

SQA Advanced Project-based Graded Unit Specification

General Information

This Graded Unit has been validated as part of the SQA Advanced Diploma 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 2 (SCQF level 8)

Graded Unit code: HV1A 48

Type of Project: Practical Assignment

Publication date: August 2018

Source: Scottish Qualifications Authority

Version: 02

Graded Unit purpose

This Graded Unit is designed to provide evidence that the learner has achieved the following principal aims of the SQA Advanced Diploma 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.

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- ◆ 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.
- ◆ 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
 - Preparation of reports and schedules
 - Obtaining, recording and organising technical information
 - Creation and manipulation of 3D CAD models
 - Management of design projects using traditional and emerging technologies
- ◆ To develop knowledge, understanding and skills in a range of core Computer Aided Draughting topics up to SCQF level 7 for SQA Advanced Certificate and up to SCQF level 8 for the SQA Advanced Diploma qualification.
- ◆ 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

2 SQA Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

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 principal aims prior to undertaking this Graded Unit:

HV1Y 48	<i>CAD: Manufacturing</i>
HV1X 48 or HV24 48	<i>CAD: Feature Based Modelling 2 or Autodesk Certified Professional: Inventor</i>
HV21 48	<i>CAD: Prototyping</i>
HV1T 48	<i>CAD: 3D Animation</i>
HR05 48	<i>Project Management</i>

Additionally, it would be of benefit to acquire specialist skills by completing a range of Units from the SQA Advanced Diploma in Computer Aided Draughting and Design optional Units.

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 our website: www.sqa.org.uk/assessmentarrangements

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

Graded Unit title: Computer Aided Draughting and Design:
Graded Unit 2 (SCQF level 8)

Assessment

This Graded Unit will be assessed by the use of a project-based *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.

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.

Reasonable assistance is the term used by SQA to describe the difference between providing learners with some direction to generate the required evidence for assessment and providing too much support, which would compromise the integrity of the assessment. Reasonable assistance is part of all learning and teaching processes. In relation to the assessment of Advanced Certificate/Diploma project-based Graded Units, assessors may provide advice, clarification, and guidance during the time between the distribution of the project instructions and the completion date, ie at each stage of the project.

Remediation allows an assessor to clarify learner responses, either by requiring a written amendment or by oral questioning, where there is a minor shortfall or omission in evidence requirements. In either case, such instances must be formally noted by the assessor, either in writing or recording, and be made available to the internal and external verifier. In relation to Advanced Certificate/Diploma project-based Graded Units, learners must be given the opportunity for remediation at each stage of the project.

At this level, learners should work independently within the context of a typical working environment. Centres should encourage learners to bring their specialist knowledge and experience to the project. Learners should be allowed to use appropriate technology within and outwith the college environment.

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To ensure authentication of work, learners must complete a log diary recording progress and tasks completed. There should be regular meetings between the tutor and learner(s) to review progress and these meetings should be recorded.

The final evaluation should include questioning of each learners understanding of the evidence submitted. Where possible, the involvement of an employer in the questioning is encouraged.

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	<p>Action plan document which includes:</p> <ul style="list-style-type: none"> ◆ A set of objectives relating to a given design brief ◆ Development of project plan ◆ Identification of the market ◆ Information gathered from a variety of sources to support concepts ◆ Aims of the practical assignment with clearly defined goals and targets ◆ Identification of materials and resources required and how they will be accessed <p>Verification strategy is established with a minimum of three learner/mentor feedback sessions.</p> <p><i>The learner must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i></p>	30%
Stage 2 — Developing	<p>Produce a project report:</p> <ul style="list-style-type: none"> ◆ Concept development methods are used to identify materials, manufacturing processes, sizes and costs. ◆ Evaluation methods are applied to determine solution selection ◆ Report on concept development phase ◆ Produce log book with a minimum of six entries <p>Practical output:</p> <ul style="list-style-type: none"> ◆ Concept sketches ◆ Creation of prototype ◆ Production of manufacturing drawings ◆ 3D Animation ◆ Presentation graphics ◆ Attends three feedback sessions with mentor ◆ Demonstrates self-directed learning throughout the project <p><i>The learner must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i></p>	50%

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Project stage	Minimum Evidence Requirements	% Mark Allocation
Stage 3 — Evaluating	<ul style="list-style-type: none"> ◆ Review and update the project plan as the project progresses ◆ Progress report and goal setting as part of the project implementation ◆ Identification of knowledge and skills which have been gained by the learner ◆ Summary of any unforeseen events and methods employed to overcome them ◆ Assess the strengths and weaknesses of the output of the assignment ◆ Determine to what extent the assignment met the original brief ◆ Responds to questions based upon the content of the project submission ◆ List three action points if you were to undertake a similar project again 	20%
	<p><i>The learner must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p>	

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.

