe how good practice in design, specification and management can reduce the environmental impact of the construction and built environment sector		

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P6 select and describe a fit-for-purpose sustainable construction technique for each of the following issues: energy, materials, and waste.	M3 compare selected sustainable construction techniques in terms of relative cost and performance-in-use.	D2 justify their selection of appropriate sustainable construction techniques for a tutor-specified construction project.

Essential guidance for tutors

Delivery

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, seminar presentations, site visits, supervised practicals, research using the internet and/or library resources and the use of personal and/or industrial experience are all suitable. Delivery should stimulate, motivate, educate and enthuse learners. Visiting speakers will add to the relevance of the subject.

The intention of this unit is that learners should, at an early point in their studies, become aware that, although the provision of buildings and the built environment is essential to our quality of life and to the health of both the local and national economies, there is a high price to be paid in terms of environmental damage and the use of large quantities of resources. The delivery should clearly address both this issue and the established and emerging sustainable construction techniques used to minimise the environmental impact of the sector.

The intention is that the delivery should be broad rather than deep, and the unit should be contextualised as appropriate, for example, learners should be made aware of relevant environmental and building control legislation but there is no requirement for an in-depth treatment at this point. The same approach should inform other parts of the unit.

Because this unit is designed to be undertaken at an early stage of the programme, it is unlikely that learners will have had the time to develop an in-depth knowledge and understanding of construction technology great deal of knowledge and understanding of construction technology and this should be taken into account when introducing sustainable construction techniques.

Wherever possible links should be made to the practical aspects of construction, utilising photographs, drawings, plans, videos and CD ROM-based materials to give learners the opportunity to explore and contextualise environmental and sustainability issues. These materials can be supported by site visits or by studying flagship schemes either in progress or completed. Links with house building companies will prove most useful because they provide opportunities for learners to explore the planning, design and construction of buildings with which they are familiar and to which they have easy access.

Tutors should use these links to encourage the learners to:

- perform simple informal environmental assessments at the planning, design and construction phase of a project
- discuss the importance of controlling and disposing of ground water safely
- consider the various ways that waste can be controlled
- explore recycling issues using catalogues from local architectural salvage and reclamation companies
- suggest locally sourced and low-energy materials

- recognise that building sites generate high levels of noise, dust and fumes
- relate the use of insulation to improvements in energy efficiency
- recognise typical examples of contaminated land such as petrol stations and land-fill sites.

Although younger learners may have addressed environmental issues during their time in school, it is unlikely that the focus would have been on the construction and built environment sector and its impact on the natural environment. There are other links with the school curriculum, particularly in subjects such as Personal, Social and Health Education (PSHE), geography, design and technology, religious education and the sciences.

Other useful links can be made with Design Quality Indicators (DQIs) as found at www.ogc.gov.uk and with 'Education for sustainable development' (ESD). The latter proposes seven interrelated concepts that clarify the interaction between environment, society and economics: interdependence, citizenship and stewardship, needs and rights of future generations, diversity, quality of life, sustainable change and uncertainty and precaution. This site can be found at www.nc.uk.net/esd/gq2.htm and will provide tutors with a useful perspective.

Group activities are permissible, but tutors will need to ensure that individual learners are provided with equal experiential and assessment opportunities.

Health, safety and welfare issues are paramount and should be strictly reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken prior to practical activities. Centres are advised to read the *Delivery approach* section on page 24, and *Annexe G: Provision and Use of Work Equipment Regulations 1998 (PUWER).*

Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies or reports of practical assignments.

There are many suitable forms of assessment that could be employed, and tutors are encouraged to consider and adopt these where appropriate. Some examples of possible assessment approaches are suggested below. However, these are not intended to be prescriptive or restrictive, and are provided as an illustration of the alternative forms of assessment evidence that would be acceptable. General guidance on the design of suitable assignments is available on page 19 of this specification.

Some criteria can be assessed directly by the tutor during practical activities. If this approach is used, suitable evidence would be observation records or witness statements. Guidance on the use of these is provided on the Edexcel website.

The structure of the unit suggests that the grading criteria may be fully addressed by using three assignments. The first of these would cover learning outcomes 1 and 2, and therefore P1, P2, P3 and M1; the second would cover learning outcome 3, and therefore P4, P5, M2 and D1; and the third would cover learning outcome 4, and therefore P6, M3 and D2.

