SQA Advanced Unit specification

General information

Unit title: CAD: 2D I (SCQF level 7)

Unit code: HR3L 47

Superclass: CH

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Unit purpose

This Unit is designed to enable learners to develop the skills and knowledge required for the creation and manipulation of objects within a 2-Dimensional (2D) Computer Aided Draughting (CAD) drawing environment. It is suitable for learners wishing to pursue a career in any design discipline where CAD is used.

Outcomes

On successful completion of the Unit the learner will be able to:

1 Use correct file handling procedures within the operating system and the CAD package.
2 Use the CAD package to set up a 2D CAD drawing environment.
3 Produce a 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.
4 Edit an existing 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.

Credit points and level

1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Recommended entry to the Unit

Access to this Unit is at the discretion of the centre. However, it would be an advantage for learners to have a basic knowledge and understanding of computers and technical drawing. This may be evidenced by possession of a Higher in Graphical Communication and/or SQA Advanced Unit in *Information Technology: Applications Software 1*.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

This Unit was developed for the SQA Advanced Certificate/Diploma in Computer Aided Draughting and Design awards.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website **(http://www.sqa.org.uk/sqa/46233.2769.html)**.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

SQA Advanced Unit specification: Statement of standards

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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 SQA.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Use correct file handling procedures within the operating system and the CAD package.

Knowledge and/or Skills

- Folder operations within the operating system:
  - create directories/folders
  - delete directories and files
  - rename directories

- File operations within the operating system:
  - copy files from one location to another
  - move files from one location to another
  - rename files

- File operations within the drawing package:
  - create directories/folders
  - copy files from one location to another
  - move files from one location to another
  - delete directories and files
  - rename directories and files
  - cut, copy and paste files

Outcome 2

Use the CAD package to set up a 2D CAD drawing environment.

Knowledge and/or Skills

- Open and close the CAD application
- Standard drawing
- System variables
- Layer management
- Text styles
- Modified dimension style
- Border and title box

Outcome 3

Produce a 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.

Knowledge and/or Skills

- Co-ordinate systems
- Layers
- Drawing tools
- Hatch patterns
- Inquiry commands
- Selection methods
- Text
- Dimensions

Outcome 4

Edit an existing 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.

Knowledge and/or Skills

- Manipulation of objects:
  - Erase, Copy, Move
  - Fillet, Chamfer, Trim, Extend, Lengthen
  - Mirror, Offset, Rotate, Stretch, Scale, Array
  - Break, Explode, Undo
  - Edit Polyline, Edit Spline, Properties
- Manipulation of dimensions
- Manipulation of text
- Produce a hardcopy of the results

Evidence Requirements for this Unit

Outcomes 1–3

The learner will be required to demonstrate his/her Knowledge and/or Skills in Outcomes 1, 2 and 3 with the production of practical and graphical evidence. The learner will be required to carry out basic file management and create, save and use a Standard Template drawing in the creation of a practical 2D drawing file and produce a hard copy of a simple 2D object. The learner will be required to:

- perform a range of a minimum of four file management operations to a given specification
- create, save and use a standard drawing file to a given specification
- create a detailed drawing incorporating the standard drawing to a given specification using appropriate layers, text styles and dimension style

Outcome 4

The learner will be required to demonstrate his/her Knowledge and/or Skills in Outcome 4 with the production of practical and graphical evidence. The learner will be required to carry out basic editing commands, modify text and dimensions, add additional dimensions and produce a hard copy.

In any assessment of this Outcome all of the Knowledge and/or Skills need not be assessed. However, at least **seven** editing operations must be sampled with each assessment.

In order to ensure that learners will not be able to foresee what editing commands they will be required to use, a different sample of seven is required each time the Outcome is assessed.

SQA Advanced Unit Support notes

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Unit Support Notes are offered as guidance and 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

This is a mandatory Unit in the SQA Advanced Certificate/Diploma in Computer Aided Draughting and Design Group Awards but may be delivered on a standalone basis or as an option to another Group Award. If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

This Unit has been written in order to allow learners to develop fundamental knowledge, understanding and skills in basic file management, drawing set up, creation and use of Standard Template files, creation and editing of objects and production of printed drawings. These skills are essential to creation of practical 2D drawings within any design discipline.

