

SQA Advanced Project-based Graded Unit Specification

General Information

This Graded Unit has been validated as part of the SQA Advanced Certificate in Computer Aided Draughting and Design (CADD). Centres are required to develop a project-based assessment in accordance with this validated specification.

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 1 (SCQF level 7)

Graded Unit code: HV19 47

Type of Project: Practical Assignment

Publication date: November 2017

Source: Scottish Qualifications Authority

Version: 01

Graded Unit purpose

This Graded Unit is designed to provide evidence that the learner has achieved the following principal aims of the SQA Advanced Certificate in Computer Aided Draughting and Design:

- ◆ To provide opportunities for learners to develop competences required by employers across the range of employment situations, including full-time, part-time or freelance work.
- ◆ To make available the opportunity for learners to develop knowledge and skills for the purpose of progression to further academic or professional qualifications, either before embarking on a career, or parallel to it.
- ◆ To develop key skills for employability while building on previously acquired transferable skills which that could allow progression within the SCQF (Scottish Credit and Qualification Framework) or lead to employment.
- ◆ To develop skills in study, research, analysis, and improve learner's ability to define and solve problems.
- ◆ To develop the learner's responsibility for their own learning.
- ◆ To enable learners to enter employment as CAD technicians, Junior Designers and Designers within the engineering, manufacturing and construction sectors.
- ◆ To deliver an award that provides an opportunity for learners to achieve appropriate professional body recognition, in particular but not exclusively, the Institution of Engineering Designers, initially as student member with potential to progress to full membership and either Eng Tech, IEng or CEng recognition.

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- ◆ To provide learners with a range of contemporary vocational skills in the preparation, co-ordination and communication of technical information, that includes:
 - Production of drawings to industry and current international standards
 - Creation of graphical information
 - Obtaining, recording and organising technical information
 - Creation and manipulation of 3D CAD models
 - Management of design projects using traditional and emerging technologies
- ◆ To provide an award that, on successful completion, will allow learners to progress to appropriate degree level programmes.
- ◆ To develop a degree of specialisation within subject specific disciplines.

Credit points and level

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

Recommended entry to the Graded Unit

It is recommended that the learner should have completed, or be in the process of completing, the following Units relating to the above specific aims prior to undertaking this Graded Unit:

HP4A 47	<i>Communication: Practical Skills</i>
HR3L 47 or HV17 46	<i>CAD: 2D I or Autodesk Certified User: AutoCAD</i>
HV1K 47	<i>CAD: 3D Surface and Solid Modelling</i>
HR7H 47	<i>CAD: User Systems</i>
HV1D 47	<i>CAD: Principles</i>
HV1E 47	<i>Design Methodology</i>

Additionally, it would be of benefit to acquire specialist skills by undertaking the following Units:

HR6H 47	<i>CAD: Visualisation, Rendering and Presentation</i>
HV1H 47	<i>CAD: Graphical Design</i>

One of the optional CAD Units within a design discipline:

HR3K 47 or HR7W 46	<i>CAD: Architectural 1 or Autodesk Certified User: Revit</i>
HV1G 47 or HV18 46	<i>CAD: Feature-Based Modelling 1 or Autodesk Certified User: Inventor</i>

The nature of the project activity detailed in this specification is such that it is likely that centres will wish their learners to embark on it towards the end of the first year of the SQA Advanced Certificate Computer Aided Draughting and Design.

In principle, the project can draw on any discipline in the SQA Advanced Certificate in Computer Aided Draughting and Design framework, although the majority of any Units should be at SCQF level 7. The Project can be taken from one design discipline (eg Architectural). However, its principal purpose is to integrate learned CAD concepts using a specialised CAD application showing such practical basic knowledge and skills as planning, layout, evaluation and reporting.

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Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Graded Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Graded Unit.

Equality and inclusion

This Graded Unit 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 SQA's website:
www.sqa.org.uk/assessmentarrangements

SQA Advanced Project-based Graded Unit Specification: Designing the project and assessing learners

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Assessment

This Graded Unit will be assessed by the use of a project-based *case practical assignment* developed by centres. The project should provide the learner with the opportunity to produce evidence that demonstrates she/he has met the aims of this Graded Unit.

