

SQA Advanced Unit Specification

General information for centres

Unit title: Architectural CADT: Construction Detailing (SCQF level 7)

Unit code: HR70 47

Superclass: TD

Publication date: August 2017

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit is designed to enable learners to develop the skills and knowledge required in the electronic production of construction details for low-rise, residential and small commercial buildings.

Outcomes

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

- 1 Produce accurate CAD drawings, construction details and technical requirements for apertures in a building enclosure system.
- 2 Produce accurate CAD drawings, construction details and technical requirements for roof technologies and systems.
- 3 Produce accurate CAD drawings, construction details and technical requirements for substructure systems.
- 4 Produce accurate CAD drawings, construction details and technical requirements for intermediate storey connections in buildings.

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

This Unit assumes learners will have existing 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 or similar, equivalent Units. It would also be beneficial to have completed the Unit HR71 47 *Architectural CADT: Building Technologies*.

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.

Outcome 1

Produce accurate CAD drawings, construction details and technical requirements for apertures in a building enclosure system.

Knowledge and/or skills

- ◆ client brief
- ◆ building types
- ◆ aperture requirements
- ◆ aperture components
- ◆ aperture closure and or protection
- ◆ component elements
- ◆ aperture and component materials and finishes

Outcome 2

Produce accurate CAD drawings, construction details and technical requirements for roof technologies and systems.

Knowledge and/or skills

- ◆ roof types
- ◆ roof technologies
- ◆ roof structures
- ◆ connection details
- ◆ performance requirements
- ◆ roof materials and finishes

Outcome 3

Produce accurate CAD drawings, construction details and technical requirements for substructure systems.

Knowledge and/or skills

- ◆ substructure systems
- ◆ substructure types
- ◆ materials

Outcome 4

Produce accurate CAD drawings, construction details and technical requirements for intermediate storey connections in buildings.

Knowledge and/or skills

- ◆ intermediate storey system
- ◆ intermediate floor types
- ◆ ceiling systems
- ◆ stair connections

Evidence Requirements for this Unit

Outcome 1

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

- ◆ respond to a client brief for a specified building type and produce detailed CAD construction drawings of building enclosure details incorporating **an example of a type of aperture component for two of the following: aperture components:** doors (external), windows, rooflights or stairs
- ◆ for the two aperture components selected, incorporate to each **a minimum of three appropriate fixing connection details and a minimum of two protection or closure details**
- ◆ generate **at least** one hardcopy plot of the details required for the Evidence Requirements produced to suitable paper sizes (A3 or larger) using appropriate scales for the details generated

The use of standard CAD template files, AEC conventions, symbols, annotation and referencing should be applied consistently at all times.

- ◆ provide a justification of the selection of aperture materials and finishes recommended for **one** of the types of aperture components selected in respect of **three of the following considerations:**
 - functionality
 - aesthetics
 - performance requirements
 - regulatory constraints
 - technical limitations

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.

If a learner's assessment response does not meet the minimum evidence and a remediation attempt is offered, the resubmission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project details.

Outcome 2

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

- ◆ respond to a client brief for a specified building type and produce roof system solution detailed CAD construction drawings **of two** roof types (or combinations) from: flat, pitched, hipped, gable, mansard, dormer, arced or domed
- ◆ **incorporate a minimum of three** roof technologies, **two** connection details and **two** finishing details
- ◆ generate **at least one** hardcopy plot of the details required for the Evidence Requirements produced to suitable paper sizes (A3 or larger) using appropriate scales for the details generated

The use of standard CAD template files, AEC conventions, symbols, annotation and referencing should be applied consistently at all times.

- ◆ provide a justification of the selection of one roof system solution, its structure, materials and or finishes in respect of **three of the following considerations**:
 - functionality
 - aesthetics
 - performance requirements
 - regulatory constraints
 - technical limitations

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.

If a learner's assessment response does not meet the minimum evidence and a remediation attempt is offered, the resubmission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project details.