To achieve a pass grade learners must meet the six pass criteria listed in the grading grid.

For P1, learners must identify four different features of the natural environment that could suffer as a result of bad practice in the construction and built environment sector. The four features should be clearly differentiated from each other and must not be different aspects of the same thing. A brief description of each feature is required, but there is no requirement for any details of the mechanism by which harm may occur. Evidence for this criterion could be provided, for example, in the form of a presentation, a report on a real project that has been studied or through oral questioning based on a tutor provided case study.

For P2, learners must identify two different forms of global pollution. The two forms chosen should be clearly differentiated and must not be different aspects of the same thing. A clear description of the mechanism by which each form of global pollution may harm the environment is required, but there is no requirement for a rigorous explanation of any underpinning science. Examples of suitable evidencing approaches are as for P1.

For P3, learners must identify two different forms of local pollution. The two forms chosen should be clearly differentiated and must not be different aspects of the same thing. A clear description of the mechanism by which each form of local pollution may harm the environment is required, but there is no requirement for a rigorous explanation of any underpinning science. Examples of suitable evidencing approaches are as for P1.

For P4, learners must describe how legislation and control measures are used to reduce the environmental impact of the sector. Learners should demonstrate an understanding of how legislation and control is used, and the time and expense involved in each. There is no requirement for learners to demonstrate a detailed knowledge of environmental legislation, although they should be capable of naming the most important pieces of relevant legislation, and they should understand which statutory bodies would monitor, police and enforce such legislation. Examples of suitable evidencing approaches are as for P1.

For P5, learners must describe how good practice in design, specification and management can help reduce the environmental impact of the sector. Learners should provide examples to support the descriptions provided, and the examples must be clearly categorised as a design, specification or management technique. Diagrams should be used to support the text, wherever appropriate, but the standard of sketching and drawing is not an issue here. Examples of suitable evidencing approaches are as for P1.

To achieve a merit grade learners must meet all of the pass grade criteria **and** the three merit grade criteria.

For M1, learners must base the evidence provided upon either a proposed local construction project or a virtual project provided by the tutor. In either case, the project should be of a reasonable size and complexity. Useful examples might include a school, a housing estate, a shopping complex, a new sports ground or something similar. Learners must identify the features of the natural environment that are under threat during the pre-construction, construction and post-construction phases of the given project. Non-specific responses that refer to construction projects in general are not acceptable. There is no requirement for a rigorous scientific treatment of the mechanisms by which the natural environment may be harmed. The proposed project could also be used in M2, D1 and D2, if so desired.

For M2, learners must compare the four key methods used to protect the natural environment, (ie legislation, control, design, specification and management), in terms of: how well each achieves the stated objective of protecting the natural environment (effectiveness); the relative expense associated with each in life-cycle terms (cost); and the advantages and disadvantages of each in terms of good public relations and links with the community (public perception). Learners are not required to provide precise figures and relative expressions of cost will suffice (cheap, moderately expensive, and so forth).

There is no requirement for learners to go into great detail but they must demonstrate a broad understanding of the issues. For example, they may conclude that legislation is a long and expensive process, that control measures imply the existence of a large workforce to monitor, police and enforce compliance, that the effects of good design and specification can be felt throughout the entire life of a building and that good management is nothing more than the regularisation of good habits, and is relatively cheap. (These examples are for guidance only.)

For M3, learners must compare each of the selected techniques in terms of how well each does what it is intended to do (performance-in-use) and the relative outlay associated with each in life-cycle terms (cost). Learners are not required to provide precise figures and relative expressions of cost will suffice (cheap, moderately expensive, and so forth). Diagrams should be used to support the text, wherever appropriate, but the standard of sketching and drawing is not an issue here.

To achieve a distinction grade learners must meet all of the pass and merit grade criteria **and** the two distinction grade criteria.

For D1, learners must evaluate the methods used to protect the natural environment against the potential environmental impacts of a tutor-specified, real or virtual, construction project. Learners must justify these recommendations in terms of the specific features of the given construction project. Non-specific responses, that refer to construction projects in general, are not acceptable.

