

ARCHITECTURAL TECHNOLOGY
Higher

First edition — published March 2006

National Course Specification

COURSE Architectural Technology

COURSE CODE C226 12

COURSE STRUCTURE

This Course has three mandatory Units:

<i>DV3V 12</i>	<i>Architectural Technology: Building Design (Higher)</i>	<i>1 credit (40 hours)</i>
<i>DV3W 12</i>	<i>Architectural Technology: Site Surveying (Higher)</i>	<i>1 credit (40 hours)</i>
<i>DV3X 12</i>	<i>Architectural Technology: Manual and Computer Aided Construction Drawing (Higher)</i>	<i>1 credit (40 hours)</i>

All Courses include 40 hours over-and-above the 120 hours for the Units. This may be used for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning and preparation for Course assessment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ Intermediate 2 Course in Product Design, Graphic Communication or Technological Studies, or their Units
- ◆ Two Standard Grades at credit level, one from each of the following groupings:
 - Mathematics, Physics or Technological Studies;
 - either Craft and Design or Graphic Communications

No prior knowledge of construction technology, building design, building drawing, CAD, maps, plans or surveying work is required of candidates undertaking this Course, although drawing and sketching experience and Information Communication Technology (ICT) will be of benefit.

Administrative Information

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Additional copies of this specification (including unit specifications) can be purchased from the Scottish Qualifications Authority for £7.50. **Note:** Unit specifications can be purchased individually for £2.50 (minimum order £5).

National Course Specification (cont)

PROGRESSION

This Course or its Units may provide progression to:

- ◆ Study at Higher National level in one of a number of built environment specialisms:
 - Architectural Technology
 - Building Surveying
 - Civil Engineering
 - Construction
 - Construction Management
 - Facilities Management
 - Quantity Surveying
- ◆ Higher Education
- ◆ Training or employment

CREDIT VALUE

The Higher Architectural Technology Course is allocated 24 SCQF credit points at SCQF level 6.

SCQF points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.

CORE SKILLS

Achievement of this Course gives automatic certification of the following:

Complete Core Skill	Numeracy at SCQF level 5
Core Skills component	Critical Thinking at SCQF Level 5

National Course Specification: course details

COURSE Architectural Technology (Higher)

RATIONALE

The construction industry makes a significant contribution to the economy and is a major employer in Scotland. Construction technicians are likely to be in increasing demand in the future. National Courses in construction subjects therefore have a role in a strategically important area. The skills acquired in the study of this subject area are in demand by employers.

This Course is suitable for candidates who aim for a career in the construction industry as technicians, technologists and other construction professionals. The Course will appeal to candidates who desire a practical or creative career. It should attract those who enjoy working as part of a team and who seek variety in their work.

The Course may be undertaken by both full-time and part-time candidates in Further Education as well as candidates currently at school. Candidates may use this qualification to progress to further study at Higher National level or Degree level.

Architectural technologists provide architectural design services and solutions. They are specialists in the science of architecture, building design and construction and form the link between concept and construction. Fully qualified technologists can manage a project from conception through to completion.

Architectural technologists and architects make a unique and far reaching contribution to the built environment. Their designs should be responsive to social, cultural and environmental issues, utilising the potential of science and technology to achieve quality in the design of spaces, forms and details. The following skills and knowledge are required of architectural technologists and architects:

- ◆ Design
- ◆ Visual Awareness — *The designer must understand the public requirements of buildings and of the designed environment as a whole*
- ◆ Building Technology — *Architectural technologists and architects require an understanding and knowledge of the properties and uses of materials, building structures, and the sequence of building operations*
- ◆ Organisation and Management
- ◆ Environmental Control — *Architectural technologists and architects are required to be familiar with the physics of the environment and its relationship to human responses: how heat; light, sound and ventilation affect people and the building fabric. Awareness of energy conservation and sustainability issues is essential.*

Such skills and knowledge will be introduced and developed in the Architectural Technology Course. It takes years of study to become a fully qualified architect or technologist, but an effective start will have been made by completion of this Course.

Candidates taking the Architectural Technology Course will be made aware of the interdependency of a number of discrete skills within the construction industry. The Course will also provide employers and admissions staff with a useful benchmark to gauge the skills and knowledge of entrants to employment or further courses of study.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Higher Architectural Technology focuses on creative activities and design factors considered in the design process. It emphasises the integration of design, graphical communication and practical construction activities. Technological studies, product design, physics, craft and design and graphic communication subjects introduce candidates to scientific and technical concepts, and to the process of design. *Higher Architectural Technology* will allow candidates to extend such studies to the context of the built environment.

This Course contributes significantly to candidates' general education and personal development: it promotes core and transferable skills important for future employment within construction and other industries. The development of competencies in this vocational context will improve generic skills in communication, report writing, presentation, research techniques and working with others.

AIMS

The aims of this Course are to develop:

- ◆ an awareness of the functional requirements of buildings
- ◆ an appreciation of the design factors and constraints to be considered in successful building projects
- ◆ knowledge and understanding of the primary forms of construction currently in use
- ◆ knowledge of the environmental impact of construction
- ◆ experience in interpreting Ordnance Survey maps and plans
- ◆ skills in carrying out land surveys including the use of surveying equipment and the plotting of survey results
- ◆ knowledge and understanding of the types of drawings used in the construction process and skills in both manual and computer-aided preparation of construction drawings
- ◆ the ability to integrate site surveying, building design and graphical communication processes in the preparation of construction proposals for small buildings
- ◆ skills in problem solving, communication, investigation, report writing and team work

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

COURSE CONTENT

The Course consists of three Units, each of 40 hours.

The Course has been designed to allow the Units to be delivered sequentially, providing the candidate with an overview of the building design process from site survey and sketch design through to more detailed drawings.

All of the Course content is subject to sampling in the Course assessment (ie the Question Paper and Project). The section of Course content that deals with ‘manual and computer-aided construction drawing’ will **not** be subject to sampling in the Question Paper. This section will, however, be covered in the Project.

The other sections of the Course content, namely *building design* and *site surveying* are subject to sampling in every part of the Course assessment (ie the Question Paper and Project).

Centres must ensure that the content is covered over the duration of the Course. The following descriptions outline the content for the Course which is subject to Course assessment in the Question Paper and the Project:

Building Design

This part of the Course introduces the methods and processes of developing clients’ briefs into viable designs. Candidates are introduced to the overall process and basic principles of building design. It also examines the functional requirements of buildings and their elements, and the range of inter-related design factors, for example, technical design, aesthetics and sustainability. Candidates will acquire skills in the selection of construction methods and materials, and in the preparation of sketch designs for buildings.

Building Design — Content	
Building design requirements	
Building type	Domestic and non-domestic.
Function of building	eg to provide a controlled environment.
Functional requirements of buildings	Shelter, enclosure, space provision and physiological comfort.
Performance requirements, design factors and the inter-relationship of design factors	<ul style="list-style-type: none">◆ architectural/aesthetic◆ safety◆ structural◆ buildability◆ comfort◆ design life◆ economic◆ environmental impact

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Building Design — Content	
<p>Building design requirements (cont)</p> <p>Constraints of building projects</p> <p>Role of the statutory authorities (planning and building control)</p> <p>Environmental impact of building</p>	<p>Social, technical, legal/statutory and financial.</p> <ul style="list-style-type: none"> ◆ Development, design and construction to satisfy minimum standards and authority requirements. ◆ Application procedure for a building warrant and planning permission. <p>Determination of the eco-friendliness (or otherwise) of building and its construction materials, ecologically orientated product choice, eco-labelling.</p> <p>The following environmental assessment schemes and initiatives may be considered as examples:</p> <ul style="list-style-type: none"> ◆ Building Research Establishment Environmental Assessment Method (BREEAM) for assessing the environmental performance of new building designs and for existing buildings in terms of: <ul style="list-style-type: none"> — management, energy use, health and well-being, pollution, land use, ecology, materials, water consumption and waste ◆ BRE Ecohomes for environmental assessment of houses ◆ National Home Energy Rating (NHER) scheme and energy efficiency advice ◆ The Government’s Standard Assessment Procedure (SAP) for producing energy cost ratings and a carbon index (CI)
<p>Construction methods, building form and construction materials</p> <p>Building type</p> <p>Forms of construction</p> <p>Construction materials for main enclosure and structural elements</p> <p>Environmental sensitivity of construction methods</p>	<p>Domestic and non-domestic.</p> <p>Traditional masonry cavity wall construction and timber frame. Advantages and limitations of the two forms.</p> <p>Traditional materials, modern materials, current good practice, current building legislation and associated standards.</p> <p>Including ‘best available technology’.</p>

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Building Design — Content	
Elements of buildings	
Buildings considered	Domestic, social, commercial office, industrial, any other type of building suitable to exemplify function and functional requirements of building elements.
Elements of common enclosure and structural systems	Functions of, connections between and the support systems for elements.
Enclosure elements	Walls, cladding, windows, doors and roofs.
Structural elements	Foundations, walls, timber frame, floors, roofs and stairs.
Development of a design	
Building type	Domestic and non-domestic.
Consideration of the brief	Clients' requirements and preferences.
Selection and form of construction	Advantages and limitations of form selected as applicable to the brief.
Selection of materials for enclosure and structural systems	Appropriate selection in terms of the brief.
Bubble diagrams and preliminary sketch drawings	Bubble diagrams and preliminary sketch drawings to demonstrate clearly the development of the design. Sketch drawings well proportioned. Sketch drawings to include a minimum of a floor plan and two elevations. <i>Note: Candidates may prepare space diagrams in addition to bubble diagrams, but these are not mandatory.</i>
Graphical presentation requirements	Well proportioned. Layout of sketches to follow good practice. Including titles and specification notes.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Site Surveying

This part of the Course introduces candidates to the principles of land surveying and to the techniques adopted in the preparation of site plans. Skills are developed in the use of equipment to gather site data and in the preparation of site plans and contours.

Site Surveying — Content	
<p>Ordnance Survey maps and plans and project site plans</p> <p>Ordnance Survey maps and construction project site plans</p> <p>Ordnance Survey (OS)</p> <p>Project site plans</p>	<p>Extracting and interpreting information.</p> <p>Maps and plans, scales, the National Grid, grid references, sheet references, co-ordinates, description of surface relief, boundaries, conventional symbols.</p> <p>Appropriate scales, levels, plan orientation, legends and conventional symbols.</p>
<p>Linear measurement surveying</p> <p>Carrying out of a linear measurement survey</p> <p>Trilateration and offsetting</p> <p>Aspects of linear surveying</p> <p>Plotting of results on a plan</p> <p>Reporting writing</p>	<p>Accurate tape measurement. Reference to sources of error, corrections and standardisation.</p> <p>Purpose and techniques.</p> <p>Reconnaissance, selection of stations, conditioning of triangles, detail and check lines, ranging, use of tapes, tape standardisation, treatment of slopes, errors and corrections, standard of accuracy and means of checking.</p> <p>Accurate booking and field notes with appropriate cross-referencing; procedure for plotting of results.</p> <p>Concise and accurate report writing.</p>
<p>Levelling, contouring and sections</p> <p>Carrying out of a levelling survey</p> <p>Survey factors and procedures</p> <p>Prepare contour plans</p>	<p>A range of modern builders' and engineers' levels.</p> <p>Ordnance Datum; use of bench marks; use of staff; height of collimation and rise and fall methods of reduction; use and adjustment of levels; sources of error and checks on closing error.</p> <p>Plans incorporating a suitable number of contour lines. Plans to standard suitable for reproduction.</p>

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Site Surveying — Content (cont)	
Principles covered	Indirect method of contouring, method of plotting, contour interval, contour configurations, identification of contours, determination of gradient.
Prepare a longitudinal section	Method of plotting, use of datum, identification of sections, ground level information, and use of natural and exaggerated scales. Sections to a standard suitable for reproduction.
Arithmetic and closing error checks	Standard arithmetic checks. Acceptable values of closing error and methods of distributing closing error.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Manual and Computer-Aided Construction Drawing

This part of the Course stresses the important role of graphics in the development, communication and interpretation of construction proposals. It will help candidates appreciate graphical communication as an essential part of the construction design process that is vital to the quality of the end product.

If this part of the Course is delivered concurrently with the other parts this will help candidates to appreciate the inter-relationship between construction graphics, site surveying and construction technology, and will enable them to use drawing skills to support their study in other areas.

Manual and Computer-Aided Construction Drawing — Content	
<p>Orthographic projection and layout of drawings</p> <p>Introduction</p> <p>Conventional layout and presentation of drawings</p> <p>Presentation techniques</p> <p>Types of orthographic view</p> <p>Drawing standards</p>	<ul style="list-style-type: none"> ◆ the range of drawing materials and equipment used in the manual draughting process ◆ principles of orthographic projection ◆ relevant conventions applicable to construction drawing ◆ appropriate use of scale ◆ line types and their applications ◆ dimensioning styles ◆ use of conventional symbols <p>Layout, annotation, lettering, hatching, conventions, title blocks.</p> <p>First angle, third angle, combination of first angle and third angle.</p> <p>Reference should be made to relevant and current British and international standards, (and in the absence of these) current good practice in drawing layout and standard methods of detailing.</p>
<p>Site layout and general arrangements drawings</p> <p>Types and function of drawings</p> <p>Requirements and uses of site layout and building location drawings</p> <p>Information displayed by drawings</p>	<p>Site location, site layout, building location (general arrangement), assembly and component details, sections, fabrication.</p> <p>Consideration of layout grids, other reference systems and dimensional coordination.</p> <p>Statutory control, site investigation, determination of earthworks and drainage quantities and setting out of construction work.</p> <p>Level, contour and orientation information. Specification notes and dimensions for construction purposes.</p>

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Manual and Computer-Aided Construction Drawing — Content

Computer Aided Construction Drawing

This part of the Course provides candidates with the ability to use a two-dimensional computer-aided drawing (2D CAD) system to generate drawings for small building projects. In this context, a commercial CAD system is defined as: *hardware and software necessary to allow the operator to generate drawings at an acceptable processor speed and to a standard acceptable for reproduction and presentation to a client.* The work is based on site layout and building location (general arrangement) drawings for a domestic building.

Competence will be developed in the following areas:

- ◆ generous of continuous and broken lines, hatching, dimensions, styles of text, editing, storing, recalling, plotting

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

ASSESSMENT

To gain the award of the *Architectural Technology (Higher)* Course, the candidate must pass all of the Units and undertake the Course assessment. The Course assessment provides the basis for grading attainment in the Course award.

DETAILS OF UNIT ASSESSMENT

All Units are internally assessed against the requirements of the Outcomes as detailed in the Unit Specifications. Unit Specifications also provide support notes to assist teachers and lecturers in their understanding of Outcomes, Performance Criteria and Evidence Requirements. *Higher Architectural Technology* Unit assessments consist of the testing of practical ability, knowledge, understanding and sketching, manual drawing or CAD (Computer-Aided Drawing) skills.

Each of the three Outcomes in the Unit assessment requires the candidate to focus solely on domestic construction. This is **not** the case in the Course assessment, where the candidate has the opportunity to demonstrate knowledge and understanding of both domestic and non-domestic buildings.

The individual Unit assessments within the Course take the following form:

Unit Title	Outcome	Format of assessment
<i>Architectural Technology: Site Surveying</i>	1	45 minute closed-book test
	2 and 3	Folio of work
<i>Architectural Technology: Building Design</i>	1 and 2	60 minute closed-book test
	3	Folio of work
<i>Architectural Technology: Manual and Computer-Aided Construction Drawing</i>	1	30 minute closed-book test
	2 and 3	Folio of work

The folios of work compiled by candidates for the Units as mentioned above are to comprise CAD work, instrument-aided drawings, details and sketches as required by the Unit specification. The folios of work are to be compiled as a natural part of the learning and teaching process. Assessors are to ensure that work compiled for the folios of work are the candidates' own work.

Further details about Unit assessment for this Course can be found in the NAB materials and in the Unit Specifications.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

DETAILS OF COURSE ASSESSMENT

The following documents provide details of the Course assessment:

- ◆ Course Arrangements Document
- ◆ Specimen Question Paper
- ◆ Course Assessment Specification
- ◆ Assessment Guidance (issued by SQA every year)

The *Higher Architectural Technology* Course is externally assessed against the Grade Descriptions as detailed in this Course Specification. The Course assessment will provide the basis for grading attainment in the *Higher Architectural Technology* Course awards. Course awards will be graded A to D, and will be based on the total score achieved in the Course assessment.

The Course assessment of the *Higher Architectural Technology* Course will consist of two equally-weighted components:

- ◆ Question Paper 100 marks
- ◆ Project 100 marks

Question Paper

The purpose of the Question Paper is to assess the candidate's ability to retain and integrate knowledge and understanding from across two aspects of the Course content, namely building design and site surveying. Manual and computer-aided construction drawing are not assessed in the Question Paper.

The Question Paper may assess candidates' knowledge and understanding in **both** domestic and non-domestic building contexts.

The Question Paper will also allow the candidate to demonstrate higher order cognitive and communication skills across the content of the Course in varied and less familiar contexts.

The Question Paper will be of two hours duration, set and externally marked by the SQA. The Paper will be composed of two sections:

◆ Section A (40 marks)

This section consists of a number of short answer and/or restricted response questions examining the candidate's knowledge and understanding of building design and site surveying.

◆ Section B (60 marks)

This section consists of 3-6 structured and/or extended response questions examining the candidate's knowledge and understanding of building design and site surveying.

Further details of the format and structure of the Question Paper are given in the Course Assessment Specification and Specimen Question Paper.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Project

There are 100 marks available for the Project, The Project constitutes 50% of the total Course assessment. The purpose of the Project is to assess the candidate's ability to apply skills, knowledge and understanding to develop a building design solution for a given brief. It will draw on knowledge and skills developed across the three Units. In particular, it will test the candidate's ability to communicate, generate and refine potential solutions and to produce a final building design proposal. Candidates will acquire practical skills in research, as well as planning, implementing and reviewing that research and the subsequent report.

The Project is not restricted in scope to domestic construction. It may encompass non-domestic construction forms such as industrial, commercial and others.

The Project task will be devised by the centre, based on SQA Assessment Guidance. The Project will be conducted internally under controlled conditions and externally marked by SQA. The SQA will require submission of the completed projects by a date specified by SQA in the year of presentation.

Further details about the format and structure of the Architectural Technology Project are given in the Course Assessment Specification and Assessment Guidance document.

Relationship between Unit and Course assessments

Unit and Course assessment are designed to complement each other, but it has to be noted that there is a clear distinction between them in terms of their purpose, focus and requirements. This is achieved by careful targeting of knowledge, understanding and skills at appropriate levels in Unit and Course assessments and thereby avoiding any duplication of tasks, activities or performances.

The knowledge and understanding inherent in the Course content is tested at Unit level in the three Units *Site Surveying*; *Building Design* and *Manual and Computer-Aided Construction Drawing*.

The three Units in the Course broadly cover the surveying of prospective building sites and the design process for domestic buildings in particular. The Unit assessment samples this knowledge and understanding.

The Project component of the Course assessment provides candidates with opportunity to explore the design process to a greater depth and to research up-to-date developments in construction methods, materials and detailing. There will be greater integration of knowledge and understanding in the Project task. The Project will also provide candidates with the opportunity to demonstrate skills in manual and computer-aided drawing as well as the presentation of graphics and sketch details.

The Course assessments permit candidates to demonstrate their knowledge and understanding of both domestic and non-domestic construction.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

The 'added value' of the Course

Over and above the Units, candidates will gain significant additional benefit from completing the Course: there are opportunities in the Course to integrate knowledge, understanding and to extend the skills acquired throughout the Units.

