

SQA Advanced Unit Specification

General information

Unit title: Architectural CADT: Building Technologies (SCQF level 7)

Unit code: HR71 47

Superclass: TD

Publication date: August 2017

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit is designed to enable candidates to develop the skills and knowledge required in the selection and justification of major building technologies and the clear communication of these solutions using advanced computer-aided-design software packages.

Outcomes

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

- 1 Select and justify technical solutions in building substructure technologies, and produce 3D conceptual details for these using computer-aided design packages.
- 2 Select and justify technical solutions in building enclosure technologies, and produce 3D conceptual details for these using computer-aided design packages.
- 3 Select and justify technical solutions in building superstructure elements, and produce 3D conceptual details for these using computer-aided design packages.

Credit points and level

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

Recommended entry to the Unit

It is recommended that candidates have existing CAD skills using both 2-dimensional and 3-dimensional CAD techniques prior to the commencement of this Unit. Such experience may be evidenced by possession of the Units HR6P 47 *Architectural CADT: Principles and Practice*; HR6M 47 *Architectural CADT: Residential Design*, 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

Unit title: Architectural CADT: Building Technologies (SCQF level 7)

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

Select and justify technical solutions in building substructure technologies, and produce 3D conceptual details for these using computer-aided design packages.

Knowledge and/or skills

- ◆ client brief
- ◆ building types
- ◆ foundation types
- ◆ ground floor types
- ◆ performance requirements:
 - form — function
 - building load dynamics
 - topographical considerations
 - materials
 - strength and stability
 - reinforcement
- ◆ output

Outcome 2

Select and justify technical solutions in building enclosure technologies, and produce 3D conceptual details for these using computer-aided design packages.

Knowledge and/or skills

- ◆ client brief
- ◆ wall enclosure technologies
- ◆ internal enclosure technologies
- ◆ roof enclosure technologies
- ◆ performance requirements:
 - materials
 - technology
 - construction
 - claddings and finishes
- ◆ output

Outcome 3

Select and justify technical solutions in building superstructure elements, and produce 3D conceptual details for these using computer-aided design packages.

Knowledge and/or skills

- ◆ client brief
- ◆ openings and apertures
- ◆ door types
- ◆ window types
- ◆ stair types
- ◆ performance requirements:
 - type
 - materials
 - finishes
 - material finish
 - components
 - external function
 - internal function
 - style
 - dimensions
- ◆ output

Evidence Requirements for this Unit

Outcome 1

This is an open-book, supervised assessment. In any assessment of this Outcome **one** building type, incorporating **one** foundation type and **all** the remaining knowledge and/or skills items must appear within the evidence. Candidates **will be allowed** access to course material, textbooks or the Help files associated with the software used once the assessment is underway.

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ respond to a client brief and produce 3D conceptual design details for substructure systems, incorporating foundation and ground floor elements
- ◆ produce supporting evidence describing the six performance requirements of the CAD details generated

The hard copy, graphical output must be in the form of 3-dimensional, conceptual CAD drawings which demonstrate the candidate's grasp of substructure building technologies and their ability to express and communicate these concepts and ideas accurately within a visual, virtual CAD environment.

Outcome 2

This is an open-book, supervised assessment. In any assessment of this Outcome **one** wall enclosure technology, an **intermediate floor** and **one other** internal enclosure technology and **one** roof enclosure technology and **all** the remaining knowledge and/or skills items must appear within the evidence. Candidates **will be allowed** access to course material,

textbooks or the Help files associated with the software used once the assessment is underway.

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ respond to a brief and produce 3D conceptual design details for suitable enclosure systems, incorporating wall, roof and internal elements from given building briefs
- ◆ produce supporting evidence describing the four performance requirement features of the CAD details generated

The hard copy graphical output must be in the form of 3-dimensional, conceptual CAD drawings which demonstrate the candidate's grasp of substructure building technologies and their ability to express and communicate these concepts and ideas accurately within a visual, virtual CAD environment.

Outcome 3

This is an open-book, supervised assessment. In any assessment of this Outcome a **minimum of two** opening types, **one** door type, **one** window type, **one** stair type and **all** the remaining knowledge and skills items must be a minimum requirement within the evidence. Candidates **will be allowed** access to course material, textbooks or the Help files associated with the software used once the assessment is underway.

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ respond to a brief and produce 3D conceptual design details for suitable superstructure elements, for a given building project brief incorporating the above requirements
- ◆ produce supporting evidence describing the nine performance requirement features of the CAD details generated

The hard copy graphical output must be in the form of 3-dimensional, conceptual CAD drawings which demonstrate the candidate's grasp of substructure building technologies and their ability to express and communicate these concepts and ideas accurately within a visual, virtual CAD environment.

