

# Higher National Graded Unit Specification

## General Information for Centres

This Graded Unit has been validated as part of the suite of Civil Engineering HN awards. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

**Graded Unit Title:** Structural Engineering: Graded Unit 1

**Graded Unit Code:** F03R 34

**Type of Graded Unit:** Project

**Assessment Instrument:** Investigation

**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.*

**Purpose:** This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HNC in Structural Engineering:

### General aims — to develop:

- ◆ skills of study, research and analysis
- ◆ ability to define and solve problems
- ◆ transferable skills
- ◆ ability to be flexible and work cooperatively with others
- ◆ responsibility for own learning
- ◆ planning, organisational and review/evaluation skills
- ◆ technical skills — broadening and deepening
- ◆ oral, written and pictorial communication skills
- ◆ numerical and ICT skills
- ◆ resource management ability
- ◆ flexibility, knowledge, skills and motivation as a basis for progression to graduate and postgraduate studies

### Specific aims are to:

- ◆ Prepare candidates for employment as engineering technicians in the structural engineering industry with a range of employers who design and/or maintain, adapt or manage structures including consulting structural engineers, contractors and the owners/managers of industrial and commercial buildings.

## General Information for Centres (cont)

- ◆ Provide candidates with a range of contemporary vocational skills utilising modern equipment and techniques available for basic structural design procedures and material testing, thus enabling candidates to make an immediate contribution in their role as engineering technicians.
- ◆ Provide a choice of optional units that will allow candidates to develop in other areas relevant to future employment in structural or civil engineering, or progression via an HND in Civil Engineering.
- ◆ Enable candidates to achieve appropriate professional body recognition, in particular but not exclusively, the Institution of Civil Engineers or the Institution of Structural Engineers.

**Recommended Prior Knowledge and Skills:** It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Graded Unit:

### Mandatory (M)

Unit Title	Credit Value	SCQF level	HNC Struct	Unit Number
CAD 2D 1	1	7	M	DW1E 34
Civil Engineering Contract and Project Management A	1	7	M	DW59 34
Civil Engineering Materials and Testing	1	7	M	DW5C 34
Civil Engineering Technology	1	8	M	DW5D 35
Construction Technology: Substructure	1	7	M	DW57 34
Mathematics for Construction	1	6	M	DW4F 33
Structural Analysis A	1	7	M	DW70 34
Structural Mechanics	1	7	M	DW45 34

**Core Skills:** There are opportunities to develop the Core Skills of Problem Solving at level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Assessment:** This Graded Unit will be assessed by the use of an Investigation. The investigation, analysis and development of solutions should provide the candidate with the opportunity to produce evidence that demonstrates she/he has met the aims of the Group Award that this Graded Unit covers.

An exemplar instrument of assessment and marking guidelines have been produced to provide examples of the type of evidence required to demonstrate achievement of the aims of the Group Award covered by this integrative assessment and to indicate the national standard of achievement at SCQF level 7.

## Administrative Information

**Graded Unit Code:** F03R 34

**Graded Unit Title:** Structural Engineering: Graded Unit 1

**Original date of publication:** August 2006

**Version:** 01

### History of Changes:

Version	Description of change	Date

**Source:** SQA

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# Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates

**Graded Unit Title:** Structural Engineering: Graded Unit 1

## Conditions of Assessment

The candidate should be given a date for completion of the investigation. However, the instructions for the assessment task should be distributed to allow the candidate sufficient time to assimilate the details and carry out the assessment task. During the time between the distribution of the assessment task instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The assessment task should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the candidate's evidence at the time of the completion date.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any reassessment of stages must be undertaken before proceeding to the next stage.

If a candidate fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project, assignment, case study, etc. In this case, a candidate's grade will be based on the achievement in the *reassessment*.

The candidate should be given a date for completion of the investigation. Parameters should be agreed with the tutor/supervisor by the candidate(s) on a continuing basis providing clarification, guidance and reasonable assistance.

Each assessment task should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the candidate's evidence at the time of the completion date, including any oral examination. Reassessment of this Graded Unit should be based on a significantly different assessment task.