Outcome 3

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

- ◆ respond to a client brief for a specified building type and produce sub structure system solution detailed CAD construction drawings incorporating **a minimum of two** of the substructure types (Raft or slab, Strip (horizontal or vertical), Pad footing, Pile, stepped)
- ◆ incorporate floor and wall connecting detail, service entry requirements, ground conditions and treatment
- ◆ generate **at least one** hard copy plot of the details required for the Evidence Requirements produced to suitable paper sizes (A3 or larger) using appropriate scales for the details generated

The use of standard CAD template files, AEC conventions, symbols, annotation and referencing should be applied consistently at all times.

- ◆ provide a justification of the substructure solution with reference to floor and wall connections, service entry requirements, ground conditions and treatment, strength and stability and materials in respect of **three of the following considerations**:

- functionality
- aesthetics
- performance requirements
- regulatory constraints
- technical limitations

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

If a learner's assessment response does not meet the minimum evidence and a remediation attempt is offered, the resubmission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project details.

Outcome 4

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

- ◆ respond to a client brief for a specified building type and produce detailed CAD construction drawings for intermediate storey systems
- ◆ incorporate floor type, and ceiling system and stair connection information
- ◆ generate **at least one** hardcopy plot of the details required for the Evidence Requirements produced to suitable paper sizes (A3 or larger) using appropriate scales for the details generated

The use of standard CAD template files, AEC conventions, symbols, annotation and referencing should be applied consistently at all times.

- ◆ provide a justification of the selection of floor type, ceiling system and stair connection solutions in respect of **three of the following considerations**:
 - functionality
 - aesthetics
 - performance requirements
 - regulatory constraints
 - technical limitations

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.

If a learner's assessment response does not meet the minimum evidence and a remediation attempt is offered, the resubmission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project details.

SQA Advanced Unit support notes

Unit title: Architectural CADT: Construction Detailing (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

The Unit is at SCQF level 7 and has been devised as an optional Unit within the SQA Advanced Certificate and 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 the topics attached to each of the Outcomes.

Guidance on approaches to delivery of this Unit

In all Outcomes the learner should be helped to develop solutions to the range design criteria contained in building project briefs provided by assessor(s).

Learners may 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) could make maximum use of visual data in the delivery of all topics. Learners evaluate briefs so practice in the selection of the most appropriate medium with which to develop and realise design solutions would be helpful. No specific software is recommended, though it is anticipated centres will use industry standard CAD software for 2-dimensional drawing.

At all times, learners are required to illustrate solutions in a clear and coherent manner, typical of the professional requirements in industry. Emphasis throughout the delivery of topics on the importance placed on the professional standards, of technical accuracy, reflecting on administrative and regulatory requirements in the production of computer-aided construction details will help build quality standards of performance within learners. 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 details, nominally in plan and section views. It may be appropriate in certain instances to additionally generate projected elevations or pictorial views to aid illustrative solutions. The 2-dimensional details generated would typically be section views to illustrate clarity of expression in terms of **detailed** construction information and connections. The precise nature of detailed views generated are at the discretion of the centre, but could 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.

Outcome 1

In Outcome 1, the learner is required to decide on the correct technical requirements for apertures in building enclosure systems, and produce accurate construction details for these in 2-dimensional and 3-dimensional format, using computer-aided design packages.

- ◆ Analysis of the brief:
 - Functionality
 - Aesthetics
 - Performance requirements
 - Regulatory constraints
 - Technical limitations

- ◆ Building types — low-rise, residential and small commercial buildings

- ◆ Aperture requirements:
 - Dimensional
 - Junctions and connections
 - Material considerations

- ◆ Aperture components:
 - Doors (internal, external):
 - Wall types external (masonry, timber, internal/external leaves)
 - Wall types internal (masonry, timber stud, metal stud)
 - Components and elements
 - Fixings, fastening, ironmongery
 - Threshold, sill
 - Framing, casework, trimming

