SQA Advanced Unit Specification

General information

Unit title: Architectural CADT: Urban Design (SCQF level 8)

Unit code: HR76 48

Superclass: TD

Publication date: August 2017

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit is designed to enable learners to develop the planning, design and technical skills and knowledge required in the electronic production of 2-dimensional and 3-dimensional CAD drawings for real-world urban developments, using sophisticated computer-aided design software packages.

Outcomes

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

1 Evaluate the planning and design requirements of a given urban development brief and produce layout solutions and recommendations to satisfy the brief, using computer-aided design software.
2 Produce traffic schematics for an urban development using computer-aided design software.
3 Evaluate the technical requirements of an urban development and produce working details of the technical solutions using computer-aided design software.

Credit points and level

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

Recommended entry to the Unit

While access to this Unit is at the discretion of the centre, this Unit advances CAD competencies with new knowledge and skills and it may be beneficial if learners have a range of underpinning CAD skills prior to the commencement of this Unit. Such experience may be evidenced by possession of the Units HR6P 47 *Architectural CADT: Principles and Practice,* HR70 47 *Architectural CADT: Construction Detailing* or similar, equivalent Units. It may be beneficial if learners also have prior knowledge and skills in the area of design aesthetics, methodology, or similar. Such experience may be evidenced by possession of the Units HR6Y 47 *Architecture: For, Order and Composition*, or similar, equivalent Units.

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.

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

Evaluate the planning and design requirements of a given urban development brief and produce layout solutions and recommendations to satisfy the brief, using computer-aided design software.

Knowledge and/or skills

- design brief:
  - client type
  - environment type
  - project type
  - planning restrictions
  - environmental needs
- planning requirements:
  - site preparation
  - temporary works
  - materials storage
  - hoardings and fencing
  - access routes
  - health and safety
- setting out requirements:
  - groundwork levelling
  - excavation operations
  - grade separation
- layout requirements:
  - range of buildings
  - scale/proportion of buildings
  - position/orientation of buildings
  - access and egress
- CAD draughting & design tools
- CAD standards
- CAD presentation tools

Outcome 2

Produce traffic schematics for an urban development using computer-aided design software.

Knowledge and/or skills

- road hierarchy
- vehicular provision
- non-vehicular provision
- traffic calming measures
- traffic controls
- road signs and markings
- road junctions
- intersections and conflict
- CAD draughting & design tools
- CAD standards
- CAD presentation tools

Outcome 3

Evaluate the technical requirements of an urban development and produce working details of the technical solutions using computer-aided design software.

Knowledge and/or skills

- technical requirements
  - kerbing
  - drainage
  - services
  - surface finishes
  - soil retention
  - boundary definitions
- CAD draughting & design tools
- CAD standards
- CAD presentation tools

Evidence Requirements for this Unit

Outcome 1

Evidence for the knowledge and/or skills sections for this Outcome will be provided on a sample basis. In any assessment of this Outcome a minimum of any **two out of three** Setting Out, and any **three of the six** Planning Requirements knowledge and/or skills items, will be sampled. In any assessment occasion of this Outcome, **all the Design Brief**, **Layout Requirements** and **CAD** knowledge and skills items must be assessed. In order to ensure that learners will not be able to foresee what items they will be assessed on, a different sample of knowledge/skills items is required on each assessment occasion. Learners must provide a satisfactory response to all items.

Learners will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can respond to a design brief for a specified urban development and:

- evaluate a given design brief for an urban development in terms of the Planning, Setting Out and layout requirements
- produce a minimum of one A3 (minimum size) scaled plot of the proposed development to satisfy **all of the project layout** requirements using computer-aided design software
- produce a supporting rationale for the layout solutions

The application of CAD draughting and design tools, the use of CAD standards and CAD presentation tools must be of typical industry-quality requirements and be consistently applied at all times.

Outcome 2

Learners will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can evaluate the appropriate criteria from the knowledge and skills items, in traffic planning and management, and make appropriate recommendations in traffic-management measures, as evidenced by the ability to produce:

- **at least one** hard copy A3 (minimum size) scaled plot of the fully detailed urban development traffic scheme, suitably annotated with supporting notes to satisfy **all** the knowledge and skills items

The application of CAD draughting and design tools, the use of CAD standards and CAD presentation tools must be of typical industry-quality requirements and be consistently applied at all times.