The project undertaken by the learner must be a complex task which involves:

- ◆ variables which are complex or unfamiliar
- ◆ relationships which need to be clarified
- ◆ a context which may be unfamiliar to the learner

The project must require the learner to:

- ◆ analyse the task and decide on a course of action for undertaking the project
- ◆ plan and organise work and carry it through to completion
- ◆ reflect on what has been done and draw conclusions for the future
- ◆ produce evidence of meeting the aims which this Graded Unit has been designed to cover

Typical projects could be:

- ◆ Mountain bike including suspension, gearing and brakes.
- ◆ Engine modification/redesign
- ◆ Residential building design including planning and building warrant details

This Graded Unit will be assessed by the use of a practical assignment (CAD project within a relevant discipline). The developed practical assignment should provide the learner with the opportunity to produce evidence that demonstrates she/he has met the aims of the Graded Unit that it covers.

Conditions of assessment

The learner should be given a date for completion of the project. However, the instructions for the project should be distributed to allow the learner sufficient time to assimilate the details and carry out the project. During the time between the distribution of the project instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The project should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the learner's evidence at the time of the completion date.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any reassessment of stages must be undertaken before proceeding to the next stage.

If a learner fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project, assignment, case study, etc. In this case, a learner's grade will be based on the achievement in the **re-assessment**.

Evidence Requirements for this Graded Unit

The project undertaken by learners will consist of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

Project stage	Minimum Evidence Requirements	% Mark Allocation
Stage 1 — Planning	<ul style="list-style-type: none"> ◆ A project brief identifying customer requirements ◆ A project specification that the customer has agreed ◆ A set of project objectives ◆ A project schedule ◆ Information about different solutions ◆ Justification of chosen solution ◆ Verification Strategy ◆ Maintenance of log book ◆ A word count of 1500 words minimum 	20%
	<i>The learner must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i>	
Stage 2 — Developing	<ul style="list-style-type: none"> ◆ Practical output from the project (eg Report, 3D model, 3D support drawings (Elevations, Sections, Detail drawings and 2D support drawings, eg Orthographic Plan drawings, extraction data and schedules/tables) ◆ Written records of processes underpinning the project such as: <ul style="list-style-type: none"> — log book — progress reports ◆ A word count of 500 words minimum 	60% (50 from practical, 10 from written)
	<i>The learner must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i>	
Stage 3 — Evaluating	<ul style="list-style-type: none"> ◆ Review of project specification as the project progresses ◆ Review of project schedule as the project progresses ◆ Analysis used to decide project option ◆ Progress reporting and goal setting as part of project implementation ◆ Actions taken to overcome unforeseen circumstances ◆ An assessment of the strengths and weaknesses of the practical output of the project ◆ An evaluation of the extent to which the project brief and objectives have been overtaken ◆ Reflective part of oral presentation ◆ Identification of any knowledge and skills which have been gained by the learner ◆ A word count of 750 words minimum 	20%
	<i>The learner must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i>	

Assessing and grading learners

The overall project will be marked out of **100**. Only whole marks should be used.

The percentage of marks allocated to each stage of the project is outlined in the **Evidence Requirements**.

It is a requirement that learners must meet the minimum *Evidence Requirements* for the *Planning* stage before progressing to the *Developing* stage before progressing to the *Evaluating* stage. Learners may produce evidence over and above that specified in the minimum *Evidence Requirements* and deserve more than half the available marks for that stage. Assessors should use the grade-related criteria outlined below to judge learner performance.

Learners are required to work independently to meet the *Evidence Requirements* of the Graded Unit. At the same time, learners need appropriate support. SQA uses the term reasonable assistance to describe the balance between supporting learners in their project and not providing too much assistance.

At the end of *each* stage there should be opportunities for remediation and re-assessment of learners for that particular stage. This includes the final *Evaluation* stage. Any re-assessment should be carried out in line with the centre's own assessment policy.

Grade-related criteria	
Grade A	Grade C
<p>Is a seamless, coherent piece of work which:</p> <ul style="list-style-type: none"> ◆ provides considerably more than the minimum evidence for each of the three essential phases of the project. ◆ evidence is produced to a high standard, and is clearly inter-related. ◆ demonstrates an accurate and particularly insightful interpretation of the project brief. ◆ has continuously accessed available guidance in arriving at the Outcomes submitted. ◆ embodies non-traditional and innovative solutions. ◆ has accessed a wide range of available data and design guidance. ◆ drawings and language used are of a high standard in terms of level, accuracy and technical content. 	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> ◆ provides the minimum evidence for each of the three essential phases of the project. ◆ evidence is produced to an acceptable standard. ◆ demonstrates an acceptable interpretation of the project brief. ◆ has not amplified the initial project brief in arriving at the Outcomes submitted. ◆ embodies only routine and traditional solutions. ◆ has accessed a minimum range of available data and technical content. ◆ drawings and language used are adequate in terms of level, accuracy and technical content.