There is one other Unit in the group entitled *CAD: 2D II*. The two Units have been developed as an integrated suite of Units to meet most 2D CAD requirements and can be used in awards as necessary and where appropriate.

In designing this Unit a range of topics have been included which would be expected to be covered by lecturers. Recommendations are given below as to how much time should be spent on each Outcome. This has been done to help lecturers decide what depth of treatment should be given to the topics attached to each of the Outcomes. While it is not mandatory for a centre to use this list of topics, it is strongly recommended that it do so to ensure continuity of teaching and learning across the Units. The Assessment Support Pack (ASP) for this Unit is based on the Knowledge and/or Skills and list of topics in each of the Outcomes as well as covering aspects of the discipline which it is used in, ie Building Environment.

The list of topics is given below. Lecturers are advised to study this list of topics in conjunction with the Assessment Support Pack (ASP) so that they can get a clear indication of the standard of achievement expected of learners in this Unit.

Outcome 1 (4 hours)

Use correct file handling procedures within the operating system and the CAD package.

The following topics are generic in nature but should be put into context by reference to the CAD software application package being used at the centre:

Windows commands:

- create directories/folders
- copy files from one location to another
- move files from one location to another
- delete directories and files
- rename directories and files
- cut, copy and paste files

CAD application commands:

- create directories/folders
- copy files from one location to another
- move files from one location to another
- delete directories and files
- rename directories and files
- cut, copy and paste files

Outcome 2 (5 hours)

Use the CAD package to set up a 2D CAD drawing environment.

The following topics are specific in nature but should be put into context by reference to the CAD software application package being used at the centre:

Drawing Setup:

- limits
- Units
- system variables
- grid
- snap
- ortho

Layers:

- create layers
- assign colours
- assign linetypes
- on/off
- freeze/thaw
- lock/unlock

Text:

- create text styles
- assign fonts
- assign widths
- use the Text command
- edit text

Dimensions:

- create a dimension style

Additional Commands:

- Zoom
- Pan
- Regenerate
- Redraw

Template files:

- use existing Template files
- create a user defined Standard Template file containing set Limits, Units, Layers, Text Styles, a Dimension Style
- create a border and a title block
- save a user defined Standard Template file

Outcome 3 (12 hours)

Produce a 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.

The following topics are generic in nature but should be put into context by reference to the CAD software application package being used at the centre:

Drawing Concepts:

- use of a Template file as a basis for the standard drawing file
- use of Layer control, eg On/Off, Freeze/Thaw, Lock/Unlock
- use of absolute, relative and polar co-ordinates during creation of objects
- use of construction lines and Orthographic layouts with First and Third Angle projection
- use of hatch patterns
- use of dimensioning commands:
  - Linear
  - Aligned
  - Radius
  - Diameter
  - Angular
  - Leader
  - Centre Marks
  - Ordinate
  - Tolerance

- print to an appropriate scale for a given paper size within a border

2D Drawing Commands:

- Line, Construction Line, Ray
- Arc, Circle, Ellipse
- Polyline, Rectangle, Polygon, Spline
- Hatch, Grips, Inquiry

Views:

- creating views and naming views

Inquiry Commands:

- List
- Distance
- ID
- Area
- Divide
- Measure

Outcome 4 (14 hours)

Edit an existing 2D CAD drawing using the CAD package and plot the drawing to an appropriate scale.

The following topics are generic in nature but should be put into context by reference to the CAD software application package being used at the centre:

2D Editing Commands:

- Selection methods for selecting single and multiple objects:
  - pick
  - window
  - crossing window
  - last
  - previous
  - fence
  - add/remove
- Erase, Copy, Move
- Fillet, Chamfer, Trim, Extend, Lengthen
- Mirror, Offset, Rotate, Stretch, Scale, Array
- Break, Explode, Undo
- Edit Polyline, Edit Spline, Properties
- Edit dimensions and dimension text

Plotting:

- Use of Plot and scaling within the plotting environment

Unit Assessment

Outcome 1 to 3	Practical	3 hours
Outcome 4	Practical	2 hours

Guidance on approaches to delivery of this Unit

As this Unit provides basic CAD skills, which requires continual use to obtain proficiency, it is recommended that the Unit be delivered towards the start or middle of an award so that it may be used with other Unit requirements.