 - Windows (variety of types, sash, casement, pivot, tilt/turn):
 - Wall types external (masonry, timber, internal/external leaves)
 - Wall types internal (masonry, timber stud, metal stud)
 - Components and elements
 - Fixings, fastenings, ironmongery
 - Sills and lintels
 - DPC, vapour barrier, ventilation

 - Rooflights:
 - Roof types (roof lights, skylights, dormer openings)
 - Components and elements
 - Fixings, fastening, ironmongery
 - Threshold, sill
 - Framing, casework, trimming

 - Dormer:
 - ‘Before and after’ conversion details

 - Stairs:
 - Floor types (stairwell, vertical penetration)
 - Stair — floor connections

- Saddling, stringers
- Treads and risers
- Balustrade
- Components, fixings, accessories
- ◆ Aperture closure, protection:
 - CAD Details: Aperture closure (walls):
 - Cavity closure
 - Framing
 - Moisture/vapour barriers
 - Insulation
 - CAD Details: Aperture closure (floors):
 - Joist trimming
 - Floor edge/junction details
 - Ceiling edge/junction details
- ◆ Component elements
- ◆ Aperture and component materials and finishes/cladding

Outcome 2

The learner is required to decide on the correct technical requirements for roof technologies and systems, and produce accurate construction details for these in 2-dimensional and 3-dimensional format, using computer-aided design packages.

- ◆ Analysis of the brief:
 - Functionality
 - Aesthetics
 - Performance requirements
 - Regulatory constraints
 - Technical limitations
- ◆ Roof technologies:
 - CAD Details: roof technology:
 - Warm, cold, inverted technologies
 - Trussed systems
 - Bracing arrangements (continuity, restraint)
- ◆ Roof structures:
 - Struts, ties, collars, purlins
 - Insulation
 - Ventilation
 - Sarking, sheathing
 - Battens
 - Tile, slate, surface finishes exterior
- ◆ Performance requirements:
 - Weatherproofing
 - Insulation
 - CAD details: connections:
 - At ridge

- At eave or parapet
- At hip joint
- ◆ Roof types:
 - Flat, pitched, hipped and gable, mansard (duo pitch), dormer, domed/vaulted
- ◆ Roof materials and finishes/cladding:
 - CAD Details:
 - Soffit, fascia, verge/barge board
 - Rainwater goods, guttering, downpipes

Outcome 3

In this Outcome the learner must determine the correct technical requirements for substructure systems, and produce accurate construction details for these in 2-dimensional and 3-dimensional format, using computer-aided design packages.

- ◆ Analysis of the brief:
 - Functionality
 - Aesthetics
 - Performance requirements
 - Regulatory constraints
 - Technical limitations
- ◆ Substructure systems and types:
 - CAD details:
 - Raft, slab
 - Strip (horizontal and vertical)
 - Pad footing
 - Pile
 - Stepped
- ◆ Performance requirements:
 - Strength and stability
 - Foundation sizing calculation
 - Material requirements
 - Excavation requirements
 - Reinforcement requirements
- ◆ Floor and wall connections:
 - Floor and wall connections/relationship to substructure
 - Service entry requirements through substructure
 - Bracing, dwarf wall requirements
 - Joist sizing, spacing for ground floors
- ◆ Service entry requirements:
 - Relevant to substructure type
 - Correct depth and placement for underground routes
- ◆ Ground conditions, treatment:
 - Excavation requirements
 - Underbuilding ventilation
 - DPC, DPM
 - Moisture filtering

- ◆ Strength and stability:
 - Bracing
 - Wall ties
- ◆ Materials

Outcome 4

The learner is required to determine the correct technical requirements for intermediate storey connections in buildings, and produce accurate construction details for these in 2-dimensional and 3-dimensional format, using computer-aided design packages.