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Grade-related Criteria (cont)	
Grade A	Grade C
<ul style="list-style-type: none"> ◆ effectively consolidates and integrates required knowledge and skills ◆ considers possible conflicts in integrating proposed solutions with constraints. ◆ includes rationale and justification for proposed solutions. ◆ clearly addresses a 'fit for purpose' objective in arriving at proposed solutions. ◆ clearly identifies key areas for improvement when undertaking the work to the defined time line action plan. ◆ clearly identifies key areas for improvement when reflecting on the technical solutions chosen compared with the initial objectives. 	<ul style="list-style-type: none"> ◆ consolidates and integrates knowledge and skills but this may lack some continuity and consistency. ◆ treats proposed system solutions with justification. ◆ presents proposed solutions with justification. ◆ has not considered cost or quality issues. ◆ achieves Outcomes with minimal evaluation against the time line plan. ◆ assumes the technical solutions chosen as the 'most appropriate' with minimal retrospective comparison within the initial object. ◆ where a better grade would be applicable, but the word count is excessively outwith the 10% tolerance.

The marks allocated to each stage will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the learner for this Graded Unit based on the following grade boundaries.

- A = 70%–100%
 B = 60%–69%
 C = 50%–59%

These grade boundaries are fixed and should **not** be amended.

If a learner does not achieve a pass or wishes to upgrade, then this must be done using a substantially different project, ie all stages are undertaken using a new project (case study, investigation or practical assignment). In these circumstances, the highest grade achieved should be awarded.

More information on reasonable assistance, remediation and re-assessment may be found in the SQA publication *Guidance for the Implementation of Graded Units in Higher National Certificates and Diplomas* (SQA, 2008, Publication code: CA4405).

SQA Advanced Project-based Graded Unit Support Notes

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 1 (SCQF level 7)

Guidance on approaches to delivery and assessment of this Graded Unit

This Graded Unit has been designed to help learners achieve the principal aims of the SQA Advanced Certificate in Computer Aided Draughting and Design, and to assess their knowledge and skills relative to the mandatory subjects of the course framework. This will be achieved typically by resolving a design issue or designing a new product, allowing learners to explore a range of solutions, arrive at an appropriate and effective resolution, and communicate the solutions in an effective manner.

The learner could be introduced to the Graded Unit at the start of the academic year and Course tutors could be encouraged to refer to any contributory information, tasks and details which may be useful when the actual Graded Unit is undertaken. Every opportunity should be taken prior to embarking on the Graded Unit to encourage learners to develop independent learning skills, producing to timelines and obtaining sufficient research documentation to support ideas generation. This will provide opportunities for the learner within a supportive environment to develop an appreciation of project management techniques. Such formative tasks will prepare learners to undertake a project-based assignment.

Possible design briefs could be structured around architectural, engineering, interior design, product design, landscaping or other design related projects.

Such an approach is intended to reflect contemporary industrial, commercial and private working practices and procedures.

This project for the SQA Advanced Certificate takes forward a concept, and develops this into a practical output in the form of 3D CAD models and 2D Drawings in response to a design brief. Learners are given the opportunity to develop the concept drawing on their own vocational and personal interests. Learners may present evidence selected from a range of illustrative techniques which may include: Sketches, 2D and 3D CAD.

There are three distinct phases to the project, Planning, Developing and Evaluating, worth respectively 20%, 60% and 20% of the total marks awarded for the Unit.

In the Planning stage of the Project, learners will be expected to consider the nature of the design brief set, including factors related to a wide variety of aesthetic, administrative and technical constraints. In response to these, learners should prepare a clear Objectives list, Project Plan and Research Strategy before continuing with the design process. Learners will be expected to adhere to the Project Plan, explore and consider possible solutions, and arrive at an appropriate design solution for the Project Brief set. The solutions will be communicated visually, pictorially, including the rationale for the solutions reached.