At this level, candidates should work independently within the context of a typical working environment. It is up to Centres to take reasonable steps to ensure that the candidates bring their specialist knowledge and experience to the project. For example, Centres may wish to informally question candidates at various stages on their knowledge and understanding of the project/case study on which they have embarked. Centres should ensure that where research etc, is carried out in other establishments or under the supervision of others that the candidate does not receive undue assistance. Candidates should be allowed to use appropriate technology within and outwith the college environment.

Assessors must be satisfied that the work has been completed by the individual candidate. This could be done by, for example, candidates completing a log or diary recording progress and tasks completed. There should be regular meetings between the tutor and candidate(s) to review progress and these meetings should be recorded. Centres may wish to authenticate individual candidate understanding with an oral examination, or other appropriate test, based on the evidence submitted.

## **Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)**

**Graded Unit Title:** Structural Engineering: Graded Unit 1

### **Instructions for designing the assessment task**

The assessment task is a project. The project undertaken by the candidate must be a complex task which involves:

- ◆ variables which are complex or unfamiliar
- ◆ relationships which need to be clarified
- ◆ a context which may be familiar or unfamiliar to the candidate

The assessment task must require the candidate to:

- ◆ analyse the task and decide on a course of action for undertaking the project
- ◆ plan and organise work and carry it through to completion
- ◆ reflect on what has been done and draw conclusions for the future
- ◆ produce evidence of meeting the aims which this Graded Unit has been designed to cover

The assessment must be an investigative task within the context of a specific structural engineering project or of general application to structural engineering practice. The task to be undertaken should be defined in relation to the context of particular topic/s, and what it is reasonable to expect of candidates in the time scales available for a single credit Unit. Candidates may select or be given a topic, but the topic/issues selected should focus on the main aims of the award and the need to demonstrate an ability to integrate knowledge and skills across the mandatory Units in the HNC Structural Engineering.

The task should allow the candidate(s) to demonstrate valid and realistic responses to the current and future needs of structural engineering technology and include, where appropriate, issues of Health and Safety and sustainability. Safe working practices should be looked at in accordance with current safety codes of practice and regulations. Sustainability should include reference to criteria affecting sustainability, impact of not implementing sustainability on the environment and the legislation promoting sustainability.

The task might, for example, require the candidate to assume a work based role in design, project management, manufacture, installation or maintenance consistent with the level of this award. The task should involve elements of work planning, identification of data, research and investigation with selection and presentation of alternative Outcomes. A technical report including feedback to inform future similar activities is required. Alternatively, the task might require a more detailed analysis and evaluation of a smaller element of structural engineering technology.

At this HNC level the scope of the task should be clearly defined, the candidate should have access to readily available data and analytical tools including hardware/software. Candidates should not be expected to develop innovative Outcomes from fundamental principles but to apply existing information and techniques.

## Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

### Guidance on grading candidates

Candidates who meet the minimum Evidence Requirements will have their achievement graded as C — competent, or A — highly competent or B somewhere between A and C. The grade related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table.

Grade A	Grade C
<p>Is a seamless, coherent piece of work which has many more strengths than weaknesses and::</p> <ul style="list-style-type: none"> <li>◆ Demonstrates clear, explicit links between the three stages of the investigation.</li> <li>◆ Is highly focused throughout on the objectives of the investigation.</li> <li>◆ Carefully selects information from a variety of sources to provide strong and valid reasons to support points made.</li> <li>◆ Uses concepts and topics accurately and relevantly to support points made.</li> <li>◆ Is well structured and uses language of a high standard in terms of accuracy and technical content.</li> <li>◆ Includes a careful and considered reflection on the investigation which informs realistic recommendations.</li> <li>◆ Is based on well chosen, apposite methodology and innovative methods of gathering information which are congruent with each other.</li> <li>◆ Provides well thought-out and logical justification of points made.</li> <li>◆ Criteria for evaluation are coherently related to the objectives of the investigation and provide a strong basis for judging its success.</li> </ul>	<p>Is a co-ordinated piece of work which has a balance of strengths and weaknesses and:</p> <ul style="list-style-type: none"> <li>◆ Contains sufficient evidence to meet the minimum requirements of each of the three stages of the investigation.</li> <li>◆ Meets the objectives of the investigation but not in a consistent or fully comprehensive manner.</li> <li>◆ Uses information from a limited range of sources and in a manner which does not always support reasons given.</li> <li>◆ Makes limited reference to concepts and topics which may not always be used accurately nor always be fully relevant to the points made.</li> <li>◆ Is satisfactorily structured and uses language which is adequate in terms of accuracy and technical content.</li> <li>◆ Has some limited reflection but is not comprehensive and does not form the basis for a set of realistic recommendations and/or conclusions.</li> <li>◆ Use a suitable methodology and conventional methods of gathering data but does not consider carefully the relationship between them.</li> <li>◆ Provides some justification of points made but reasons given may be limited, weak or lack coherence.</li> <li>◆ Criteria for the evaluation may be limited, lack of support from concepts and topics, and may be difficult to use or interpret.</li> </ul>

## Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

Performance for this Graded Unit is specified in the following table.

The project will be marked out of 100. Assessors will mark each stage of the project, taking into account the criteria outlined. The marks will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the candidate for this Graded Unit based on the following grade boundaries.

A	=	70%	—	100%
B	=	60%	—	69%
C	=	50%	—	59%

**Note:** the candidate must achieve all of the minimum evidence specified below for each stage of the project in order to achieve the Graded Unit.

### Evidence Requirements

The project consists of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

**Note:** The candidate must achieve **all of the minimum evidence** specified below for each stage of the project in order to pass the Graded Unit.

Project Stage	Minimum Evidence Requirements
Stage 1 — Planning	<p>Develop a brief for the investigation. The brief must include:</p> <ul style="list-style-type: none"> <li>◆ Title</li> <li>◆ Statement of the issues/topics to be investigated</li> <li>◆ Objectives of the investigation</li> <li>◆ Reasons for choice of issue/topic and relationship to the HNC Structural Engineering</li> <li>◆ Identification of sources of information to be used and rationale for choice/s</li> <li>◆ Statement of criteria to be used to assess the implications of the issue/topic, reasons for choice of criteria and relationship to the HNC Structural Engineering</li> <li>◆ A plan to carry out the investigation including timescales and resources required</li> </ul> <p><i>Evidence of the above should be presented which may be supplemented by oral evidence in discussion between the candidate and the assessor.</i></p> <p><i>The brief is worth a total of 15% of the marks for the investigation..</i></p> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i></p>

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Project Stage	Minimum Evidence Requirements
Stage 2 — Developing	<p>Preparation of a report of the investigation. The report must include:</p> <ul style="list-style-type: none"> <li>◆ Details of how the data was gathered/collated</li> <li>◆ Actual data</li> <li>◆ Analysis of data</li> <li>◆ Explanation of how the issues/topics are supported by the data collected and the concepts covered within the HNC Structural Engineering</li> <li>◆ Assessment of the implications of the conclusions in terms of the criteria selected during the planning process</li> <li>◆ Statement of the conclusions and recommendations drawn from the investigation</li> </ul> <p><i>The report is worth 70% of the marks for the investigation.</i></p> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i></p>
Stage 3 — Evaluating	<p>Provide a report of the evaluation of the effectiveness of all parts of the investigation. The evaluation should include:</p> <ul style="list-style-type: none"> <li>◆ A brief summary of the investigation</li> <li>◆ Assessment of the extent to which each of the original objectives has been met, including any modifications made during the course of the investigation, supported with rationale</li> <li>◆ Comment on aspects of the planning and development stages which worked well or deviated from the set plan</li> <li>◆ Assessment of the research methods used</li> <li>◆ Assessment of the strengths and weaknesses of the findings of the report of the investigation</li> <li>◆ Identification of feedback to inform future investigations</li> </ul> <p><i>The evaluation is worth 15% of the marks for the investigation.</i></p> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p>



## **Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)**

### **Candidates with Disabilities and/or Additional Support Needs**

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative assessment arrangements. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk).