SQA Advanced Unit Specification

General information for centres

Unit title: Building Information Modelling (BIM): Building Science (SCQF level 8)

Unit code: HR7K 48

Superclass: CC

Publication date: June 2018

Source: Scottish Qualifications Authority

Version: 02

Unit purpose

This Unit is designed to provide learners with the skills and knowledge required to analyse the energy efficiency of a building, and to identify the potential cost savings, in terms of initial building cost against life cycle costs.

Using industry-standard Architectural Engineering and Construction (AEC), high-end 3D Architectural CAD software, learners will develop skills in using BIM analysis techniques and the contextual practical skills required for the compilation of a report to be presented to a client.

Outcomes

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

1 Analyse a given building design in terms of energy performance.
2 Propose energy improvements and justify your recommendations.
3 Produce a report justifying energy savings in terms of life cycle costs.

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

Access to this Unit is at the discretion of the centre. However, it is recommended that learners have basic CAD skills. 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.

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 ASPs 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.

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: Building Information Modelling (BIM): Building Science (SCQF level 8)

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

Analyse a given building design in terms of energy performance.

Knowledge and/or skills

- client brief
- use of analytical software
- U values
- thermal mass
- solar gain and building orientation

Outcome 2

Propose energy improvements and justify your recommendations.

Knowledge and/or skills

- current building regulations
- use of analytical software
- insulation materials and methods
- methods of space heating
- renewable energy technologies

Outcome 3

Produce a report justifying energy savings in terms of lifecycle costs.

Knowledge and/or skills

- whole life cycle cost analysis
- energy policy at local and national levels
- energy performance and certification

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.

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

Outcome 1

- Use BIM software to analyse a building in terms of its energy performance.

Outcome 2

- Propose and justify improvements to the elements which affect the energy performance of the building. Elements may include structures, insulation, and renewable energy components.

Outcome 3

- Provide a report to a client, including extracts from dedicated industry-standard analytical software, describing the current energy performance of a building, and justifying the recommended improvements.

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

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

Unit title: Building Information Modelling (BIM): Building Science (SCQF level 8)

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

- analytical use of BIM software to identify the potential cost savings, in terms of build cost against lifetime cycle costs
- renewable energy technologies, to include, but not be restricted to:
  - photovoltaic cells
  - biomass fuel
  - ground source heat pumps
- reporting to a client

It is strongly recommended that the conventional procedures, for the calculation of U values is taught before progressing to the use of analytical software, to ensure a full understanding of the processes involved.

Learners must ensure that all recommendations will comply with Section 6 of the current Scottish Building Regulations, Technical Handbook (or any subsequent changes or revisions).

Outcomes 1 and 2 require the use of specialist software, at the discretion of the centre.

This SCQF level 7 Unit is an optional Unit within the SQA Advanced Certificate and SQA Advanced Diploma Computer Aided Architectural Design and Technology Group Awards. 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 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 Certificate and SQA Advanced Diploma Computer Aided Architectural Design and Technology Group Awards. If the 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 — Analyse a given building design in terms of energy performance.

The learner should be given a 3D Architectural CAD model, prepared by the lecturer, to use in the analysis process. This CAD model should include features providing scope for improvement in terms of its energy performance. Conventional techniques for the calculation of U values should be a core element of the delivery of the Unit to ensure a full understanding of the science involved.

Outcome 2 — Propose energy improvements and justify your recommendations.

Following on from formal lectures on energy efficient technologies, learners will be expected to carry out extensive self-directed research which will enable them to make recommendations, and to justify them to a client. It is also important that learners understand the importance of complying with the current Scottish Building Regulations Technical Handbook.

Outcome 3 — Produce a report justifying energy savings in terms of life cycle costs.

Having identified potential improvements to a given building, learners will report to a client. Instruction should be given in compiling and delivery of a report, appropriate to the method of reporting, — for example, writing a formal report, preparing presentation slides, etc.

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 the learners experience a range of assessment methods, this helps them develop different skills that should be transferable to work or further and higher education.

Assessment for this Unit should be undertaken as a case study to analyse a building, in terms of energy usage and to make recommendations for improvements in energy efficiency.

Assessment for this Unit requires learners to use industry-standard software, to analyse a building in terms of its energy performance. The final output will be a report to a client, thus all assessments are inter-related and sequential in nature, in that the activities and results from one Outcome are integrated and progressed in the subsequent Outcome assessment. Evidence for all Outcomes will be generated under controlled, supervised open-book conditions. 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.

Outcomes 1 and 2 consist of practical assignments relevant to the brief provided, and Outcome 3 consists of reporting to a client, explaining and justifying the rationale supporting

the recommendations following from Outcomes 1 and 2. This allows for integration of the assessment evidence into a single portfolio of learner work thus providing an integrated approach to assessment which closely mirrors industry practice. If this approach is used to gather evidence, checklists should be used to record learner progress as a formative record of achievement prior to the substantive submission of all completed solutions for the corresponding Outcomes.

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, details requiring minor revision or modification may be remediated and resubmitted rather than the whole of the project.

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 report justifying and explaining the design decisions reached throughout the Unit. The decisions could be summarised in a document with all attributable material being referenced using a recognised referencing system.

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

There are opportunities to develop the Core Skills of *Communication*, *Numeracy*, *Information and Communication Technology (ICT)* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Learners will have opportunities to develop the Core Skills of *Communication* through presentation of a client report, *Numeracy* through the calculation of U values, *Information and Communication Technology (ICT)*, through the use of analytical CAD software, and *Problem Solving* through suggesting improvements to the fabric of a building.

History of changes

Version	Description of change	Date
02	Superclass changed from VF to CC	June 2018

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): Building Science (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 knowledge and understanding of the role which Building Information Modelling (BIM) can play in the energy analysis of a building using high-end, industry-standard AEC (Architectural Engineering Construction) CAD software packages.

- client briefs
- current building regulations
- comparative build costs against lifetime operating costs
- U values
- insulation materials and methods
- renewable energy technologies
- methods of space heating
- computer-aided techniques for energy analysis
- presentation methods
- whole lifecycle cost analysis
- energy policy at local and national levels
- energy performance and certification

The knowledge and/or skills in this Unit will be assessed under supervised, open-book conditions. You will be allowed access to course material, textbooks, the internet and the Help files associated with the software used.

The assessment for Outcome 3 will require you to present your analysis and recommendations to your client. This could be a written report, oral presentation, DVD production, or other multimedia presentation, as required by your lecturer.

The Unit is largely practical in nature, requiring you to have individual access to a CAD system. 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 develop the Core Skills of *Communication*, *Information and Communication Technology*, *Numeracy* and *Problem Solving*, all at SCQF level 6.