

SQA Advanced Unit Specification

General information

Unit title: Building Information Modelling (BIM): Residential Project (SCQF level 7)

Unit code: HR7L 47

Superclass: VF

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Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit is designed to provide learners with the skills and knowledge required for the creation of design solutions in a BIM environment, and the creation of Architectural CAD models using industry-standard Architectural Engineering and Construction (AEC), high-end 3D Architectural CAD software. Learners will develop underpinning knowledge in Building Information Modelling, residential design protocols and the contextual practical skills required for the creation of CAD and BIM models.

Outcomes

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

- 1 Produce a 3D conceptual BIM model for a residential building to a given brief.
- 2 Prepare files in a format which can be used to share BIM information with other stakeholders.
- 3 Use the information in a BIM model to produce a timeline for the construction phase of the project.
- 4 Use the information in a BIM model to generate costings for a building.

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

Access to this Unit is at the discretion of the centre. However, it is recommended that learners have a basic level of competence in a 3D Architectural CAD programme, capable of generating and exporting BIM data. This could be evidenced by completion of the SQA Advanced Unit HR6M 47 *Architectural CADT: Residential Design*, or equivalent.

Additionally, it would be advantageous for learners to have completed, or be studying towards, Units with a strong design base, preferably in architectural design processes. This might be evidenced by the SQA Advanced Unit HR6Y 47 *Architecture: Form, Order and Composition*, or equivalent.

Learners with alternative, relevant industrial experience or qualifications may also be considered.

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.

Assessment Support Packs (ASPs) provide assessment and marking guidelines that exemplify the national standard for achievement. Centres wishing to develop their own assessments should refer to existing ASP to ensure a comparable standard. A list of existing ASPs is available to download from the SQA Advanced subject-specific pages on SQA's website at www.sqa.org.uk/sqa.

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 a 3D conceptual BIM model for a residential building to a given brief.

Knowledge and/or skills

- ◆ client design brief
- ◆ major residential design principles
- ◆ employer's information requirement
- ◆ BIM execution plan
- ◆ Architectural CAD programmes
- ◆ construction technology methods and systems
- ◆ components' attribute data

Outcome 2

Prepare files in a format which can be used to share BIM information with other stakeholders.

Knowledge and/or skills

- ◆ downloading suppliers' BIM families
- ◆ inserting downloaded families into BIM model
- ◆ requirements of stakeholders
- ◆ sharing BIM data in an collaborative environment

Outcome 3

Use the information in a BIM model to produce a timeline for the construction phase of the project.

Knowledge and/or skills

- ◆ RIBA Plan of Work
- ◆ project planning
- ◆ project planning software
- ◆ construction processes

Outcome 4

Use the information in a BIM model to generate costings for a building.

Knowledge and/or skills

- ◆ costing principles
- ◆ sources of cost information
- ◆ work packages
- ◆ elemental cost plans

Evidence Requirements for this Unit

Evidence for the knowledge and/or skills in this Unit can be generated on an Outcome by Outcome basis or as a single integrated assessment event, under controlled, supervised, open-book conditions.

Outcome 1

- ◆ create a 3D conceptual CAD design solution in response to a given client residential design brief
- ◆ create a BIM execution plan in response to an employer's information requirement

Outcome 2

- ◆ share files in an appropriate format that can facilitate use of the BIM information by other stakeholders, eg cost consultant, project planner, etc
- ◆ download BIM families and integrate them into a BIM model
- ◆ explain the requirements of stakeholders

Outcome 3

- ◆ create a project plan to a timeline for a construction process

Outcome 4

- ◆ create an elemental cost plan for a construction process

Evidence could be provided electronically, on disk, to replicate industry practice or may consist of hard-copy documents, at the discretion of the centre:

Assessment for this Unit could be undertaken holistically as a design project, using BIM procedures to progress the model from the design stage, to the project planning and costing stages.

Learners will be allowed access to course material, textbooks, the internet and the Help files associated with the software used. All evidence must be generated during the assessment period, and all attributable evidence must be referenced.

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

It is widely accepted that BIM is a process which is fundamental to the future of the construction industry. This Unit has been written in order to allow learners to develop the underpinning knowledge of the procedures involved, and particularly of the software utilised. This is a practical Unit involving extensive use of industry-standard, high-end software.

This Unit will allow learners to develop knowledge, understanding and skills in the following areas:

- ◆ production of conceptual architectural models in response to a residential design brief
- ◆ sharing of information with stakeholder in a BIM project
- ◆ production of BIM information for costing a project in response to the client brief
- ◆ production of BIM information for planning a project in response to the client brief

It is strongly recommended that the manual procedures for costing and project planning is taught before progressing to the use of analytical software, to ensure a full understanding of the processes involved.

All Outcomes require the use of specialist software, at the discretion of the centre.

The Unit is at SCQF level 7 and has been developed 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 Group Awards where award designers feel this to be appropriate. The design of this Unit allows for content to be contextualised within topics which allow for a simulation of working practices when preparing a response to a residential client brief.

Consideration for other users and an adherence to practices and procedures impacting on security and safety would be a routine aspect of good practice.