SQA Advanced Unit support notes

Unit title: Architectural CADT: Building Technologies (SCQF level 7)

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 Unit has been written in order to allow candidates to develop knowledge, understanding and skills in the following areas:

- 1 Select and justify technical solutions in building substructure technologies, and produce 3D conceptual details for these using computer-aided design packages.
- 2 Select and justify technical solutions in building enclosure technologies, and produce 3D conceptual details for these using computer-aided design packages.
- 3 Select and justify technical solutions in building superstructure elements, and produce 3D conceptual details for these using computer-aided design packages.

The Unit is at SCQF level 7 and has been devised as an optional Unit within the SQA Advanced Certificate in Computer Aided Architectural Design Core Skills Technology. However, this does not preclude the use of the Unit in other awards where award designers feel this to be appropriate.

Using their previous CAD skills, the relevant CAD tools available within the software being used. These could be:

- ◆ pad tools
- ◆ topography tools
- ◆ slab tools
- ◆ edging tools
- ◆ structural component tools
- ◆ advanced model graphics
- ◆ pictorial generation
- ◆ sectional generation manipulation

A range of CAD topics to assist with delivery is recommended in the next section.

CAD topics

- ◆ wall modelling (standard and custom) techniques
- ◆ curtain wall assembly modelling and customisation
- ◆ panel system modelling
- ◆ structural component modelling
- ◆ structural component tools
- ◆ floor modelling (standard and custom) techniques
- ◆ roof modelling techniques:
 - building footprint roofs
 - extruded roofs

- ◆ advanced model graphics
- ◆ pictorial generation
- ◆ sectional generation and manipulation

Guidance on approaches to delivery of this Unit

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

Outcomes 1, 2 and 3 may be integrated into a single project-based assignment. The assignment task should involve creating 3D conceptual models of building technologies to a given brief. This Unit could be integrated with HR70 47 Architectural CADT: Construction Detailing.

Candidates could 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. Candidates could 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 use advanced architectural modelling software such as Architectural Desktop, Revit, or similar.

Candidates could be provided with specifications for the building types covered and are required to analyse these in light of the other knowledge and skills elements to arrive at appropriate substructure (foundation and ground floor) or building enclosure technologies and building superstructure elements for these. The CAD details provided would need to be clear and effective visually and supported a sound justification.

Focus of the assessment is on the production of graphic evidence in the form of 2-dimensional and 3-dimensional CAD drawings which demonstrate the candidate's grasp of and their ability to express and communicate these concepts and ideas accurately within a visual, virtual CAD environment.

At all times, if candidates are encouraged to illustrate solutions in a clear and coherent manner, this will typify professional requirements in industry. Emphasis throughout delivery of the topic could be placed on the design relationships inherent in substructure–superstructure relationships. Evaluation of different briefs, required criteria and the range of possible solutions for the briefs could be used to establish a strong design-based approach to solutions, and provide for the required rationale elements of the Outcome. Candidates 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.

Candidates are required to produce 3-dimensional solutions for the design details reached. Candidates might also wish to add to 3D conceptual details with 2-dimensional CAD drawings where appropriate, to illustrate clarity in terms of **simple** construction details and connections, but elevation and/or plan details may also be appropriate in certain circumstances. The 3-dimensional views produced could be exploited to best present solutions in a visual format. The exact nature and angle of pictorial views are at the discretion of the candidate, but should show the design solutions to best effect. Candidates may use any 3D modelling techniques and presentation options most suitable for the output required in each case.

At all times, the design criteria is the governing aspects of candidate critical thinking and evaluation, with the resulting CAD details displaying strengths in visual acuity and impact and reasonable levels of technical accuracy.

From a strong design perspective, a series of technological systems could be evaluated by candidates, solutions selected on the basis of clear performance criteria, and illustrated clearly and coherently using computer-aided-design software packages.

Solutions in graphic (CAD) format might be presented individually on an Outcome-by-Outcome basis as solutions for each assessment task are determined, or alternatively, collated into a portfolio of drawings. The supporting, explanatory rationale elements for Outcomes 1–3 could be produced by the candidate as a single evidentiary submission for all of the drawn CAD details, supporting the design decisions reached for the elements assessed, integrated across all Outcomes. Alternatively, when assessing on an Outcome-by-Outcome basis, such rationale evidence could support the drawn CAD details in the form of annotation and referencing to the drawings.

As the Unit has a strong design base, and candidates are required to evaluate a range of possible solutions, candidates are allowed to refer to relevant course material, and other sources of data, for all assessment tasks.

Candidates whose assessment response does not meet the minimum Evidence Requirements may be offered remediation and the opportunity for re-submission to reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and re-submitted.

Outcome 1

Select and justify technical solutions in building substructure technologies and produce 3D conceptual details for these using computer-aided design packages.