Overall, the added value of the Course is in the Course assessment providing opportunities for the candidate to demonstrate:

- ◆ *retention* of a range of knowledge, understanding and skills acquired from across the Units
- ◆ *integration* of a range of knowledge, understanding and skills acquired from across the Units
- ◆ the ability to demonstrate the skills of *analysis and evaluation*, in familiar and less familiar contexts, from across the Course content
- ◆ *application* of a range of knowledge, understanding and skills in *more complex* contexts
- ◆ *application* of a range of knowledge, understanding and skills in *less familiar* contexts

It is of particular value that when Units are studied as part of the Course, opportunities exist for candidates to integrate their knowledge more effectively. For example, the Unit on building design considers the requirement for the building to be oriented correctly. This inevitably ties in with a consideration of the site survey. Similarly, a consideration of effective presentation techniques for drawings, whether prepared manually or by computer-aided means will have an impact on the candidates' work in the building design aspects of the Course.

The undertaking of the Course permits candidates to study and demonstrate their knowledge and understanding of domestic and non-domestic forms of construction. The Units alone focus solely on domestic construction.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

GRADE DESCRIPTIONS AT 'A' AND 'C'

The Candidate's grade will be based on the total score obtained from the two components of the Course assessment, i.e. the Question Paper and the *Project*. The descriptions below indicate the nature of achievement required for an award at Grade 'C' and Grade 'A'.

For an award at Grade 'C' and 'A' respectively candidates must be able to:

GRADE 'C'	GRADE 'A'
◆ demonstrate knowledge and understanding of building design in a commercial context	◆ demonstrate detailed knowledge and clear understanding of building design in a commercial context
◆ use appropriate knowledge and understanding to produce solutions to building design problems	◆ use knowledge and understanding of building design to produce detailed potential solutions to problems
◆ apply knowledge and understanding to develop ideas	◆ apply a wide range of knowledge and understanding to develop and refine ideas
◆ identify issues which have influenced the design of buildings	◆ identify a wide range of issues and explain how they have influenced the design of buildings
◆ explain why particular processes and materials are used in the construction of buildings	◆ appraise why particular processes and materials are used in the construction of buildings
◆ demonstrate the ability to carry out research and to use resulting information in solving problems	◆ demonstrate the ability to carry out detailed research and to use resulting information in solving problems
◆ communicate using a range of graphic techniques	◆ communicate using a range of high quality graphic techniques

ESTIMATES AND APPEALS

Estimates

In preparing estimates, evidence of performance will be considered from across the entire content of the Course and must take account of performance in the whole Course.

As part of the examination cycle, centres are required to submit estimate grades for candidates' performance in the Course assessment. Estimates are used as the basis for Appeals and in the consideration of awards for absentee candidates. Estimates must therefore be based on sound and demonstrable evidence. Evidence used to compile estimates and support Appeals must be valid, reliable and:

- ◆ be based on National Standards and take account of the Course Grade Descriptions
- ◆ reflect the scope, nature and weighting of the components of the Course assessment (that is, the Question Paper and the Project)

Further advice on the preparation of estimates is given in the Course Assessment Specification and the SQA publication *Estimates, Absentees and External Assessment Appeals: guidance on Evidence Requirements*.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Appeals

The principal source of evidence used to support an *Architectural Technology* (Higher) Appeal is an integrated test (for example a prelim) in respect of the Question Paper component.

The Project, completed internally over a period of time allows candidates the opportunity to develop, reflect upon and revise their work. Consequently, this will probably be the candidate's 'best' work in this area of the Course. **It is therefore unlikely that Appeals evidence will be submitted from this part of the Course.**

Evidence submitted in respect of the Question Paper should therefore come from an integrated test that adequately reflects the Course content and Grade descriptions. Evidence in the form of an integrated test or prelim should replicate the style, level of demand, mark allocation and weighting of the Specimen Question Paper. Reference should be made to the *Architectural Technology (Higher)* Course Assessment Specification document.

While it is acceptable for centres to generate their own test materials for prelims by drawing on past SQA Question Papers, such papers **must not** be used in their entirety. Where materials from past papers are used, a judicious selection of items and/or appropriate adaptation is required to make this acceptable evidence to support an Appeal. Items from past SQA papers may also be supplemented or replaced by internally devised materials.

Whatever approach is taken to create an integrated test, prelim or other such assessment item, centres must be certain that the Paper is not in the public domain and has not been seen previously by the candidates. It is the responsibility of centres to ensure the validity, reliability and security of assessment instruments used for estimates and appeals.

QUALITY ASSURANCE

All National Courses are subject to external marking and/or moderation. External markers, visiting examiners and moderators are trained by SQA to apply national standards.

The Units of all Courses are subject to internal moderation and may also be chosen for external moderation. This is to ensure that national standards are being applied across all subjects.

Courses may be assessed by a variety of methods. Marking is undertaken by a trained marker. Markers meetings and central marking ensure that a consistent standard is applied. The work of all markers is supported throughout and subject to scrutiny by the Principal Assessor.

To assist centres, Principal Assessor and Senior Moderator reports are published on the SQA's website www.sqa.org.uk and can be located on the relevant subject page.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS COURSE

The Units of this Course can either be delivered sequentially or concurrently:

- ◆ *sequential* delivery leads the candidate through the site survey, design and construction drawing of small housing developments
- ◆ *concurrent* delivery of Units encourage the integration of knowledge and skills, assisting candidates' development of transferable skills

Delivery of the Course should ensure that candidates recognise that the knowledge and skills acquired in the study of the three Units are all necessary in the progress of a construction project from conception to completion. Effective planning of the learning and teaching of the Units should permit the Project work for the Course to commence in or around December. This would permit the candidates to plan their project work in good time and ensure that learning and teaching towards the Units is integrated with learning required for the project from an early date.

It is worth noting that the scope of the project could be extended to generate much or all of the evidence for the Unit assessment. Centres that wish to consider this possibility are advised to plan such an approach effectively and with careful cross-referencing to the evidence requirements for the Units concerned.

It is important that the Unit *Building Design* introduces candidates to the extensive range of building design factors and the inter-relationship between them. This could be achieved through reference to a modern office building situated on a landscaped site. The functional requirements and relevant design factors should be identified and the means of compliance considered. Thereafter, the focus of the Unit should be on the design process as applied to domestic buildings. Use should be made of Building Research Establishment Digests, Information Papers, Defect Action Sheets and case studies. BRE Digest 268 '*Common defects in low-rise traditional housing*' will be useful in identifying specific design requirements and avoiding faulty detailing.

The Unit *Site Surveying* could be introduced by considering the impact the shape and contours of the construction site has on the building design and location. Detailed knowledge of the site is an important design requirement.

Knowledge of the principles of land surveying and skills in manual techniques and computational procedures should be acquired through the use of activity-based assignments. Demonstrations, videos and small practical exercises in and around the centre should be used to build confidence in the use of surveying instruments. Thereafter, fieldwork assignments should be used as the basis of learning, teaching and assessment.

Candidates should work in small teams for fieldwork and individually for associated indoor computation and graphical work, using shared data. Leadership and composition of teams should be varied to encourage confidence and the development of responsibility. Candidates should be required to produce brief, well structured and technically accurate reports for the linear and levelling surveys.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

It is suggested that a single composite assignment, based on an area of land and a hypothetical proposed construction, be used for the development of skills and as the basis of assessment. The area of the site used for summative assessment of linear surveying work should be not less than 0.25 hectares. The areas of sites used for formative surveying exercises need not be as large as that. A suitable site for summative assessment or project work may be available in the vicinity of the centre, but if this is not the case then the centre should make arrangements for a suitable site to be made available. This approach is to be preferred to one requiring fieldwork and assessment based on a series of individual disconnected assignments.

Significant integration of the three Units of the Course can be achieved in part through the Unit *Manual and Computer-Aided Construction Drawing*. Skills developed in the study of this Unit can be used in the preparation of a site plan for the Unit *Site Surveying* and for the preparation of the sketches required by the Unit *Building Design*.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

The Course Project, described previously under the heading ‘Details of Course Assessment’, will provide the basis for substantial integration of delivery and candidate activity. To achieve satisfactory integration of the three Units in the Course it is recommended that concurrent delivery be adopted. The extent to which integrated teaching of the Units or Outcomes is adopted, must be decided by the centre.

Site visits and video presentations of recent building projects will help candidates relate design and construction principles and techniques to practical industrial situations. Building companies and materials suppliers may be happy to accept properly organised visits from groups of candidates to their building sites and materials storage yards. Visiting speakers from housebuilders and architectural firms may be a particularly helpful source of learning for this Course.

Throughout the Course, candidate contact with the industry should be encouraged by activities such as site visits, investigations and visiting speakers. This will help motivate candidates to become more involved with the industry and to promote further study.

The topics of construction safety, quality and environmental awareness and responsibility should feature throughout the learning and teaching process.

It is recommended that effective use be made of the following examples of resources:

- ◆ British Standards and international equivalents
- ◆ Codes of Practice
- ◆ Building Research Establishment (BRE) Digests
- ◆ BRE Information Papers
- ◆ BRE Good Practice Guides
- ◆ BRE Defects Action Sheets
- ◆ Current building regulations and legislation in Scotland
- ◆ Website of the Scottish Building Standards Agency
- ◆ National House Building Council (NHBC) Standards
- ◆ Manufacturers’ literature
- ◆ Samples of building materials
- ◆ Sets of drawings from real building projects from industry
- ◆ Planning Advice Notes (PANs) — for example *PAN 67: Housing Quality*; *PAN 68: Design Statements*
- ◆ Architectural and design journals
- ◆ Website of the Commission for Architecture and the Built Environment (CABE)
- ◆ Website of Royal Fine Arts Commission for Scotland (RFACFS) — *a body providing independent public advice to government on the quality of planning and architecture in Scotland*
- ◆ Websites of various professional institutions (see list of institutions overleaf)
- ◆ ScottishArchitecture.com — *Scotland’s Virtual Architecture Centre* including *Digital Exhibition Archive*

The use of building drawings is especially helpful to allow candidates to see at a glance how the whole process of design is finally brought together. Candidates should be encouraged to look for examples of good practice in drawing work and in effective construction detailing in the drawings.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

Construction Industry exhibitions and seminars are other avenues of learning that are to be recommended for candidates of the *Higher Architectural Technology* Course. Some of these events are arranged by or through the professional institutions. Student membership of the various construction-related institutions is often available free or for a nominal fee. Membership normally permits candidates to access institution libraries. These are specialist resources devoted to the construction industry, or one aspect of it. In addition, the professional institutions have good websites with up-to-date and topical content. These websites often have a dedicated student section and links to other related sites.

Professional institutions that candidates might think of joining as student members include:

- ◆ BIAT (British Institute of Architectural Technologists)
- ◆ CIBSE (Chartered Institution of Building Services Engineers)
- ◆ CIOB (Chartered Institute of Building)
- ◆ I Struct E (Institution of Structural Engineers)
- ◆ ICE (Institution of Civil Engineers)
- ◆ RIAS (Royal Incorporation of Architects in Scotland)
- ◆ RICS (Royal Institution of Chartered Surveyors)

The additional 40 hours assigned to the Course will allow candidates time to develop a folio of work, complete a report and prepare for Course assessment, to carry out further research and to practice the integration of the skills acquired through study of the individual Units of the Course.

CANDIDATES WITH ADDITIONAL SUPPORT NEEDS

This Course 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 on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*.

National Course Specification: course details (cont)

COURSE Architectural Technology (Higher)

ARCHITECTURAL TECHNOLOGY IN A BROADER CONTEXT

A number of national initiatives and programmes promote themes that are important to contemporary society such as citizenship and enterprise. These themes contribute to individual subjects and Courses by making connections beyond the subject boundaries and enrich the learning experience of candidates. Similarly, the specialist knowledge and skills developed through study of a particular subject contributes to the understanding of these themes.

In the construction industry, such national initiatives include programmes on design town planning, quality and sustainability:

- ◆ Designing Places — A Policy Statement for Scotland
 - This Scottish Executive paper is all about the need to create successful and sustainable places and calls for a shift in attitudes, expectations and practices about the design of cities, towns and the countryside. It includes comments on the value of good design and design skills.
- ◆ A Policy on Architecture for Scotland
 - This Scottish Executive policy document contains sections on Processes, Principles, Design, Partnership and Change.
- ◆ Best Practice Knowledge
 - This programme supports the main objectives of the *Constructing Excellence* initiative by creating continuous improvement through the exchange of best practice.
- ◆ Key Performance Indicators (KPIs)
 - This initiative is part of the Constructing Excellence programme. It allows construction firms to monitor and assess their progress (benchmarking) against a set of key criteria including environmental issues and customer satisfaction.
- ◆ Sustainable Construction
 - The Department of Trade and Industry's (DTI's) Sustainable Construction Briefs highlight current issues and background information relating to sustainable development in construction.
- ◆ Rethinking Construction
 - A far-reaching report on the state of the construction industry, focusing on value for money for clients.
- ◆ Accelerating Change
 - A follow-up to Rethinking Construction, this important report looks at practical ways to implement the recommendations of the principal report.
- ◆ Promoting Sustainable Construction
 - A DTI initiative, which, as the name suggests, aims at promoting sustainable construction techniques and design.
- ◆ Quality Mark
 - This is the only Government sponsored initiative aimed at raising standards in the domestic repair, maintenance and improvement sector.

National Unit Specification: general information

UNIT Architectural Technology: Site Surveying (Higher)

CODE DV3W 12

COURSE Architectural Technology (Higher)

SUMMARY

This Unit is a mandatory Unit of the *Higher Architectural Technology* Course, but may also be taken as a free-standing Unit.

This Unit introduces the principles of land surveying and the techniques adopted in the preparation of construction site plans. The Unit includes a consideration of site plans developed for individual building projects and Ordnance Survey maps and plans. Skills will be developed in the use of surveying equipment to gather survey data that will allow candidates to create site plans and contour plans. Candidates will also produce concise technical reports on their fieldwork and results.

Site Surveying requires candidates to carry out linear surveying by tape or other appropriate means and levelling with an automatic level or other similar equipment. The Unit allows candidates to acquire knowledge of basic land surveying techniques and an understanding of site plans and Ordnance Survey maps and plans. This knowledge will facilitate progression to further surveying Units, allowing candidates to build on this basic knowledge and extend the site survey process.

The Unit is suitable for candidates who aim for a career in the construction industry as technicians, technologists and other construction professionals. The Unit may be undertaken by both full-time and part-time candidates in further education as well as candidates currently at school. Candidates may use this qualification to progress to further study at Higher National or Degree level.

OUTCOMES

- 1 Interpret information from site plans and Ordnance Survey maps and plans.
- 2 Carry out a linear measurement survey, plot the results and produce a brief report.
- 3 Carry out a levelling survey, prepare a contour plan and section and produce a brief report.

Administrative Information

Superclass: TC

Publication date: March 2006

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National Unit Specification: general information (cont)

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ An Intermediate 2 Course in Product Design, Graphic Communication or Technological Studies or their Units
- ◆ Two Standard Grades at Credit level, one from each of the following groupings:
 - Mathematics, Physics or Technological Studies
 - either Craft and Design or Graphic Communication

CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF level 6*).

**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.*

CORE SKILLS

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill	Numeracy at SCQF level 5
Core Skills component	Critical Thinking at SCQF Level 5

National Unit Specification: statement of standards

UNIT Architectural Technology: Site Surveying (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Interpret information from site plans and Ordnance Survey maps and plans.

Performance Criteria

- (a) Maps and locations within maps are identified correctly using the referencing system of the Ordnance Survey.
- (b) Information from an Ordnance Survey plan is interpreted correctly in accordance with the referencing system of the Ordnance Survey.
- (c) Information from a project site plan is extracted and interpreted accurately in accordance with current good practice and referencing systems for site plans.

OUTCOME 2

Carry out a linear measurement survey, plot the results and produce a brief report.

Performance Criteria

- (a) A linear measurement survey of a site is carried out correctly and in accordance with current good practice.
- (b) Linear measurement survey results are plotted on a plan to an accuracy of not less than 1 in 250.
- (c) A survey report is produced which is accurate and in accordance with current good practice.

OUTCOME 3

Carry out a levelling survey, prepare a contour plan and section and produce a brief report.

Performance Criteria

- (a) A levelling survey is carried out correctly and in accordance with current good practice.
- (b) Levels are reduced accurately using a standard procedure.
- (c) A contour plan is prepared to a specified standard using fieldwork results.
- (d) A section through the contour plan is prepared accurately and to an appropriate scale.
- (e) A survey report is produced which is accurate and in accordance with current good practice.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Site Surveying (Higher)

EVIDENCE REQUIREMENTS FOR THIS UNIT

Written/oral and product evidence is required which demonstrates that the candidate has achieved all Outcomes and all Performance Criteria within Outcomes. The mandatory content for this Unit is detailed in the Appendix.

The Outcomes should be assessed with two assessments comprising:

- ◆ a 45 minute closed-book test for Outcome 1;
- ◆ an open-book integrated folio of work for Outcomes 2 and 3, produced as a natural part of the learning and teaching process

The closed-book test is on site plans and Ordnance Survey maps and plans and will comprise a series of short answer and/or restricted response questions. The test will be carried out in controlled conditions: candidates are not permitted to collaborate in their responses.

The folio of work is a collection of evidence brought together in open-book conditions. It will include evidence of practical surveying work and the production of two survey reports. The folio should include evidence of:

- ◆ correct carrying out of the survey work for linear measurement
- ◆ plotting of results from the linear measurement survey to the prescribed accuracy
- ◆ correct carrying out of the levelling work
- ◆ reducing of levels, carrying out of arithmetic checks and preparation of the contour plan
- ◆ preparation of an accurate section through the contour plan to appropriate horizontal and vertical scales

The production of the folio of work will be carried out in open-book, supervised conditions. Candidates must, of necessity, co-operate in practical surveying work. They must also share data obtained by the practical surveying work. Assessors must, nevertheless, satisfy themselves that candidates' folios contain their own work. In particular, candidates must carry out their own calculations, both in reducing levels and in arithmetic checking. Candidates must also draw up their own linear survey plan, contour plan and longitudinal section.

The report writing for the practical surveying work will be carried out in controlled conditions during which candidates will have access to their folio of work and the associated checklists. Candidates will not be permitted to confer with others in the drafting of their reports.

Achievement in the closed-book test can be decided by the use of a cut-off score. The National Assessment Bank items illustrate the standard that should be applied and also the nature and extent of the sample to be used. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

Achievement in the folio of work will be decided on an achieved/not achieved basis. The criteria for achievement in the folio of work are the Performance Criteria in Outcome 2 and Outcome 3.

An exemplar for the folio of work for Outcomes 2 and 3 can be accessed via the SQA Coordinator for each centre. The exemplar illustrates the standard that should be applied for the folio of work.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Site Surveying (Higher)

For the closed-book test, for Outcome 1, where candidates fail to reach the agreed threshold score, reassessment should follow using an alternative instrument of assessment.

For the folio of work for Outcomes 2 and 3, where candidates fail to achieve the required performance, reassessment of one or more sub-tasks may be all that is required to bring the candidate's performance up to an acceptable standard.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Site Surveying (Higher)

APPENDIX

NB: This Appendix is within the statement of standards, ie the mandatory requirements of the Unit. All of the content in this section must be covered, but for assessment purposes it will be sampled as illustrated in the Evidence Requirements and the NABs.

Content to be covered for Outcome 1

Ordnance Survey maps and plans:

- ◆ scales
- ◆ sheet references
- ◆ grid references
- ◆ co-ordinates
- ◆ standard symbols
- ◆ depiction of surface relief

Site plans:

- ◆ scales
- ◆ levels
- ◆ site orientation
- ◆ conventional symbols

Open-book folio of work (Outcomes 2 and 3)

A folio of work for the Outcomes will be prepared by each candidate individually. Centres will ensure that work submitted in the folio is the candidate's own work. It is anticipated that the folio of work is produced as a natural part of the learning and teaching process.

The folio of work will include for the *linear measurement survey*:

- ◆ A linear measurement survey of a site of not less than 0.25 hectares, based on:
 - trilateration
 - offsetting
 - measurement by tape or other means
 - siting of stations
 - ranging
 - booking and field notes
 - standardisation of instruments
 - slope corrections
 - accuracy of measurement
 - orientation

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Site Surveying (Higher)

- ◆ A plot of the linear measurement survey results to an accuracy of not less than 1 in 250, including:
 - an appropriate scale
 - use of standard symbols
 - orientation
 - details of all stations
 - survey lines
 - checklines
 - offset measurements
 - a title box
- ◆ A copy of the linear measurement survey booking sheets.
- ◆ A survey report for the linear measurement survey.