In the Developing stage, learners will be expected to evolve their design solution using computer aided technology to create 2D and 3D CAD models and appropriate industry standard drawings. They could also create pictorial/illustrative images of the developed design to fully convey their solution. They will produce a report documenting the processes underpinning the project.

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In the Evaluating stage of the Project, learners will be expected to consider the success and efficacy of their solution, providing a presentation of their final solutions and recommendations, and reflect upon the experience.

Stage 1: 8 hours

Stage 2: 24 hours

Stage 3: 8 hours

The Unit is graded, and this Grade (A–C) quantifies and qualifies the quality of the SQA Advanced Certificate award. A checklist and guidance on completion of the checklist is included below.

Opportunities for developing Core and other essential skills

The achievement of this Unit gives automatic certification of the following:

Problem Solving at SCQF level 6

There are also opportunities to develop the Core Skills of *Information and Communication Technology (ICT)* and *Communication* at SCQF level 6 in this Unit.

History of changes to Graded Unit

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](#).

Scottish Qualifications Authority

Computer Aided Draughting and Design: Graded Unit 1

Grading Unit Checklist

Centre's name: _____

Centre's number: _____

Learner's name: _____

Learner's number: _____

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No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
Stage 1 — Planning						
1	Yes	The project brief includes sufficient information to identify the customer's main requirements.	Yes	Yes	Yes	The project brief includes all relevant information, is written clearly and concisely and has been agreed fully with the customer.
2	Yes	The project specification contains the essential information required to proceed with the project.	Yes	Yes	Yes	The project specification is well structured, contains relevant, accurate information and any revisions made have been agreed with the customer.
3	Yes	The project objectives identify the key long term project targets.	Yes	Yes	Yes	The project objectives accurately and fully reflect the long term project targets.
4	Yes	The initial project schedule (probably in the form of a Gantt chart) shows all essential project activities. Some evidence of monitoring the schedule to inform project development is available.	Yes	Yes	Yes	The initial project schedule (probably in the form of a Gantt chart) contains a comprehensive list of project activities and timings. The information in the initial schedule is used to assess if the project can be completed within timescales. The schedule is monitored on a regular basis to inform on-going project planning and development.
5	Yes	The learner develops an adequate knowledge base to support the demands of the project.	Yes	Yes	Yes	The learner develops a substantial knowledge base to support the demands of the project.
6	Yes	A reasonable case is presented to justify the choice of the selected solution.	Yes	Yes	Yes	The selected solution is justified in terms of a thorough evaluation of a range of options.
7	Yes	A verification strategy is developed to test the essential parts of the product.	Yes	Yes	Yes	A comprehensive verification strategy is developed to ensure the product is completely tested.

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No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
Stage 2 — Development						
8	Yes	The learner feeds back to her/his supervisor on at least three occasions providing an indication of progress made	Yes	Yes	Yes	The learner feeds back to her/his supervisor on a regular basis, updating the supervisor on progress made and actions for the next stage of the project.
9	Yes	The learner accesses components and/or software and/or materials of the correct specification from a range of sources	Yes	Yes	Yes	The learner accesses component and/or, software and/or materials of the correct specification from a range of sources at the most economic price.
10	Yes	The product is designed to an acceptable standard of quality	Yes	Yes	Yes	The product is designed to a high standard and functions correctly.
11	Yes	Practical activities are carried out to an acceptable level of health and safety	Yes	Yes	Yes	Practical activities are carried out in a totally safe and healthy manner.
12	Yes	The log book contains essential details of project development and there is evidence that it has been maintained	Yes	Yes	Yes	The log book is regularly maintained and provides a detailed, informal record of the learner's thinking as the project develops including reflective comments.
13	Yes	The project report meets acceptable standards in terms of structure, use of English and clarity, and has accurate conclusions and recommendations. Double weight	Yes	Yes	Yes	The project report is well structured, contains only relevant information, has clear and accurate conclusions and recommendations and is written in clear and correct English. Double weight