- ◆ client brief
- ◆ range of building types (domestic, low-rise, small commercial):
 - detached, semi detached
 - terraced
 - single story
 - multiple story
 - townhouse
 - flats
- ◆ foundation types:
 - raft, slab
 - strip
 - pile
 - pad footing
- ◆ ground floor types:
 - solid
 - suspended
- ◆ performance requirements:
 - form — function
 - building load dynamics
 - topographical considerations
 - materials
 - strength, stability
 - reinforcement

- ◆ outputs:
 - isometric 3D views
 - axonometric 3D views
 - exploded 3D views
 - 3D sections

Outcome 2

Select and justify technical solutions in building enclosure technologies and produce 3D conceptual details for these using computer-aided design packages.

- ◆ client brief
- ◆ wall enclosure technologies:
 - continuous masonry
 - timber frame
 - post, column and beam, slab
 - panel, prefabricated sections
 - curtain wall assemblies
- ◆ internal enclosure technologies:
 - internal blockwork walls
 - internal stud partitions, timber
 - internal stud partitions, metal
 - intermediate floor systems
- ◆ roof enclosure technologies:
 - trussed rafter
 - single pitch
 - hipped
 - gable
 - mansard
 - curved
 - flat deck
 - dormer
- ◆ performance requirements:
 - materials
 - technology
 - construction
 - claddings, finishes

Outcome 3

Select and justify technical solutions in building superstructure elements and produce 3D conceptual details for these using computer-aided design packages.

- ◆ client brief
- ◆ openings and apertures:
 - for door insertion
 - for window insertion
 - for stairwell
 - for fire/chimney/flue insertion
 - for access and movement
- ◆ door types:
 - single, double
 - symmetrical, asymmetrical
 - with/without integral light

- panel
- vision light
- Louvre
- ◆ window types:
 - casement
 - sash
 - fixed
 - picture
 - oriel
 - bay
 - arched, swept head
- ◆ stair types:
 - straight run
 - 90° rotation, with landing
 - 90° rotation, with winders
 - 180° rotation, with landing
 - 180° rotation, with winders
 - spiral
- ◆ design considerations:
 - type
 - materials
 - finishes
 - material and finishes
 - components
 - external function
 - internal function
 - style
 - dimensions

CAD topics

- ◆ openings and aperture creation in model components
- ◆ door modelling
- ◆ window modelling
- ◆ door and window manipulation
- ◆ stair modelling:
 - component elements
 - type definitions
- ◆ advanced model graphics
- ◆ pictorial generation
- ◆ sectional generation and manipulation

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.

Assessment for this Unit could be delivered by assessment events on an Outcome-by-Outcome basis, or by combining elements of Outcomes, or by one single holistic assessment covering all Outcomes. If assessment is conducted using a holistic approach, it is recommended that a project driven approach to the development of solutions is used by centres. For this approach, a brief should be provided by the centre, with the emphasis on low-rise construction systems, suitable for residential or small commercial buildings.

Outcome 1

The recommended time allocation for assessment activity is three hours. The CAD details provided will need to be clear and effective visually and supported by a sound rationale. Further guidance is provided in the support notes to this specification.

The performance requirement elements for Outcome 1 could be integrated with the additional material to follow in Outcomes 2 and 3 if the Unit is being assessed holistically. If assessing on an Outcome by Outcome basis, this might be evidenced in the form of appropriate annotation and referencing to the drawing details.

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

Outcome 2

The recommended time allocation for assessment activity is three hours. The CAD details provided will need to be clear and effective visually and supported by a sound rationale. Further guidance is provided in the support notes to this specification.

The performance requirement elements for Outcome 2 could be integrated with the additional material in Outcomes 1 and 3 if the Unit is being assessed holistically. If assessing on an Outcome by Outcome basis, this might be evidenced in the form of appropriate annotation and referencing to the drawing details.

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

Outcome 3

The recommended time allocation for assessment activity is three hours. The CAD details provided will need to be clear and effective visually and supported by a sound rationale. Further guidance is provided in the support notes to this specification.

The performance requirement response element required of Outcome 3 could be integrated with the additional material in Outcomes 1 and 2 if the Unit is being assessed holistically. If assessing on an Outcome by Outcome basis, this might be evidenced in the form of appropriate annotation and referencing to the drawing details.

A checklist could be used to support the assessment 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

Candidates 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. Candidates 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.

Accuracy of interpretation and effective communication of numerical and graphic information underpins the competencies developed in the Unit, and candidates are assessed on their ability to create and edit elements within a drawing using a full range of software commands. Some candidates 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. Candidates 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

© Scottish Qualifications Authority 2007, 2016, 2017

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

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: Building Technologies (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 develop underpinning knowledge in the evaluation and selection of major building technologies for a range of small building types, and provide you with the sophisticated CAD skills required to produce 2-dimensional and 3-dimensional details and models for these using advanced computer-aided design software packages.

Within this Unit, major technologies for small building projects will be considered, including:

- ◆ a range of wall enclosure technologies
- ◆ a range of roof enclosure technologies
- ◆ a range of floor enclosure technologies
- ◆ foundation technologies
- ◆ major superstructure elements such as doors, windows and stairs

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

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

The 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* at SCQF level 6.