The folio of work will include for the *levelling survey*:

- ◆ A levelling survey over a grid of minimum overall size 30x30 metres based on:
 - the indirect contouring method
 - at least two change points
 - a permissible closing error of +/- 20mm
 - use of level
 - use of staff
 - elimination of parallax
 - use of benchmark(s)
 - booking (Rise and Fall **or** Height of Collimation method — although both will be taught)
 - elimination of collimation error
- ◆ Results plotted using interpolation or other method with:
 - an appropriate scale (identical to the scale of the linear survey)
 - sufficiency of clearly identified contour lines
 - all gridlines
 - reduced levels
 - a title box (if appropriate)
- ◆ Longitudinal section through contour plan to appropriate horizontal and vertical scales.
- ◆ A copy of the levelling survey booking sheets with levels reduced and closing error distributed.
- ◆ Original arithmetic checks for the levelling survey results.
- ◆ A survey report for the levelling survey.

The survey reports for the linear measurement survey and the levelling survey will be drafted in supervised conditions after the satisfactory compilation and submission of the folio of work to the assessor. Candidates may refer to their folio of work and the assessor-prepared checklists for information during the writing of the reports, but must not confer with colleagues on the content of the report. Candidates will be given a standard survey report template or headings for the report sections (templates are included in the NABs for that purpose).

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Site Surveying (Higher)

The drawing up of the linear measurement survey and contour plan may be done either manually or by computer-aided means. If completed by computer-aided means, the evidence for the folio may be presented and stored electronically (there being no requirement in such a case to produce hard copies of the linear survey plan and levelling survey and section).

National Unit Specification: support notes

UNIT Architectural Technology: Site Surveying (Higher)

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

The *Site Surveying* Unit is set in the context of building sites for single buildings or small developments. Candidates will gain appreciation of the type of information that is required by design teams to plan the layout of building developments and the setting out of building works, roads and drainage installations. Candidates may go on to study the subject of site planning and setting out of building works at HN level, Degree level or in employment.

Corresponding to Outcomes 1-3:

- Outcome 1 For this Outcome candidates will read and interpret site plans and Ordnance Survey maps and plans and extract information from them.
- Outcome 2 This Outcome requires candidates to undertake, as part of a small team, a linear measurement survey. The candidate will plot the results to scale on a plan that is suitable for reproduction and write a brief survey report*. Emphasis should be given to sensible planning of surveying work and the layout of stations. The accuracy required for the overall linear survey is not less than 1 in 250.
- Outcome 3 This Outcome requires candidates to undertake a levelling survey, reduce the levels, produce a contour plan which is suitable for reproduction and write a brief survey report*. Once again, emphasis should be given to planning the survey properly to minimise abortive work. Candidates will also be required to produce a longitudinal section through the surveyed site.

**Candidates are to be given a template or headings upon which to base their survey reports. An example of such a template is given in the NABs for this Unit.*

The study of site surveying should include relevant health and safety issues. Candidate groups and individuals should consider the hazards encountered in practical surveying work, for example, manual handling, cuts from tapes and nipped fingers from staff work and tripods. The focus must be on how to remove hazards or minimise risks.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The topic of site surveying is most logically taught in the order of the Unit Outcomes. This permits candidates to first consider maps and plans. Candidates may already have a general familiarity with road maps, street maps, atlases and geographical maps.

Scale may be a new concept for some candidates, so it may be worthwhile devoting some time to this. Candidates who wish a career in the construction industry will need to be proficient in working with scale drawings both in surveying and in other areas such as building drawing.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Site Surveying (Higher)

OS maps and plans are readily available, both electronically and in hard copy. Candidates may be shown a series of maps that depict a location of interest such as an ancient monument, a sports stadium, their home town or even their own street and house. Once the candidate's interest is aroused, the mathematics of the OS grid and reference systems can be tackled, perhaps using the candidate's home town or other places of interest as a case study.

When candidates have successfully grasped the concept of OS maps and their symbols, the subject of site plans is relatively straightforward. Both OS maps and site plans are drawn to scale and incorporate the use of standard symbols.

Lessons can be reinforced by tutorial sessions involving short answer or multiple choice questions. The use of hard copy site plans and OS maps and plans in such tutorial sessions is to be encouraged. Tutorial periods on maps and plans could include sessions on the identification of standard symbols. These can be of short answer or multiple choice varieties and can be presented in either electronic form or hard copy.

Textbooks on site surveying generally are readily available as are a number of texts specialising in maps and plans. Centres may have their own learning packages on these subjects.

Field trips to sites depicted on OS maps, plans and site plans are always of benefit to candidates. During site visits, candidates can be asked to consider how they would have gone about gathering information for the preparation of a map or plan of the site. This will conveniently introduce the next subject in the study of site surveying — linear measurement surveys.

The use of trilateration in surveying and mapping can be readily depicted on a whiteboard, electronically or by handout materials. Convincing candidates that trilateration is an effective method of preparing site plans may be demonstrated by a small scale practical example: a lesson that involves candidates measuring the location of several trees and drawing up a scale plan of the trees' positioning. This will demonstrate that triangles are the most useful and reliable shape in reproducing locations accurately.

Although the small scale exercise outlined above can be carried out using a single sheet of paper and neat note taking, candidates should learn that such an approach would not work for larger or more detailed surveys. It is at this point that the use of standard linear survey booking sheets can be introduced. The candidates can now try using the booking sheets for the 'tree' exercise previously mentioned. Next a larger exercise, involving offset measurements can be tackled and the results drawn up to scale. The accuracy of the survey should at this stage be checked using the actual closing measurement and the corresponding measurement on the scale plan. The use of checklines should also be explained and demonstrated. These exercises prepare the candidate for the compilation of their folio of work for summative assessment.

The method of checking accuracy of survey results must be explained and demonstrated to candidates. A small scale exercise is just as effective as a large scale exercise in demonstrating how to compare the actual closing measurement with the closing measurement as scaled from the drawing up of the linear survey results. It must be made clear to candidates exactly what is meant by an accuracy of 1 in 250.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Site Surveying (Higher)

Candidates will benefit from reading good examples of previous linear [and levelling] survey reports. They must appreciate the benefits of clear and concise technical language, well presented under appropriate headings. Examples of report writing from fields outwith land surveying may also be used to illustrate effective report writing technique and language.

Short tutorial exercises in linear measurement surveying can focus on specific skills:

- ◆ planning the survey
- ◆ surveying over sloping ground
- ◆ offsets and locating specific objects
- ◆ measuring horizontal curves
- ◆ booking skills
- ◆ use of checklines
- ◆ drawing up results from booking sheets
- ◆ checks on accuracy
- ◆ report writing

Sites suitable for linear measurement and levelling surveys may be available within school or college grounds. Centres are reminded that if they intend to use private land or public open spaces such as parks, permission in writing should be obtained from the owners or departments responsible.

Once candidates are sufficiently confident with linear surveying they can be introduced to the subject of levelling. This can be done by referring again to OS maps and plans on which surface relief is depicted by spot heights and/or contours.

Candidates may readily grasp the depiction of contours by examining maps of mountain ranges. They can then be introduced to the relatively more subtle slopes depicted on site plans. It would be useful for candidates to examine real examples of such site plans. Even better would be a visit to a construction site where candidates can view the contours and changes in height in real life and see how the site plan endeavours to depict them. If a site visit coincided with a practical demonstration of the use of levelling surveying this would be useful.

A candidate's first practical lesson in levelling should be on the safe use of the equipment employed in surveying work. Hazards that may be encountered in the carrying out of surveying include: manual handling, slips, trips and falls, contact with sharp edges of tapes. Injury may also occur due to the pinching of fingers in-between the legs of tripods when closing the legs and in raising or lowering them. The sharp ends of ranging rods are an obvious hazard. This list is not exhaustive. Candidates should be taught to recognise potential hazards that may be particular to any one survey site, for example a busy main road or overhead cables. Candidates should not, of course, be asked to survey on sites that are inherently dangerous.

After learning about the safety implications associated with levelling surveying, the candidate can proceed to use the instruments in practice. Candidates can learn how to set up correctly a tripod and an automatic or other level. This is best demonstrated by a tutor, or can be learned by watching a video. The use of textbook instructions or notes is not as effective as hands-on demonstrations and practice in this regard.

The reading of the standard measuring staff is a skill that may take some time to perfect. The concept of parallax should be explained and candidates should learn how to eliminate this from their readings.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Site Surveying (Higher)

Candidates can build up skills and confidence in the use of the levelling instrument by short practical exercises such as carrying out a survey around a single building. Candidates will be able to complete this in a few minutes, and at the same time be forced to carry out two or more change points in the survey. Correct booking of such a survey is a relatively easy task, but candidates must learn to carry this out correctly.

Candidates should learn that careful surveying leads to satisfactory results. They should also acknowledge that there will almost invariably be a closing error in all levelling surveys. A number of different methods are available to calculate an acceptable tolerance for a levelling survey in any one instance. For example, one method employs the following formula:

$$\text{Allowable loop misclosure } C = 10\text{mm}\sqrt{n}$$

Where n is the number of instrument set-ups.

For two change points therefore, this gives $C = 10\text{mm}\sqrt{3} = 17\text{mm}$.

For this Unit the closing error for assessment purposes has been set at +/- 20mm.

Wherever possible, candidates should practise carrying out levelling surveys on the same plot of land on which they carried out linear measurement surveys. Contours drawn up on tracing paper can be placed over the site plan, thus incorporating in one visual, the full range of information on the site.

Videos on the subjects of linear measurement surveying and levelling surveying can be made available to individuals studying on an open/distance learning basis as well as to the class group in general. They are no substitute, however, for practical, hands-on experience with surveying work. Actual practice can be reinforced by means of tutorial examples.