Assessment will be open-book, undertaken in controlled, supervised conditions. Learners will be allowed access to course material, textbooks or the Help files associated with the software used in the generation of the solutions.

Outcome 3

Evidence for the knowledge and/or skills sections for this Outcome will be provided on a sample basis. In any assessment of this Outcome a minimum of any **three out of six** Tech Requirement knowledge and skills must be assessed and **all of the CAD** knowledge and skills items must be assessed.

In order to ensure that learners will not be able to foresee what items they will be assessed on, a different sample of knowledge/skills items is required on each assessment occasion. Learners must provide a satisfactory response to all items.

Learners will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can develop appropriate and effective technical solutions to the technical requirements of the urban development project, as evidenced by the ability to produce:

- **at least one** hard copy A3 (minimum size) scaled plot of the urban development with technical recommendations evaluated and resolved using computer-aided design software

The application of CAD draughting and design tools, the use of CAD standards and CAD presentation tools must be of typical industry-quality requirements and be consistently applied at all times.

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

The Unit is at SCQF level 8 and has been devised as an additional Unit within the SQA Advanced Diploma in Computer Aided Architectural Design and Technology. However, this does not preclude the use of the Unit in other awards where award designers feel this to be appropriate.

A suggested range of topics required to introduce the knowledge and skills to be covered by centres along with recommendations as to how much time should be spent on each Outcome assessment is provided. This has been done to help lecturers decide what depth of treatment should be given to topics attached to each of the Outcomes.

Guidance on approaches to delivery of this Unit

In all Outcomes the learner should be able to evaluate the range of design criteria and landscape project briefs, as provided by assessor(s) from given briefs, following the knowledge and skills items.

Learners should be encouraged to explore a range of possible solutions. Additional learning from acceptable texts, e-learning environments and other resources should be actively supported.

Assessor(s) should make maximum use of visual data in the delivery of all topics. Learners should evaluate the briefs and select the most appropriate medium with which to develop and realise design solutions — no specific software is recommended, though it is anticipated centres will use industry-standard CAD software, with dedicated libraries for civil engineering symbols, components and annotations, suitable for 2-dimensional urban and civil layout drawings.

At all times, learners are required to illustrate solutions in a clear and coherent manner, typical of professional requirements in industry. Emphasis throughout delivery of the topic should be placed on the professional standards of graphic presentation, reflecting performance criteria of the computer-aided urban details. Learners will be encouraged to use their own discretion and judgement in the selection of CAD software best suited to both the interrogative study of solutions, recording of elemental data and the production of graphic solutions.

Learners are required to produce, primarily 2-dimensional CAD drawings, however, it may be appropriate in certain instances to additionally generate 3-dimensional pictorial representation views to aid illustrative solutions. The 2-dimensional details generated would typically be plan layout schematics, elevations and sectional views to illustrate the recommendations made. The precise nature of details generated are at the discretion of the

centre, but should be driven by original briefs set by the assessor(s) for each assessment event.

At all times, the design criteria should be the governing aspects of learner critical thinking and evaluation, with the resulting CAD details displaying strengths in technical knowledge and fast, practical skills in the communication of these.

A suitable design brief for the urban development project should be provided to learners at the outset of the Unit, and may be generated from other topics being delivered within the framework of the programme being taught. Suggested design briefs could be small to modestly sized housing estate developments, out of town retail park developments, community project developments incorporating a range of public service buildings, or other. Centres should use their own discretion and contextualise, perhaps to suit the wider framework being taught, or by integration with other Units.

The Unit relies heavily on the use of sophisticated computer-aided solutions throughout, and it is strongly recommended centres use suitable CAD software capable of the assessment tasks.

In **Outcome 1**, learners should be introduced to the range of factors involved in the planning and layout design stages of typical, modestly scaled urban development projects, as laid down by the brief provided. Topics for lecture and discussion should follow a logical and sequential pattern, leading students towards an understanding of influences and preparatory provisions in the determination of first draft site layout drawings.

The design brief provided should provide extensive information for learners to examine, including marked up drawings of the site location, providing groundwork elevation data and conditions. Effective planning decisions in terms of project planning should be made with regard to general and specific site preparation and include consideration for:

- levelling, compaction, ground improvement, soil removal, plant requirements
- temporary works, huts, sheds, shoring and other temporary support, shuttering
- materials storage huts, sheds, cement silos
- hoardings and fencing, security, access, safety
- determination of principal access routes to site

Structured tutorials in the use of specific CAD solutions tailored to the needs of civil engineering drawings in this context should support the underpinning knowledge, and learners introduced to a variety of advanced techniques in the application of such CAD solutions.

