

Higher National Unit Specification

General information for centres

Unit title: Design Principles and Application

Unit code: DP12 34

Unit purpose: This unit is designed to provide the candidate with a fundamental understanding of the design process and of how the planning and design phases are co-ordinated and managed.

This unit forms the design base for the study programme. The unit has been devised to enable candidates studying Building Services Engineering programmes to demonstrate both knowledge and understanding of design considerations and the design process. It is intended that this unit will help candidates develop the ability to apply, analyse and evaluate the design in terms of the production and cost implications for projects.

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

- ◆ Differentiate between the planning, design and production phases of the construction process and describe the co-ordination and management of each phase
- ◆ Analyse the various factors that affect the selection of materials, systems and equipment and evaluate the environmental impact of energy and other constraints on the planning, design and construction processes
- ◆ Describe the roles, responsibilities and obligations (including liability for health, safety and welfare) of all parties to a construction project
- ◆ Demonstrate how technology affects the design of a construction project and also the design processes and procedures used in the production phase.

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: It would be an advantage for candidates to have a basic understanding and knowledge of building services engineering science and technology. Such understanding and knowledge may be evidenced by the possession of a National Certificate in Building Services Engineering or a related subject. The unit includes all the basic principles necessary to allow candidates possessing other qualifications or experience to succeed in this unit.

Core skills: There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

General information for centres (cont)

Context for delivery: This unit was developed for the HNC in Building Services Engineering. If this Unit is delivered as part of another group award (s), it is recommended that it should be taught and assessed within the context of the group award (s) to which it contributes.

Assessment: It is possible to assess candidates either on an individual Outcome basis, combinations of Outcomes or by a single holistic assessment combining all Outcomes. The assessment paper/s should be composed of an appropriate balance of short answer, restricted response and structured questions. Assessment should be conducted under supervised, controlled conditions. A single assessment covering all outcomes should not exceed 2 hours in duration. It should be noted that candidates must achieve all the minimum evidence specified for each Outcome in order to pass this Unit.

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.

An exemplar instrument of assessment and marking guidelines has been produced to provide examples of evidence required to demonstrate achievement of the aims of this unit.

Higher National Unit specification: statement of standards

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Outcome 1

Differentiate between the planning, design and production phases of the construction process and describe the co-ordination and management of each phase.

Knowledge and/or skills

- ◆ Planning and design of a project
- ◆ Land issues
- ◆ Health, safety and welfare
- ◆ Financial considerations
- ◆ Planning and control considerations
- ◆ Design considerations

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can:

- identify the planning processes for each type of project
- compare and contrast the design process for building, civil engineering and/or building services projects
- describe the main stages of the production phase of the construction process
- compare the co-ordination and management of each phase of the design and construction process.

Evidence for the knowledge and /or skills for this Outcome will be provided on a sample basis. In any assessment of this Outcome a minimum of **four out of six** knowledge and/or skills items should be sampled. In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of knowledge/skill items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all four items.

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed book conditions and as such candidates should not be allowed to bring textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 2, 3, 4 to form a single assessment paper.

Higher National Unit specification: statement of standards (cont)

Unit title: Design Principles and Application

Outcome 2

Analyse the various factors that affect the selection of materials, systems and equipment and evaluate the environmental impact of energy and other constraints on the planning, design and construction processes.

Knowledge and/or skills

- ◆ Environmental planning
- ◆ Energy efficiencies
- ◆ Services requirements

Evidence requirements

Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- ◆ interpret the client's brief and the other factors that may effect the selection of materials, systems and equipment. Analyse how these factors may effect the aesthetics of a project
- ◆ assess the need for services required for or by a project and how these may be integrated into the overall design
- ◆ compare the financial implications of a project in terms of sourcing, funding, planning and maintenance costs
- ◆ evaluate the need for environmental efficiencies and in planning the selection, use and recycling of materials
- ◆ identify the environmentally safe methods for the disposal of waste materials
- ◆ assess the design factors that influence energy saving measures.

In any assessment of this Outcome **all** knowledge and/or skills items should be included.

Candidates must provide a satisfactory response to all items.

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed book conditions and as such candidates should not be allowed to bring textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 3, 4 to form a single assessment paper.

Higher National Unit specification: statement of standards (cont)

Unit title: Design Principles and Application

Outcome 3

Describe the roles, responsibilities and obligations (including liability for health, safety and welfare) of all parties to a construction project

Knowledge and/or skills

- ◆ Construction team
- ◆ Obligations and responsibilities

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ describe the roles of all the parties involved in the design and planning and construction processes
- ◆ identify the responsibilities of all the parties involved in the design and planning and construction processes
- ◆ identify the particular responsibilities and liabilities of all parties concerned in terms of health, safety and welfare issues.

In any assessment of this Outcome **all** knowledge and/or skills items should be included.

Candidates must provide a satisfactory response to all three items.

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed book conditions and as such candidates should not be allowed to bring textbooks, handouts or notes to the assessment.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 2, 4 to form a single assessment paper.

Outcome 4

Demonstrate how technology affects the design of a construction project and also the design processes and procedures used in the production phase.

Knowledge and/or skills

- Affect on design of technological advances in construction

Higher National Unit specification: statement of standards (cont)

Unit title: Design Principles and Application

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ analyse important technological advances in construction and evaluate the effect of developing software applications and new ways of building
- ◆ produce sketch plans and detailed drawings using both manual and CAD packages.