Short tutorial exercises in levelling measurement surveying can focus on specific skills:

- ◆ planning the survey
- ◆ levelling the instrument
- ◆ reading the staff
- ◆ how to deal with severely sloping areas within large grid intervals
- ◆ booking skills
- ◆ reducing the levels
- ◆ arithmetic checks and closing error
- ◆ drawing up results
- ◆ report writing

Manufacturers and suppliers of surveying instruments produce technical literature and posters that highlight how their products are to be used. Candidates will likely find such literature informative and visual. Technical literature often refers the reader to the company's website where even more information and drawn/photographic details are available.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Site Surveying (Higher)

Candidates should be made aware of the techniques and equipment to which they may progress as they study surveying further. The basic land surveying techniques that they acquire in this Unit will allow them in due course to extend the site survey process to full topographical surveys. They may progress in further Units to completing three-dimensional surveys and use EDM (electromagnetic distance measurement) and total station equipment. Candidates should be made aware of modern theodolites and the facility to ascertain both angular and linear measurement using such equipment. If time permits, centres may demonstrate the use of such equipment. Nevertheless, assessment in the unit *Site Surveying* requires the use of tapes and levels.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

This Unit gives candidates experience of practical surveying activity. Although candidates will develop their knowledge and understanding of maps, site plans and surveying techniques, Unit assessment is focused on the application of this knowledge and understanding.

Candidates should achieve a satisfactory mark in the closed-book test for Outcome 1. The standard to be applied is detailed in the National Assessment Bank item for the Unit.

Candidates should gather a folio of work which will provide evidence for Outcomes 2 and 3. The standard to be applied is exemplified in the exemplar provided. The folio of work will be assessed on an achieved/not achieved basis only.

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 document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (SQA, 2004).

National Unit Specification: general information

UNIT	Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)
CODE	DV3X 12
COURSE	Architectural Technology (Higher)

SUMMARY

This Unit is a mandatory Unit of the *Higher Architectural Technology* Course, but may also be taken as a free-standing Unit.

This Unit stresses the important role of graphics in the development, communication and interpretation of construction proposals. The study of presentation techniques used in instrument-aided drawing, along with the more advanced techniques of Computer-Aided Drawing (CAD) will provide useful and transferable skills for candidates of all construction vocations. Candidates will acquire skills in the preparation of site layouts and building location (general arrangement) drawings for small building projects.

The Unit is suitable for candidates who aim for a career in the construction industry as technicians, technologists and other construction professionals. The Unit may be undertaken by both full-time and part-time candidates in further education as well as candidates currently at school. Candidates may use this qualification to progress to further study at Higher National or Degree level.

No prior knowledge of building drawing or CAD work is required of candidates undertaking this Unit, although drawing and sketching experience and Information Communication Technology (ICT) literacy will be of benefit. It will also benefit candidates to have previously studied construction technology.

OUTCOMES

- 1 Demonstrate knowledge and understanding of the type and purpose of drawings in common use in the construction industry.
- 2 Manually prepare a construction drawing utilising basic drawing skills.
- 3 Use a commercial Computer-Aided Drawing (CAD) system to generate a construction drawing.

Administrative Information

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National Unit Specification: general information (cont)

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ An Intermediate 2 Course in Product Design, Graphic Communication or Technological Studies, or their Units
- ◆ Two Standard Grades at Credit level, one from each of the following groupings:
 - Mathematics, Physics or Technological Studies;
 - either Craft and Design or Graphic Communications

CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF level 6*).

**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.*

CORE SKILLS

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill	None
Core Skills component	Using Graphical Information at SCQF level 4

National Unit Specification: statement of standards

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding of the type and purpose of drawings in common use in the construction industry.

Performance Criteria

- (a) The types of drawings in common use in the construction industry are identified correctly.
- (b) The purposes of the types of drawing in common use in the construction industry are explained correctly.

OUTCOME 2

Manually prepare a construction drawing utilising basic drawing skills.

Performance Criteria

- (a) Instruments used in the production of drawings are selected correctly and used in accordance with current good practice.
- (b) A drawing for a construction project is produced in accordance with current good practice.
- (c) Drawings are prepared in accordance with the correct application of the principles of orthographic projection.

OUTCOME 3

Use a commercial Computer-Aided Drawing (CAD) system to generate a construction drawing.

Performance Criteria

- (a) A CAD drawing for a construction project is produced in accordance with current good practice.
- (b) Construction drawings are generated using a range of CAD facilities and functions.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required which demonstrates that the candidate has achieved all Outcomes in this Unit and all Performance Criteria within Outcomes.

Outcome 1 (the type and purpose of construction drawings in common use) should be assessed by a 30 minute closed-book test. The test will be carried out in controlled conditions: candidates are not permitted to collaborate in their responses.

Outcomes 2 and 3 should be assessed by a folio of work produced as a natural part of the learning and teaching process in open-book conditions. This folio of work will cover:

- ◆ the preparation of site layout **or** a building location (general arrangement) drawing for a construction project utilising basic manual drawing skills (Outcome 2)
- ◆ the use of a range of CAD facilities and functions to generate a site layout **or** a building location (general arrangement) drawing for a small building project (Outcome 3)

In addition, the folio of work requires two assessor-completed checklists: one for the manual drawing and one for the CAD work. The production of the folio of work will be carried out in open-book, supervised conditions. Candidates are free to co-operate in the researching of technical information and construction technology details. They may also be free to confer on drawing techniques and CAD functions and commands. Assessors must, nevertheless, satisfy themselves that candidates' folios contain their own work.

The assessment instruments will sample the content and skills detailed in the Appendix to the Unit. The assessment instruments must, taken together, cover all Outcomes and all Performance Criteria.

Achievement in the closed-book test for Outcome 1 can be decided by the use of a cut-off score. The National Assessment Bank (NAB) items illustrate the standard that should be applied and also the nature and extent of the sample to be used. If a centre wishes to design its own assessments for this closed book test, they should be of a comparable standard.

Achievement in the folio of work for Outcomes 2 and 3 will be decided on an achieved/not achieved basis. The criteria for achievement in the folio of work are the performance criteria in Outcome 2 and Outcome 3.

An exemplar for the folio of work for Outcomes 2 and 3 can be accessed via the SQA Coordinator for each centre. The exemplar provided illustrates the standard that should be applied to the folio of work.

For the closed-book test, for Outcome 1, where candidates fail to reach the agreed threshold score, reassessment should follow using an alternative instrument of assessment.

For the folio of work for Outcomes 2 and 3, where candidates fail to achieve the required performance, reassessment of one or more sub-tasks may be all that is required to bring the candidate's performance up to an acceptable standard.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

APPENDIX

NB: All of the content in this section should be covered and is liable to sample through Unit and/or Course assessment.

Content to be covered for Outcome 1

Candidates will be taught the type and purpose of construction drawings in common use. Candidates will be required to describe the purpose and content of given types of drawings used in typical construction projects. Candidates will be required, for each type of drawing, to:

- ◆ state a suitable scale
- ◆ describe the purpose of the drawing
- ◆ describe the type of information shown on the drawing

The types of drawing to be covered are:

- ◆ site location plan
- ◆ site layout plan
- ◆ sketch drawings
- ◆ general arrangement drawings
- ◆ construction details (assembly drawings)

Folio of work (Outcomes 2 and 3)

A folio of work for the assignment will be prepared by each candidate individually. It is anticipated that the folio of work is produced as a natural part of the learning and teaching process.

The folio of work will include:

- ◆ a manually-produced site layout **or** building location (general arrangement) drawing for a small building project (although both will be covered in learning and teaching)
- ◆ a CAD-produced site layout **or** building location (general arrangement) drawing for a small building project (although both will be covered in learning and teaching)

Two assessor-completed checklists will be used to confirm that the candidate has provided all of the above to an acceptable level.

The *site layout* drawing must include:

- ◆ contours (from given information)
- ◆ graphical conventions
- ◆ conventional symbols
- ◆ annotations
- ◆ dimensions
- ◆ title box

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

The *building location (general arrangement)* drawing must comprise **one out of:**

- ◆ plan
- ◆ front elevation and roof plan
- ◆ cross-section

The *building location (general arrangement)* drawing must include:

- ◆ graphical conventions
- ◆ conventional symbols
- ◆ annotations
- ◆ dimensions
- ◆ title box

The CAD drawing must include:

- ◆ annotations
- ◆ title box

The manual and CAD drawings must:

- ◆ be accurate and comply with current good practice for construction drawings
- ◆ be produced to a scale appropriate to the type of drawing
- ◆ contain correct detailing with respect to current building legislation and good practice

Candidates are not permitted to produce the same drawing both manually and by means of CAD. One of the drawing types should be produced manually and the other type by CAD.

Manual drawings must demonstrate the use of lines of different widths and darkness, in order to emphasise and differentiate main lines from preliminary locating lines.

The production of orthographic views, and the preparation and presentation of drawings must comply with the requirements of relevant good practice. All drawings produced are to be 2-dimensional.

The folio of work must also include three assessor-completed checklists confirming that the candidate has (to an acceptable standard):

- ◆ Provided both manual and computer-aided construction drawings covering all of the requirements above
- ◆ Selected correct instruments for manual drawing, including:
 - T-square/parallel motion
 - scale rule
 - set squares

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

- ◆ Demonstrated competence in the use of the following CAD facilities for a 2D system:
 - continuous and broken line types
 - hatching
 - dimensions
 - two styles of text
 - editing/modifying
 - storing
 - recalling
 - plotting

National Unit Specification: support notes

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

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

The *Manual and Computer-Aided Construction Drawing* Unit is set in the context of low-rise domestic buildings and small residential layouts. It nevertheless shares principles and techniques with drawing work for industrial and commercial buildings. No prior knowledge of manual or computer-aided construction drawing is required of candidates undertaking this Unit.