The layout drawings for the proposed development should clearly illustrate the factors discussed and resolved, and be completed with outline representation of the site layout configuration in terms of the site organisation with respect to range, type, position, orientation, scale and proportion of buildings therein.

Given the complexity of the underpinning knowledge, it is anticipated that learners produce word processed document of approximately 1,500-2,000 words, or equivalent, in support of the technical investigation and design decisions reached. This might alternatively be open-book responses to a series of limited response, structured questions, or take the form of a short presentation, including oral questioning.

In **Outcome 2,** learners should be introduced to the variety of factors required in the consideration of traffic management and planning for the proposed development. Learners should again work towards practical CAD solutions tailored to the needs of civil engineering

drawings in the context of traffic studies to support the underpinning knowledge, and introduced to a variety of advanced techniques in the application of such CAD solutions. Learning topics, led by the knowledge and skills items, and delivered as a series of lectures and discussions, should examine:

- road hierarchy:
  - major/minor roads, street hierarchy and functions
- vehicular provision:
  - road/street dimensions, turning circle provisions, through routes, non-through routes, parking, deliveries, public transport (bus lanes, contraflows and priorities)
- non-vehicular provision:
  - pedestrian/cyclist facilities, vehicle/pedestrian-shared surfaces
- traffic calming measures:
  - humps, cushions and tables, chicanes and build-outs, surfacing, area-wide schemes
- traffic controls:
  - traffic signals, vehicle identification, CCTV, parking controls and capacities, tolls and charges
- road signs and markings:
  - function of signs and markings; types of road sign, location of signs, types of markings
- road junctions:
  - geometric types, layout and control, types of roundabout, standard layouts
- intersections and conflict:
  - different types of vehicle/vehicle and vehicle/pedestrian conflict at junctions; advantages of junction types

In **Outcome 3**, learners should be introduced to the consideration of a range of the detail requirements for technical performance aspects of site layout and design solutions. Learners should again work towards practical CAD solutions tailored to the needs of civil engineering drawings in the context of these technical areas to support the underpinning knowledge, and introduced to a variety of advanced techniques in the application of such CAD solutions. Learning topics, led by the knowledge and skills items, and delivered as a series of lectures and discussions, should examine:

- kerbing; types, dimensions, straight, sloping access, sectional details
- drainage; runs, gradients, piped, inspection chambers, access, reed beds, soakaway, plan and sectional details
- services; electrical, water, gas, telecommunications, sub-stations, rainwater collection, alternative power options (turbine, solar panel, other), plan and sectional details
- surface finishes; roads, paving, pathways, durability, aesthetics
- soil retention; retaining walls, berms, banking
- boundary definitions; walls, fences, rails, berms, banking, planting

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.

A suitable brief for a modestly sized, urban development project could be provided at the outset of assessment activity, and used throughout all assessment tasks. Assessment for this Unit could be delivered as individual assessment events or could be integrated into one single assessment covering all Outcomes. If assessment is conducted using an integrated approach, it is recommended that the solutions reached and presented be in the form of a holistic portfolio of CAD details and graphics, with clear recommendations. This approach would match very closely to industry practice. Learners should produce the Evidence Requirements using CAD packages and supported by fully annotated and referenced drawings.

Where a learner whose assessment response does not meet the minimum evidence and a remediation attempt is offered, the re-submission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and re-submitted rather than the whole of the project details.

Assessment guidelines

Outcome 1

Learners are provided with a design brief containing data for a specified urban development project and are required to produce the correct development details required. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate annotation. Such annotation and referencing could provide learners with the elemental aspects of their supporting rationale for design decisions reached.

Focus of the assessment should be on the production of graphic evidence in the form of 2-dimensional layout and orthographic views which demonstrate the learner's grasp of the advanced creation of detailed civil engineering considerations for the assigned urban development project, and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for assessment activity is three hours.

The CAD drawings and graphics produced should illustrate a rigorous understanding of the underpinning design and planning requirements for the brief, and the rationale requirement of the assessment in this respect, should further demonstrate the learner's grasp of complex ideas. It is recommended that a report of approximately 1,500 words be generated to satisfy these elements of the assessment, although alternative methods of assessing these elements may be used.

