

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

Superclass:	TD
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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

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|-----------|--|
| 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).