Corresponding to Outcomes 1–2

- | | |
|-----------|--|
| Outcome 1 | This Outcome introduces candidates to the range and purpose of drawing types used in the construction industry. |
| Outcome 2 | This Outcome introduces candidates to the range of drawing materials and equipment used in the manual draughting process and the principles of orthographic projection. Candidates are required to apply basic drawing skills in the manual preparation of drawings for small building projects using conventional standards and methods of layout and presentation. |
| Outcome 3 | This Outcome requires that candidates are able to use a CAD (Computer-Aided Drawing) system to generate drawings for a small building project. |

From study of this Unit candidates will develop an appreciation of the role of graphics in the development, communication and interpretation of construction proposals. This will allow them to further appreciate the importance of clarity and consistency in construction drawings. Candidates will acquire practical drawing skills in the preparation of site layouts and building location (general arrangement) drawings for small building projects, for both manual and computer-aided drawing. The study of presentation techniques used in drawing, along with the more advanced techniques of CAD will provide useful and transferable skills.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

This Unit is mainly practical-based; candidates are required to develop skills in manual drawing and in the use of 2D CAD (Computer-Aided Drawing).

Manual drawing class work will allow candidates to develop good draughting skills, for example, developing the ability to draw lines of consistent thickness, of various weights. This is useful for emphasis of important/minor or near/far elements in drawings thereby making them clearer and more easily understood. The introduction to and use of some of the available tools and instruments used in industry, eg clutch pencils, drawing pens, stencils, or templates, may be of interest.

It is important to familiarise candidates with conventional construction drawing symbols for components and fittings.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Manual and Computer-Aided Construction Drawing (Higher)

Candidates will develop skills in writing neat annotations, concentrating on different types and sizes of lettering, with appropriate spacing. This is important in the dimensioning of site layout and building drawings. The use of templates may also help with the comprehension of scale.

Knowledge of the type and purpose of construction drawings can be provided through examination of full sets of preliminary and working drawings. This will convey to candidates the standard of presentation expected by industry. Thereafter, attention should focus on the use of equipment and on the basic principles of orthographic projection. Adequate time should be devoted to the study of this technique. Candidates will acquire skills in the production and layout of views of simple geometric shapes before attempting to produce full construction drawings. Additional drawing exercises may be issued, particularly for less experienced candidates.

Manual drawing skills should be mastered prior to beginning CAD. Candidates will thus understand commonly-used drawing terms and methods of planning and setting out drawings before attempting computer-aided draughting. This is particularly important for candidates who are not confident in the use of computers. Computers provide many benefits but due to limited screen size there is a trade-off between detail and full-view display. This underscores the benefit, to some candidates, of first learning the principles of construction drawing practice manually.

A brief introduction to CAD should cover basic operations, generation of shapes and drawings, advantages of CAD systems and equipment requirements of systems. The introduction should not include details of the internal operational sequences of the system.

For CAD work, ideally each candidate should be provided with an individual work station. Initially, candidates should attempt simple exercises to become familiar with basic commands and functions. Work on simple drawings will be helpful, allowing candidates to develop further skills such as:

- ◆ accurate sizes and angles
- ◆ text and dimensions
- ◆ hatching
- ◆ editing or modifying drawings

Examples of CAD-produced construction drawings and/or a visit to a drawing office would be beneficial to the students' learning experience.

Candidates may be undertaking other construction-related Units which require the production of drawings and details. These Units may permit the use of CAD. Such Units include: *Architectural Technology: Building Design; Site Surveying; Building Construction: Substructure and Building Construction: Superstructure.*

It is recommended that the same case studies be used for both the *manual* and the *computer-aided* drawing work. Furthermore, integration of learning and teaching with Outcome 3 of the Unit *Building Design* (part of the *Higher Architectural Technology* Course) would be very useful: candidates could use their own design as the subject for which to prepare general arrangement drawings. Integration of learning and teaching with *Site Surveying* (also part of the *Higher Architectural Technology* Course) in respect of the preparation of site plans would also be beneficial.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Manual and Computer-Aided
Construction Drawing (Higher)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

This Unit gives candidates experience of manual and computer-aided drawing activity. Although candidates will develop their knowledge and understanding of drawing and CAD techniques, Unit assessment is focused on the application of this knowledge and understanding.

Candidates should achieve a satisfactory mark in the closed-book test for Outcome 1. The standard to be applied is detailed in the National Assessment Bank item for the Unit.

Candidates should gather a folio of work which will provide evidence for Outcomes 2 and 3. The standard to be applied is exemplified in the exemplar provided. The folio of work will be assessed on an achieved/not achieved basis only.

RESOURCES

In the context of this Unit, a commercial CAD (Computer-Aided Drawing) system is defined as a software package with the hardware necessary to generate drawings at an acceptable processor speed and to a standard suitable for presentation to a client.

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 document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (SQA, 2004).

National Unit Specification: general information

UNIT	Architectural Technology: Building Design (Higher)
CODE	DV3V 12
COURSE	Architectural Technology (Higher)

SUMMARY

This Unit is a mandatory Unit of the *Higher Architectural Technology* Course, but may also be taken as a free-standing Unit.

In this Unit, candidates will learn how designers develop clients' briefs into viable designs. Candidates are introduced to the overall process and basic principles of building design. The Unit also examines the functional requirements of buildings and their elements, and the range of inter-related design factors, for example, technical design, aesthetics and sustainability. Candidates will acquire skills in the selection of construction methods and materials, and in the design process for domestic buildings. Candidates will develop a design from client's brief to sketch designs.

The Unit is suitable for candidates who aim for a career in the construction industry as technicians, technologists and other construction professionals. The Unit may be undertaken by both full-time and part-time candidates in further education as well as candidates currently at school. Candidates may use this qualification to progress to further study at Higher National or Degree level.

OUTCOMES

- 1 Explain the impact of design factors on domestic building projects.
- 2 Analyse the enclosure, structural elements and materials of domestic buildings.
- 3 Develop a design for a domestic building project.

Administrative Information

Superclass:	TD
Publication date:	March 2006
Source:	Scottish Qualifications Authority
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National Unit Specification: general information (cont)

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ An Intermediate 2 Course in Product Design, Graphic Communication or Technological Studies, or their Units
- ◆ Two Standard Grades at Credit level, one from each of the following groupings:
 - Mathematics, Physics or Technological Studies
 - either Craft and Design or Graphic Communications

No prior knowledge of building drawing or design is required of candidates undertaking this Unit, although drawing and sketching experience will be of benefit. It will also benefit candidates to have previously studied construction technology.

CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF level 6*)

**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.*

CORE SKILLS

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill	None
Core Skills component	Using Graphical Information at SCQF level 5 Critical Thinking at SCQF Level 5

National Unit Specification: statement of standards

UNIT Architectural Technology: Building Design (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Explain the impact of design factors on domestic building projects.

Performance Criteria

- (a) The function and functional requirements of buildings are explained accurately.
- (b) The importance of design in building projects is explained clearly.
- (c) Design factors relevant to building projects are identified correctly.
- (d) Constraints relevant to building projects are identified correctly.
- (e) The impact of major design factors on design is explained correctly.

OUTCOME 2

Analyse the enclosure, structural elements and materials requirements of domestic buildings.

Performance Criteria

- (a) The main enclosure and structural elements are identified correctly from a given drawing.
- (b) The functions of the main enclosure and structural elements are described correctly.
- (c) Suitable materials are identified for the main enclosure and structural elements with regard to current practice in the construction industry.
- (d) Materials identified are justified in terms of function.

OUTCOME 3

Develop a design for a domestic building project.

Performance Criteria

- (a) Domestic building forms are compared in terms of function, buildability and the client's priorities.
- (b) The design developed fulfils a given brief.
- (c) The selection form is justified in terms of the brief.
- (d) The materials selected are justified in terms of the brief.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Building Design (Higher)

EVIDENCE REQUIREMENTS FOR THIS UNIT

Written/oral and product evidence is required which demonstrates that the candidate has achieved all Outcomes and all Performance Criteria within Outcomes.

- ◆ a 45 minute closed-book test for Outcomes 1 and 2
- ◆ a folio of work for Outcome 3, produced as a natural part of the learning and teaching process

The closed-book test requires candidates to identify and explain the importance of design factors relevant to domestic building projects, to identify and explain the function of enclosure and structural elements of domestic buildings and select typical materials for the main enclosure and structural elements. This must be carried out in controlled conditions: candidates are not permitted to collaborate in their responses.

The folio of work is a collection of evidence including the selection of appropriate forms of construction and materials for a domestic building project and the development of a design for the building. The folio of work should be in two parts: one for the selection of appropriate forms of construction and materials, and the other for the sketch proposals of the design. The production of the folio of work will be carried out in open-book, supervised conditions. During this assessment candidates are free to co-operate with colleagues in the researching of technical information and construction technology details. Candidates may also confer with one another regarding design factors and concepts. Assessors must, nevertheless, satisfy themselves that candidates' folios contain their own work.

The assessment instruments will sample the content and skills detailed in the Appendix to the Unit. The assessment instruments must, taken together, cover all Outcomes and all Performance Criteria.

Achievement in the closed-book test can be decided by the use of a cut-off score. The National Assessment Bank items illustrate the standard that should be applied and also the nature and extent of the sample to be used. If a centre wishes to design its own assessments for the closed book test, they should be of a comparable standard.

Achievement in the folio of work will be decided on an achieved/not achieved basis. The criteria for achievement in the folio of work are the Performance Criteria in Outcome 3.

An exemplar for the folio of work for Outcome 3 can be accessed via the SQA Coordinator for each centre. The exemplar provided illustrates the standard that should be applied for the folio of work.

For the closed-book test for Outcomes 1 and 2, where candidates fail to reach the agreed threshold score, reassessment should follow using an alternative instrument of assessment.

For the folio of work for Outcome 3, where candidates fail to achieve the required performance, reassessment of one or more sub-tasks may be all that is required to bring the candidate's performance up to an acceptable standard.

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Building Design (Higher)

APPENDIX

NB: All of the content in this section should be covered and is liable to sample through Unit and/or Course assessment.

Content to be covered (Outcomes 1 and 2)

- ◆ The overall function or functional requirements of domestic buildings:
 - comfort/shelter
 - structural integrity
 - aesthetic merit/architectural
 - space provision for activities/work

- ◆ Design factors relevant to domestic building projects and their impact:
 - architectural/aesthetic
 - spatial
 - safety
 - structural
 - buildability
 - physiological comfort
 - design life (maintenance)
 - economic
 - environmental

- ◆ Constraints relevant to domestic building projects and their impact:
 - social
 - technical
 - legal/statutory (including planning and building control)
 - financial

- ◆ The main enclosure and structural elements and their functions: any three domestic building elements and any four functional requirements of each element.