Assessment of this Outcome could be delivered as a stand-alone assessment, with subsequent Outcomes in the Unit using different development brief data. However, it is anticipated that centres will use an integrated approach to assessment by using the same holistic design brief data for all Outcomes, allowing learners to enhance and develop solutions by adding to the results of the Outcome 1 activity with the solutions and details reached in Outcomes 2 and 3.

A checklist could be used to support the Evidence Requirements for each of the knowledge and/or skills required in the Outcome.

Outcome 2

Learners could continue working with the assigned brief provided for Outcome 1 where centres are using an integrated, sequential approach to assessment. Alternatively, centres may use an alternative urban development scheme for this assessment. Learners are required to produce 2-dimensional CAD recommendations and details for the traffic planning,

design and layout requirements for the development. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate annotation.

Focus of the assessment should be on the production of graphic evidence in the form of 2-dimensional CAD graphics which demonstrate the learner's grasp of the advanced application of detailed traffic planning and design recommendations for the assigned urban development brief and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for assessment activity is three hours.

A checklist could be used to support the Evidence Requirements for each of the knowledge and/or skills required in the Outcome.

Outcome 3

Learners could continue working with the assigned brief for provided for Outcome 1 and Outcome 2 where a sequential integrated approach is being used by centres. Alternatively, an alternative, different development brief could be offered. Learners are required to produce 2-dimensional CAD recommendations and details for the technical requirements for the development. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate annotation.

Focus of the assessment should be on the production of graphic evidence in the form of 2-dimensional CAD graphics which demonstrate the learner's grasp of the advanced application of detailed technical recommendations for the assigned urban development brief, pertaining to the knowledge and skills items, and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for assessment activity is three hours.

A checklist could be used to support the Evidence Requirements for each of the knowledge and/or skills required in the Outcome.

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

Although no automatic certification of Core Skills or Core Skills components exists within this Unit, opportunities to develop components of some Core Skills are possible. Learners are working to design brief remits which requires the ability to create and manipulate objects in a computer-aided design environment, thus developing the Core Skills of *Numeracy, Problem Solving and ICT* at SCQF level 6. 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, components and annotation is integral to achievement, as are

techniques in editing data to meet identified needs of purpose and content. Critical Thinking, Planning and Organising, and Reviewing and Evaluating are requirements for these tasks.

Accuracy of interpretation and effective communication of numerical and graphic information underpins the competencies developed in the Unit, and learners are assessed on their application of a range of CAD draughting and presentation tools, and CAD standards in the resolution of real-world design problems, using a full range of software commands. All these tasks provide further opportunities to challenge the learner to improve on the breadth of Core Skills mentioned above. 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 online 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

Version	Description of change	Date

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: Architectural CADT: Urban Design (SCQF level 8)

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 develop underpinning knowledge in the understanding and practical production of detailed technical solutions using computer-aided techniques for typical urban development projects and related issues. In response to a given design brief, you will produce a progressive series of solutions for:

- planning, design and layout of urban developments
- traffic planning management schematics
- technical performance details

You will be introduced to a wide range of design factors in the evaluation of these solutions, including an understanding of land use, estate layout and configuration, environmental considerations for estate developments and technical details related to pre-construction aspects of a development.

The Unit will be taught with a series of lectures, practical exercises and design tutorials, which will logically, and sequentially progress knowledge and skills from the simple to the complex. At all times, a strong design base will underpin your learning and assessment.

It is imperative that you develop your technical knowledge within this Unit so learning within the Unit builds upon other knowledge and skills. As you will have existing CAD skills, you will use these skills to produce primarily 2-dimensional CAD drawings, occasionally supported by the production of 3-dimensional pictorial graphics. The use of CAD standard template files, conventions, symbols, annotation and referencing should be consistently applied at all times, these being assumed knowledge and skills at point of entry to the Unit.

In this Unit, adherence to the appropriate British Standards, Building Regulations and other accepted design parameters is essential to effective communication of solutions. Individual learning tasks, lectures and tutorials will also form part of the delivery of this Unit.

There are three formal assessment events, which may be integrated. The greater element of assessment time and effort will be on the practical production of CAD solutions appropriate to an urban development project brief.

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

As you will be working consistently with numerical and graphical data within an IT-based platform, opportunities exist within this Unit for you to also develop Core Skills in *Information and Communication Technology (ICT), Problem Solving and Numeracy* to SCQF level 6.