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No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
Stage 3 — Evaluation						
14	Yes	The project includes an evaluation of the project strategy and activities and includes an evaluation of what the learner has learnt from undertaking the project.	Yes	Yes	Yes	The project report includes a clear and comprehensive evaluation of the project strategy and activities and includes clear evaluation of what the learner has learnt from undertaking the project.
15	Yes	The oral presentation is acceptably structured, contains largely relevant information and is to time. Double weight	Yes	Yes	Yes	The oral presentation is well structured, contains only relevant information, is to time and includes the use of appropriate aids. Double weight
16	Yes	The learner gives technically correct answers to questions raised as part of the oral presentation.	Yes	Yes	Yes	The learner gives clear, concise and technically accurate answers to questions raised during the oral presentation.
17	Yes	The learner includes some reflection of the success, or otherwise, of the project in the oral presentation.	Yes	Yes	Yes	The learner includes a clear, reflective account of the success, or otherwise, of project activities against project objectives in the oral presentation.
18	Yes	The learner undertakes the project with an acceptable level of supervision.	Yes	Yes	Yes	The learner undertakes the project with the minimum of supervision.
19	Yes	The learner provides some details of the new knowledge and skills she/he has developed as a result of doing the project.	Yes	Yes	Yes	The learner identifies clear and full details of the new knowledge and skills she/he has developed as a result of doing the project.

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No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	
20	Yes	None	Yes	Yes	Yes	The learner introduces a significant novel feature into the project.
21	Yes	The learner demonstrates an acceptable level of motivation throughout the project.	Yes	Yes	Yes	The learner demonstrates a high level of self-motivation throughout the project.
22	Yes	None	Yes	Yes	Yes	The learner undertakes additional research well beyond that demanded by the project.

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 1 (SCQF level 7)

Guidance on the completion of the Grading Checklist

Centre staff are asked to read the following guidance notes before completing the Grading Checklist.

The checklist has been designed to help assessor(s) decide what Grade should be awarded to a learner doing the CAD Project. It will also be used by external verifiers as part of the external verification of project work. **A Grading Checklist form should be completed for each learner who has been entered for the Computer Aided Draughting and Design: Graded Unit1 (CAD Project).**

In completing the checklist assessor(s) should take note of the following points:

- 1 For each item shown in the checklist, the 'Yes', which most closely reflects the learner's performance, should be circled. It can be seen from the checklist that the grade criteria for Grade C and Grade A have been included in the checklist and items 13 and 15 are double weighted.
- 2 A Grade B should be awarded where the learner's performance lies approximately mid-way between a Grade C and a Grade A (ie better than a Grade C (competent) but not good enough to be a Grade A (highly competent)).
- 3 No Grade should be awarded where a learner's performance is not good enough to satisfy a Grade C pass (ie a competent level of performance).
- 4 Once centre assessor(s) have completed the twenty-two items, they should then apply their own professional judgement to decide what Grade to award a learner.
- 5 In arriving at the Grade, due account should be taken of the distribution of circles around 'Yes'. For example, if 18 out of 22 items have been circled 'Yes' under the Grade B column and the other four have been circled under the Grade C column, then it is likely that the assessor(s) will award the learner a Grade B. Professional judgement is much more involved where, for example, if 'Yes' is circled 11 times under the Grade A column and 10 times under the Grade B column. The assessor's first-hand knowledge of the learner's performance will influence whether the learner is awarded a Grade A or Grade B. External moderators are unlikely to overturn the grading awarded by the centre assessor(s) unless they are not happy that grading judgements have been awarded in a fair, consistent and rigorous manner.
- 6 Centres may provide additional comments and/or evidence in support of their grading decisions.

General information for learners

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 1 (SCQF level 7)

This Graded Unit is designed to provide you with opportunities to demonstrate knowledge and skills which reflect and underpin the principal aims of the SQA Advanced Certificate in Computer Aided Draughting and Design.

Essentially the assessments are designed to provide evidence that you have developed key skills for employability and built on acquired transferable skills you have obtained during the course. These skills include research and analysis, defining and problem solving, while taking responsibility for your own learning. The Graded Unit requires you to demonstrate planning, organisational and evaluation skills and a broadening and deepening of the technical skills required to work to a given design brief. You will also be required to demonstrate communication skills and resource management ability.

The practical assignment used in this Graded Unit has also been chosen to develop a range of *Communication* and *Information and Communication Technology (ICT)* skills relevant to CAD technicians/draughtspersons. Being a project it will also demand problem solving and analytical skills as you progress through the tasks in the Graded Unit, which culminates in the production of a physical solution to the design brief.

The scope of the design brief will allow you a degree of personal choice, reflecting your own personal or vocational interests in finding solutions which match the design requirements. Such an approach is intended to reflect contemporary industrial, commercial and private working practices and procedures.