- ◆ Typical materials for the main enclosure and structural elements for any three domestic building elements.

Open-book folio of work (Outcome 3)

A folio of work for this Outcome will be prepared by each candidate individually. Centres will ensure that work submitted in the folio is the candidate's own work. It is anticipated that the folio of work is produced as a natural part of the learning and teaching process.

The folio of work is based on the development of a design and the selection of appropriate forms of construction and materials from a given brief, to include:

- ◆ an explanation of the advantages and limitations of the form of construction selected
- ◆ an appropriate selection of materials for the enclosure and structural systems to suit the chosen form of construction

National Unit Specification: statement of standards (cont)

UNIT Architectural Technology: Building Design (Higher)

- ◆ bubble diagrams and preliminary sketch drawings, well proportioned, showing the development of the design and encompassing a minimum of a floor plan and two elevations

National Unit Specification: support notes

UNIT Architectural Technology: Building Design (Higher)

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

The *Architectural Technology: Building Design* Unit is set in the context of single domestic buildings or small residential developments. No prior knowledge of building design is required of candidates undertaking this Unit.

Corresponding to Outcomes 1-3

- Outcome 1 This Outcome creates an awareness of the functional requirements of domestic buildings and the inter-relationship of the range of design factors contributing to the overall building design process. The following design factors are considered: architectural-aesthetic, spatial, safety, structural, physiological comfort, design life (maintenance), economic and environmental. Design constraints include social, technical, legal and financial.
- Outcome 2 This Outcome provides candidates with knowledge of the functions of the elements of common enclosure and structural systems. It also considers the materials typically used in the main enclosure and structural elements.
- Outcome 3 This Outcome follows naturally from Outcomes 1 and 2 with the development of a design and the selection of appropriate forms of construction and materials for a domestic building. This will develop design skills and enhance understanding of design problems and processes. This Outcome covers main construction methods used in the UK for domestic buildings and suitable materials for such buildings.

Building design

Candidates studying this Unit will develop an appreciation of the basic principles and procedures relating to building design through an introduction to the function of domestic buildings and their separate elements, the performance requirements of these and the inter-related design factors that impact on the design solution.

Design factors should be considered in relation to examples of sites in various locations and climatic conditions as this can influence or alter the functions/functional requirements of the elements of the building. These factors may influence the form of construction chosen and the materials selected (which may or may not align with the original brief).

The function of a domestic building in providing a controlled environment will be introduced and the functional requirements to be satisfied for creation of a successful dwelling considered. These requirements include: shelter and enclosure, space provision and physiological comfort. The effects of the outdoor site environment on the indoor environment will be explored.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Building Design (Higher)

The following requirements and design factors are considered:

- ◆ Architectural
- ◆ Structural
- ◆ Comfort
- ◆ Buildability
- ◆ Design life
- ◆ Economic
- ◆ Environmental impact
- ◆ Safety

The social, technical, legal and financial constraints to domestic building projects are covered. The role of the statutory authorities (planning and building control), in ensuring that development, design and construction satisfy minimum acceptable standards, will be considered. Candidates may examine the official technical handbooks regarding the requirements of current legislation pertaining to domestic building construction in Scotland, although specific requirements of the current regulations should not be considered in detail at this stage. The application procedure for a building warrant and planning permission should be covered briefly.

In considering the environmental impact of buildings, reference is made to the determination of the eco-friendliness (or otherwise) of construction materials, ecologically orientated product choice and eco-labelling. Candidates should also be made aware of the following environmental assessment schemes and initiatives:

- ◆ Building Research Establishment Environmental Assessment Method (BREEAM) for assessing the environmental performance of new building designs and for existing buildings in terms of:
 - energy use
 - health and well-being
 - pollution
 - land use
 - ecology
 - materials
 - water consumption and waste
- ◆ National Home Energy Rating (NHER) scheme and energy efficiency advice.
- ◆ The Government's Standard Assessment Procedure (SAP) for producing energy cost ratings and a carbon index (CI).
- ◆ Any other relevant current schemes and initiatives regarding sustainability and environmental considerations.

The application of quality assurance principles to construction should be considered, relating to:

- ◆ control of the design process;
- ◆ purchasing and product certification
- ◆ checking and issue of drawings
- ◆ building process control
- ◆ the National House Building Council (NHBC) '*Buildmark*' scheme
- ◆ NHBC Standards manuals and other publications on quality in construction works generally

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Building Design (Higher)

Construction methods

Study of construction methods provides candidates with knowledge of the main construction methods used in the UK for domestic buildings. Candidates will be able to select forms of construction and suitable materials for such buildings.

A building construction form or method should be explained as a combination of a structural system and an enclosure system.

The forms of construction will include: traditional masonry cavity wall construction and timber frame. Materials appropriate to each method of construction are to be considered. The advantages and limitations of each type of construction are to be covered, including:

- ◆ Traditional — *suitable for small builders, uses traditional crafts, one-off production, labour intensive*
- ◆ Timber frame — *offers speed of erection, reduction in site work, economy of labour, high strength/weight ratio of timber, rationalisation*

The need for environmental sensitivity in the choice of construction methods is covered and reference is made to the concept of ‘best available technology’.

Elements of buildings

Study of this enables candidates to describe, through sketches, the elements of common enclosure and structural systems. Only domestic buildings are considered. Enclosure elements covered include: walls, cladding, windows, doors and roofs. Structural elements include: foundations, walls, floors, roofs and stairs. The functions of elements, the connections between elements and the support systems for elements are to be included.

Candidates will practise describing, by use of either free-hand or instrument-aided sketches, building elements and the connections between such elements. These should be well proportioned and annotated.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

To begin this Unit, candidates may be given a small design project, for example, designing their ‘dream’ bedroom. To make this exercise realistic, a space restriction should be imposed. This helps to develop skills in analysing, prioritising and making decisions regarding available space. This space planning exercise provides an opportunity for candidates to think imaginatively and to develop technical skills such as working to scale, sketching and drawing.

This exercise could be followed up with a building case study focusing on functional requirements, design procedures, selecting building forms and construction details. Standard house types from a developer’s catalogue may provide useful subjects for critical discussion.

Another exercise may involve studying a building (domestic or otherwise) by a notable architect which will introduce candidates to architectural design and allow them to develop research skills. Alternatively, a local architect may be willing to supply drawings and information for one of their own buildings and make a presentation on the development of their design.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Building Design (Higher)

Candidates may learn through practical design exercises, lectures, tutorials and discussions on the choices made by architects regarding:

- ◆ Site analysis:
 - orientation
 - location
 - aspect
 - exposure
 - surrounding environment (urban/rural/industrial/coastal/conservation area)
 - topography
 - micro-climate

- ◆ Functional and performance requirements of the building and its elements

- ◆ Plan layout:
 - placing of rooms
 - influence of the structural form on the plan
 - influence of the design concept on the structural form

- ◆ Choice of architectural form

- ◆ Choice of form of construction (for example traditional masonry cavity wall construction and timber frame)

- ◆ Choice and justification of materials:
 - locally available
 - traditional
 - imported
 - ecologically beneficial

- ◆ Proportion, colour, texture, scale

Having discussed an example in class, candidates could be encouraged to research a building on their own, identifying the relevant functional requirements and design factors. Visits to local buildings will also play an important role in developing candidates' abilities to recognise the above factors. It is often helpful to look at a variety of building types in this regard.

Visits to building sites would be very valuable as the different stages of a building project and different structural forms and materials can be observed. Candidates should be encouraged to speculate about the reasons behind design decisions (for example constraints on technical, aesthetic and perhaps economic and legal factors).

Learning and teaching for Outcomes 1 and 2 should not be restricted to the design factors relevant to domestic buildings. Candidates will find it beneficial to be introduced to the range of design factors influencing all types of modern building. If the learning and teaching for this Unit was to be restricted to domestic buildings only it might be difficult for candidates to grasp some of the design factors that are best illustrated or exemplified through a wider range of building types. However, for assessment purposes, the Unit focuses on low-rise domestic buildings only.

National Unit Specification: support notes (cont)

UNIT Architectural Technology: Building Design (Higher)

Tutorial exercises may be beneficial in the subject area of design factors. Candidates should be helped to appreciate that the various design factors can rarely be considered in isolation, but that they will be inter-related. When considering design factors it may be beneficial to allow candidates to dwell on the sub-factors (in *italics*). This will help them to understand what the main (**bold**) factors are all about.

- ◆ **Architectural** — *creativity, spatial, form/scale relationships, harmony, fire protection and escape, site influences, function, security, access*
- ◆ **Structural** — *loading, force resistance, structural concept, strength, stability*
- ◆ **Comfort** — *water exclusion, thermal, light, air quality, sound and acoustics, ergonomics*
- ◆ **Buildability** — *ease of construction, safety, standardisation, modular co-ordination, prefabrication*
- ◆ **Design life** — *durability, maintenance*
- ◆ **Economic** — *client's budget, contract completion requirements, concept of required standard at lowest cost, whole life costs, investment potential*
- ◆ **Environmental impact** — *visual, energy use, eco-friendliness of materials and activities*
- ◆ **Safety** — *fire escape and compartmentation, radon gas, accident prevention*

This Unit should provide a valuable introduction to building design principles and processes and to standard forms of construction. Research in the library and on the Internet could be encouraged to broaden candidates' understanding of design. On completion of this Unit candidates should be able to tackle a simple design of their own.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

This Unit gives candidates experience of design activity. Although candidates will develop their knowledge and understanding of design factors and issues, Unit assessment is focused on the application of this knowledge and understanding.

Candidates should produce a folio of work for Outcome 3. The standard to be applied is exemplified in the exemplar provided. The folio of work will be assessed on an achieved/not achieved basis only.

Candidates should achieve a satisfactory mark in the tests for Outcomes 1 and 2. The standard to be applied is detailed in the National Assessment Bank item for the Unit.

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 document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (SQA, 2004).