In any assessment of this Outcome **all** knowledge and/or skills items should be included. Candidates must provide a satisfactory response to all three items.

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed book conditions and as such candidates should not be allowed to bring textbooks, handouts or notes to the assessment.

Assessment Guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

The assessment for this outcome might be combined with that for Outcomes 1, 2, 3 to form a single assessment paper.

Administrative Information

Unit code:	DP12 34
Unit title:	Design Principles and Application
Superclass category:	TE
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Higher National Unit specification: support notes

Unit title: Design Principles and Application

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 of this Unit

This unit provides the candidate with the basic knowledge and understanding of the design and planning processes of a construction project. Attention should be paid in the delivery of this unit to the syllabus content of the other units in the programme, particularly those related to the technology units of the main discipline covered by the programme.

The opportunity to provide evidence of the achievement of a range of key skills will feature strongly in both formative and summative assessments. This unit links with the Project (Integrative Assignment), Services Project Management and the technology units in each occupational pathway. Recommended time allocations to each outcome are given as guidance towards the depth of treatment which might be applied to each topic. This guidance has been used in the design of the assessment exemplar material provided with the unit.

1 Planning, design and production phases (10 hours)

Planning and design of a project: the client's brief, aesthetics of the project and the process, influence of shape, size and proportion, position, location and structural considerations of a building, an engineering project or a plant system, content of the project.

Land issues: effects of green/brown and reclaimed land on a project

Health, safety and welfare: issues in design, maintenance and demolition

Financial considerations: financial implications and sources of funding, financial planning including the cost of building, the cost of commissioning, costs in use, life cycle costing, cost modelling and facilities management.

Planning and control considerations: legal restraints, town and country planning, building regulations and European legislation.

Design considerations: designing for planned use, designing for inclusivity, for change of use, for versatility, designing for disability, relevant legislation and Acts of Parliament.

2 Materials selection, systems and equipment, and environmental impact (20 hours)

Environmental planning: the selection of materials and the form(s) of construction, use of new and renewable resources, use of recycled materials where appropriate.

Energy efficiencies: production of materials, processing of materials and services within the building or project.

Services required: into and out of the building or project, disposal of waste materials from the construction process, disposal of waste materials from the use of the building or project, availability of services to a building or project, services used by a building or project.

Higher National Unit specification: support notes (cont)

Unit title: Design Principles and Application

3 Roles, responsibilities and obligations (5 hours)

Construction team: their roles and responsibilities at various stages including planning and development, design, surveying, construction, maintenance and facilities management. An understanding of the part they play is required in terms of the roles of each party to the process, activities undertaken by each party to the process.

Obligations and responsibilities: of each party to the process, liabilities of each party to the process (including both corporate and personal responsibility for health, safety and welfare).

4 How technology affects design (5 hours)

Affect on design of technological advances in construction: level of technology available at the time of design, how this affects the design and construction processes, development of new materials, more advanced methods, more powerful construction plant, new systems and services, Information & Communication Technology (ICT).

Guidance on the delivery and assessment of this Unit

Opportunities for developing Core Skills

Since it is important that candidates have a sound understanding of the principles that underpin the planning and co-ordination of design of a construction project, this unit should be studied early in the first year of a two-year programme in parallel with related technology.

Case studies should be used in order to develop a working knowledge of the design and planning processes used in the construction industry. The unit might usefully involve practitioners to deal with some aspects of the curriculum. Where appropriate, role-play should be encouraged to develop a better understanding of the application and the difficulties that are encountered in the design and the planning of a construction project.

Candidates will usually work individually and should be encouraged to provide oral presentations from their own studies or experiences. During a role-play, candidates would normally work in groups to present scenarios for discussion.

Appropriate attention must be given to health, safety and welfare arrangements and CDM Regulations throughout the delivery of this unit.

It is recommended that evidence for learning outcomes is achieved through well-planned course work, assignments and projects. Assessment may be formative and summative and both may feature as part of the process. Although assessments must be focused on the individual achievement of each candidate, group work and role-play activities may contribute to the assessment. Integrative assignments and project work will help to link this unit with other related units.

The volume of evidence required for each assessment should take into account the overall number of assessments being contemplated within this unit and the design of the overall teaching programme.

Higher National Unit specification: support notes (cont)

Unit title: Design Principles and Application

In designing the assessment instrument/s, opportunities should be taken to generate appropriate evidence to contribute to the assessment of Core Skills units.

Where available, evidence from the workplace can also be incorporated to enhance the learning outcomes, provided that this evidence is appropriate and authenticated as the candidate's own work. The volume of evidence required for each assessment should take into account the overall number of assessments being contemplated within this unit and the design of the overall teaching programme.

Open Learning

Given that appropriate materials exist this unit could be delivered by distance learning, which may incorporate some degree of on-line support. However, with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that assessment/s were conducted under controlled, supervised conditions.

Candidates with additional support needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website www.sqa.org.uk

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- ◆ Describe the roles, responsibilities and obligations (including liability for health, safety and welfare) of all parties to a construction project
- ◆ Demonstrate how technology affects the design of a construction project and also the design processes and procedures used in the production phase.

Evidence that you can satisfy the knowledge and skill elements of this unit will be obtained by assessment in controlled, supervised conditions to which you will not be allowed to bring textbooks, handouts or notes to the assessment.