- ◆ Analysis of the brief:
 - Functionality
 - Aesthetics
 - Performance requirements
 - Regulatory constraints
 - Technical limitations
- ◆ Intermediate floor types:
 - Concrete, beam and block
 - Timber
 - Prefabricated cassette systems (timber)
- ◆ Ceiling systems:
 - Plasterboard, plaster
 - Suspended systems
 - Plenum requirements
- ◆ Stair connections
 - Stair — floor connections:
 - Top of flight
 - Base of flight
 - Landing requirements

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 as individual assessment tasks or could be integrated into one single assessment covering all Outcomes. Different building types or project briefs could be used for separate Outcome tasks. If assessment is conducted using an integrated approach, it is recommended that building project brief guidelines should be provided based on contemporary design in low-rise, residential or small commercial types and a project driven approach to the development of solutions adopted. This approach would match very closely to industry practice. Learners should produce the detailed construction

Evidence Requirements using CAD packages and supported by full annotated and referenced drawings.

Where learners whose assessment responses do not meet the minimum evidence and a remediation attempt is offered, the resubmission should reflect industry practice. For example, drawing details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project details.

Assessment guidelines

Outcome 1

Focus of the assessment is on the production of graphic evidence in the form of 2-dimensional CAD drawings which demonstrate the learner's grasp of advanced construction detailing for the building components evaluated and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for this assessment activity is 2 hours.

Learners could be provided with a learner design brief containing data for a specified building of contemporary style for which they are required to produce a solution for the building components required. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate construction detail annotation.

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

Outcome 2

Focus of the assessment is on the production of graphic evidence in the form of 2-dimensional CAD drawings which demonstrate the learner's grasp of roof systems and technologies and their ability to express and communicate these concepts and ideas accurately. The time allocation suggested for this assessment activity is 2 hours.

Learners could be provided with a learner design brief containing data for a specified building of contemporary style for which they are required to produce a solution for the building components required. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate construction detail annotation.

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

Outcome 3

Focus of the assessment is on the production of graphic evidence in the form of 2-dimensional CAD drawings, which demonstrate the learner's grasp of building substructure elements, and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for this assessment activity is 2 hours.

Learners could be provided with a learner design brief containing data for a specified building of contemporary style for which they are required to produce a solution for the building components required. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate construction detail annotation.

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

Outcome 4

Focus of the assessment is on the production of graphic evidence in the form of 2-dimensional CAD drawings, which demonstrate the learner's grasp of intermediate building elements and systems, and their ability to express and communicate these concepts and ideas accurately. The suggested time allocation for this assessment activity is 2 hours.

Learners could be provided with a learner design brief containing data for a specified building of contemporary style for which they are required to produce a solution for the building components required. The CAD details provided should be clear and effective visually and be supported by extensive and appropriate construction detail annotation.

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

Although no automatic certification of Core Skills or Core Skills components exists within this Unit, there might be opportunities to develop elements of some Core Skills. Learners are working to design brief remits which require the ability to create and manipulate objects in a computer-aided design environment thus developing the Core Skills of *Numeracy*, *Problem Solving* and *Information and Communication Technology (ICT)* at SCQF level 6. Access to, and evaluation of, examples of complex design drawings would be of value in formative work. Learners work unaided in correct file management so considerations of security and safety should become routine aspects 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 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 ability to create and edit elements within a drawing using a full range of software commands. All these tasks provide further opportunities to challenge the learner to improve on the breadth of the 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 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

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.

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General information for learners

Unit title: Architectural CADT: Construction Detailing (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 understanding and practical production of detailed construction drawings. For a variety of elemental systems and connections in these small buildings, you will produce such detail using advanced computer-aided design software packages.

Within this Unit, a wide range of detail construction requirements for small building projects will be considered, including openings and elements in walls, roofs and floors, the detailing of doors, windows, stairs, dormers, openings and foundations. Throughout the Unit, traditional, contemporary and innovative technologies and systems will be considered, and emphasis will be placed on the determination of appropriate technical design solutions to given building project briefs.

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 details, nominally in plan and section views. The use of standard CAD 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 four 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 a building brief. The supporting evidence for all the assessment events could be integrated into a covering report submission for the practical CAD work generated.

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 the Core Skills of *Information and Communication Technology (ICT)*, *Problem Solving* and *Numeracy* to SCQF level 6.