Guidance on approaches to delivery of this Unit

This Unit could be a follow-up to *Architectural CADT: Residential Design* HR6M 47, which is a mandatory Unit in the SQA Advanced Diploma in Computer Aided Architectural Design and Technology Group Awards. If SQA Unit Building Information Modelling (BIM): Principles HR7N 47, is also being taught as part of the same Group Award, it should precede this Unit in the order of teaching.

Outcome 1 — Produce a 3D conceptual BIM model for a residential building to a given brief.

It is assumed that the learner has sufficient competence in the use of advanced AEC CAD software to produce appropriate three-dimensional conceptual model(s). However, it is expected that other specialist BIM programmes will be required to be used to create and process the information requested in the employer's information requirement.

The client brief will include an employer's information requirement, detailing the BIM information required as part of the project. The learner will then provide a BIM execution plan which will outline how the BIM will be delivered. Templates are available to facilitate the creation of this.

By using a client brief for a residential solution containing sufficient primary details to cover the production of all learner Evidence Requirements, learners will be able to reflect on site data, client requirements, planning constraints or stylistic imperatives. Learning topics should be structured sequentially to allow learners the opportunity to develop the appropriate level of skills required for each element of the assessment. The following learning topics are recommended:

- ◆ client requirements
- ◆ employer's information requirement
- ◆ BIM execution plan

Outcome 2 — Prepare files in a format which can be used to share BIM information with other stakeholders.

Sharing information with other stakeholders should be done through a two-way process:

- ◆ downloading BIM families from suppliers' web sites
- ◆ preparing (for example).ifc or.nwc/nwd files for use in specialist downstream functions: this will be necessary to enable the next stages on the task to be undertaken, in Outcomes 3 and 4

Outcome 3 — Use the information in a BIM model to produce a timeline for the construction phase of the project.

Learners should be able to export information from a BIM model in a format which can be used to create a project plan for the construction of a residential building. Prior to creating an electronic project plan, the learner should be made familiar with manual project planning techniques, regarding timing and sequencing of each stage of the construction process.

Outcome 4 — Use the information in a BIM model to generate costings for a building.

Learners should be able to export information from a BIM model in a format which can be used to create costing details for a residential building. Prior to creating electronic costing details plan, the learner should be made familiar with manual costing techniques, regarding initial build costs and lifetime cycle costs.

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 undertaken holistically as a design project, using BIM procedures to progress the model from the design stage, to the project planning and costing stages. Although the Unit could be assessed holistically, it is recommended there should be four formal assessment events, corresponding to the four Outcomes, to be taken by learners at agreed points, determined by the lecturer.

Evidence for all Outcomes will be generated under controlled, supervised open-book conditions. Learners will be allowed access to course material, text books, the internet and the Help files associated with the software used. All evidence must be generated during the assessment period and all attributable material must be referenced using a recognised referencing system.

Standard reporting formats could include written report, oral presentation, DVD production, or other multimedia presentation. The learner should use an appropriate format to produce a portfolio of work, combining an architectural BIM model with associated drawings, and output from specialist analytical software.

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.

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 will have opportunities to develop the Core Skills of *Numeracy*, *Information and Communication Technology (ICT)* and *Problem Solving* at SCQF level 6 as well as the Core Skills component *Written Communication* at SCQF level 6 in this Unit. Although there are opportunities to develop Core Skills and Core Skills components, there is no automatic certification.

Learners will have opportunities to develop the Core Skills of *Communication* (Written or oral), through presentation of a client report, *Numeracy* through costing calculations, *Information and Communication Technology (ICT)*, through the use of analytical CAD software, and *Problem Solving* through project planning.

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.

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: Building Information Modelling (BIM): Residential Project (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 knowledge and understanding of the role which BIM can play in the design of residential properties, and to provide you with advanced skills the use of high-end, industry-standard AEC (Architectural Engineering Construction) CAD software packages. Within the Unit, you will learn about:

- ◆ BIM software
- ◆ BIM file formats
- ◆ residential design principles
- ◆ spatial design principles
- ◆ manual techniques for project planning
- ◆ computer-aided approaches to BIM project planning
- ◆ manual techniques for project costing
- ◆ computer-aided techniques to BIM project costing
- ◆ computer-aided tools for production and presentation purposes

The Unit will be taught with a series of lectures, practical exercises and design tutorials, which will progress sequentially through the case study.

There may be four formal assessment events based around a single case study. These are supervised, open-book tasks in which you will be allowed access to course material, text books, the internet and the Help files associated with the software used. You will sit these assessments at prescribed points during the Unit at the discretion of the lecturer.

All assessments are entirely design-driven, and provide the opportunity for you to produce and present an organised portfolio of graphic work in response to an employer's information requirement. The assessments are inter-related and sequential in nature.

For Outcomes 3 and 4 it is important that you fully understand the principles involved, by using manual processes, before proceeding to using analytical software.

The Unit is largely practical in nature, requiring you to have individual access to BIM CAD and analytical systems. 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. Additionally, because you will be working continuously with CAD systems and manipulating numerical and graphical data, and responding to a design brief, you will have the opportunity to develop the Core Skills of *Information and Communication Technology (ICT)*, *Numeracy*, *Communication* and *Problem Solving*, all at SCQF level 6.