Where this Unit is incorporated into other Group Awards it is recommended that it be delivered in the context of the specific occupational area(s) that the award is designed to cover, eg architectural drawings with Built Environment courses.

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines after the Outcomes in the SQA Advanced Unit specification: Statement of Standards section. It is recommended that these sections be read carefully before proceeding with assessment of learners.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

The assessments for all Outcomes **must be** in the form of practical assessments. Outcomes 1 to 3 should be given as one integrated practical assessment lasting no more than 3 hours and the remaining Outcome as a second practical assessment lasting two hours. Both assessments must be given under controlled, supervised conditions. It should be noted that learners must achieve all the minimum evidence specified for each Outcome in order to pass the Unit. Learners whose assessment response does not meet the minimum evidence will be offered remediation and the opportunity for re-submission to reflect industry practice. For example, if a drawing requires minor modifications this may be remediated and re-submitted.

An Assessment Support Pack (ASP) is available for this Unit.

Assessment Guidelines

Outcome 1–3

Evidence must be generated through practical assessment undertaken in controlled, supervised conditions. The time allocation for this assessment is 3 hours. Assessment will be under open-book conditions and, as such, learners **will be allowed** to bring any textbooks or notes to the assessment or use the Help available within the application software.

It is recommended that centres develop a checklist to support the assessment requirements for each of the Knowledge and/or Skills items in Outcomes 1–3.

Outcome 4

Evidence must be generated through practical assessment undertaken in controlled, supervised conditions. The time allocation for this assessment is two hours. Assessment will be under open-book conditions and as such learners **will be allowed** to bring any textbooks or notes to the assessment or use the Help system available within the application software.

Graphical evidence will be in the form of CAD application drawing files presented on a disk and printed copies of finished drawings.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

Learners are working to a remit which requires the ability to create and manipulate objects in a computer aided design environment. Access to, and evaluation of, examples of complex design drawings would be of value in formative work. Learners should be able to work unaided in correct file management: considerations of security and safety should be a routine aspect of good practice. The selection of appropriate software application packages and the ability to manipulate objects, dimensions and text is integral to achievement, as are techniques in editing data to meet identified needs of purpose and context.

Accuracy of interpretation and effective communication of numerical and graphic information underpins the competencies developed in the Unit, and learners are assessed on their ability to edit, to use a full range of dimensioning commands and plot to scale. Some learners may benefit from formative opportunities to further develop effectiveness in the understanding, analysis and application of numerical and graphic data, and the use of software packages or on-line tutorials to reinforce numeracy skills may be useful. Learners could additionally benefit from discussions with the class group and/or assessor in order to encourage analytical evaluation of approaches to the design process.

History of changes to Unit

Version	Description of change	Date

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for learners

Unit title: CAD: 2D I (SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This Unit has been designed to help you to develop knowledge, understanding and basic skills in the use of Computer Aided Design application software for the creation of two-dimensional drawings. It will provide a sound basis for progression to other CAD Units. You will learn file management techniques, standard drawing and editing commands, drawing layout and final printing options. It is appropriate for use within chosen Group Awards such as Built Environment, Architectural, Mechanical or Civil Engineering.

There will be a series of practice exercises and drawing tutorials which will logically progress from simple to complex.

There are two formal practical assessments with times as follows:

Outcome 1 to 3	Practical	3 hours
Outcome 4	Practical	2 hours

The assessments will be supervised and conducted under open-book conditions in which you will be allowed to take notes, textbooks, etc. into the assessment. You will sit these assessments at prescribed points during the Unit at the discretion of the lecturer.

This is a practical Unit requiring you to have individual access to a CAD system. A CAD system is defined as hardware and software, which will enable an operator to generate (and regenerate) drawings at an acceptable processor speed. A typical minimum hardware configuration would be a current single user PC fitted with suitable peripherals attached such as a printer/plotter to produce hard copies of your work. Alternatively other configurations such as networked CAD stations are acceptable provided they can satisfy the Unit's criteria.