For D2, learners must justify the selection of appropriate sustainable construction techniques for a tutor-specified, real or virtual, construction project, for example that used for D1, in terms of the associated environmental and sustainability issues. Non-specific responses, that refer to construction projects in general, are not acceptable.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit should be delivered at an early stage of the programme. The primary intention is that this unit will raise issues that will inform and influence the delivery strategies to be used in all other units in the qualification. The learning outcomes and content articulate closely with the Environment unit in the BTEC Higher Nationals in Construction and the Built Environment. The content of this unit has been mapped against, and successfully supports, the Edexcel BTEC Environmental Learning Outcomes.

This unit may have links to the Edexcel Level 3 Technical and Professional NVQs for Construction and the Built Environment. Updated information on this, and a summary mapping of the unit to the CIC Occupational Standards, is available from Edexcel. See *Annexe D: National Occupational Standards/mapping with NVQs*.

The unit provides opportunities to gain Level 3 key skills in communication technology. Opportunities for satisfying requirements for Wider Curriculum Mapping are summarised in *Annexe F: Wider curriculum mapping*.

Essential resources

Some of the issues dealt with in this unit are global in nature and the relevant measuring equipment is not readily available. Relatively cheap and accurate equipment is, however, available to measure the parameters associated with local environmental issues such as air pollution and water pollution, and sound level meters are generally available in most centres.

Local authority environmental services departments may be prepared to assist with guest lectures or equipment on loan. Copies of the Building Research Establishment Environmental Assessment Method (BREEAM) and other environmental assessment methods should be made available for reference purposes. A great deal of useful source material is available, in bulk and at a reasonable cost, from the National Society for Clean Air & Environmental Protection. Greenpeace and Friends of the Earth offer similar resources.

There are a multitude of websites dedicated to this topic and it is difficult to recommend any single one in such a constantly changing environment. Learners will however benefit from accessing www.brampton-ecohouse.org.uk, where they will learn about the successful development of sustainable homes from start to finish, in a very user-friendly and accessible manner. The resource pack 'Environmental Resource Materials for Use in the Teaching of Construction Studies' (www.penarth.co.uk) also contains resource material that is useful at this level.

Indicative reading for learners

Textbooks

Anderson and Howard — *Green Guide to Housing Specification* (BRE Publications, 2000) ISBN 1860813763

Beggs C — *Energy Management and Conservation* (Architectural Press, 2002) ISBN 0750650966

Brownhill and Rao — *Sustainability Checklist for Developments*: *A Common Framework for Developers and Local Authorities* (BRE Publications, 2002) ISBN 1860815332

Graham P — *Building Ecology*: *First Principles for a Sustainable Built Environment* (Blackwell Science (UK), 2002) ISBN 0632064137

Hall K — *Green Building Bible* (The Green Building Press, 2003) ISBN 1898130019

Harrison P — *Green Building Handbook Volumes 1 and 2* (Spon Press, 2000) ISBN 0419261508

HSE — *How to Deal With Sick Building Syndrome Guidance for Employers, Building Owners and Building Managers* (Health and Safety Executive (HSE), 1995) ISBN 0717608611

NSCAEP — *Pollution Handbook 2006* (National Society for Clean Air & Environmental Protection) ISBN 0903474492

Shorter B — *Waste Minimisation in Construction — Training Pack, C555TP* (Construction Industry Research and Information Association, 2001) ISBN 0860175553

Waters J R A — *Energy Conservation in Buildings Guide to Part L of the Building Regulations* (Blackwell Science (UK), 2003) ISBN 1405112530

Key skills

Achievement of key skills is not a requirement of this qualification but it is encouraged. Suggestions of opportunities for the generation of Level 3 key skill evidence are given here. Staff should check that learners have produced all the evidence required by part B of the key skills specifications when assessing this evidence. Learners may need to develop additional evidence elsewhere to fully meet the requirements of the key skills specifications.

Communication Level 3	
When learners are:	**They should be able to develop the following key skills evidence:**
• identifying two forms of global pollution and describing how each may harm the local environment • identifying two forms of local pollution and describing how each may harm the local environment • describing how legislation and control are used to reduce the environmental impact of the construction and built environment sector • describing how good practice in design, specification and management can reduce the environmental impact of the construction and built environment sector.	C3.2 Read and synthesise information from at least **two** documents about the same subject. Each document must be a minimum of 1000 words long. C3.3 Write **two** different types of documents each one giving different information about complex subjects. One document must be at least 1000 words long.