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Grade Related Criteria	
Grade A	Grade C
<p>Is a seamless, coherent piece of work which:</p> <ul style="list-style-type: none"> ◆ accurately details the project objectives and fully reflects the key long term project targets and goals in a consistent and fully comprehensive manner. ◆ identifies a primary and secondary target market. ◆ details carefully selected information from a variety of sources to provide strong and valid reasons to support points made. ◆ contains a project schedule detailing 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. ◆ details a comprehensive verification strategy, developed to ensure the product is completely tested. ◆ makes use of concept development methods to communicate a comprehensive understanding of detail design considerations including materials, manufacturing processes and costs. ◆ summarises concept development, detailing a minimum of three concepts supported by a comprehensive evaluation of the strengths and weaknesses of each design. ◆ determines solutions through evaluation methods, supported by a rationale and justification. ◆ detailed prototype is created with notes. ◆ contains comprehensive manufacturing drawings. 	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> ◆ identifies the project objectives and long term project targets. ◆ identifies a target market. ◆ details an adequate knowledge base from a limited range of sources to support the demands of the project. ◆ contains a project schedule detailing all essential project activities and timings. Provides evidence that the schedule has been monitored on at least three separate occasions during the life of the Project. ◆ details a verification strategy, developed to test any essential parts of the product. ◆ makes use of concept development methods to communicate design considerations including materials, manufacturing processes and costs. ◆ summarises a minimum of three concepts developments. ◆ presents solutions. ◆ contains a simple prototype. ◆ contains manufacturing drawings for the key elements of the design.

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Grade Related Criteria (cont)	
Grade A	Grade C
<ul style="list-style-type: none"> ◆ makes use of animation tools in the creation of a comprehensive animated sequence that incorporates both camera and component animation. ◆ contains supporting graphics produced to a presentation standard. ◆ evidences learner feed back to her/his supervisor on a regular basis. As well as updating the supervisor on progress made and actions for the next stage of the project. ◆ contains only relevant, well-structured Information. Has clear and accurate conclusions and recommendations and uses language of high standard in terms of accuracy and technical content. ◆ contains the log book, regularly maintained and providing a detailed, informal record of the learner's thinking as the project develops including reflective comments. ◆ demonstrates clear, explicit links between the three stages of the investigation. ◆ the learner gives clear, concise and technically accurate answers to questions raised during the presentation. ◆ the learner identifies clear and full details of the new knowledge and skills he/she has developed as a result of doing the project. ◆ demonstrates self-directed learning consistently. ◆ details additional research undertaken to enhance discussion and solutions provided. 	<ul style="list-style-type: none"> ◆ makes use of animation tools in the creation of an animated sequence. ◆ contains supporting graphics. ◆ evidences learner feed back to her/his supervisor on at least three occasions. ◆ contains a structured report with conclusions and recommendations. ◆ contains the log book containing project ideas and progress and there is evidence that entries have been made on at least six occasions during the life of the project. ◆ demonstrates links between the three stages of the investigation. ◆ the learner answers questions raised as part of the presentation. ◆ the learner identifies some details of the new knowledge and skills he/ she has developed as a result of undertaking the project. ◆ seeks additional mentor support. ◆ some research included.

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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.

The evidence for an Advanced Certificate/Diploma project-based Graded Unit is generated over time and involves three distinct stages, each of which has to be achieved before the next is undertaken. This means that any re-assessment of stages must be undertaken before proceeding to the next stage. The overall grade is derived from the total number of marks *across all* sections, and should reflect the ability of the learner to work autonomously and the amount of support required. In relation to Advanced Certificate/Diploma project-based Graded Units, learners who have failed any stage of the project and have been unable to provide the necessary evidence through remediation must be given the opportunity for re-assessment of that stage.

Any learner who has failed their graded unit or wishes to upgrade their award must be given a re-assessment opportunity, or in exceptional circumstances, two re-assessment opportunities. In the case of project-based graded units, this must be done using a substantially different project.

The final grading given must reflect the quality of the learner's evidence at the time of the completion of the graded unit. Learners must be awarded the highest grade achieved — whether through first submission or through any re-assessment, remediation, and/or reasonable assistance provided.

SQA Advanced Project-based Graded Unit Support Notes

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 2 (SCQF level 8)

This Graded Unit has been designed to help learners achieve the principal aims of the SQA Advanced Diploma 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 are 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 Diploma in CADD takes forward a concept, and develops this into a practical output in the form of a series of illustrative and physical models 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 output as well as mixed media time based material. A physical model will be produced supporting all of the previous development work as demonstrable physical solution to the design scenario.

This Graded Unit is intended to be driven by the learner and other than the Unit introduction, requires only guidance and direction from the lecturer. Course tutors may wish to take on the role of a client or other professional routinely involved in the design of a product. Liaising with industry professionals within appropriate fields, and 'end users' for advice and guidance should be encouraged.

The nature of the project would nominally be along the lines of the SQA Advanced Certificate course, ie resolving a design issue or designing a new product. The topic would usually be of mechanical type design, allowing the learners to demonstrate their knowledge and skills gained from the mandatory subjects of the course framework and selected optional ones.

There are three distinct phases to the project, Planning, Developing and Evaluating, worth respectively 30%, 50% and 20% of the total marks awarded for the Unit.

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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.

In the Developing stage of the Project, learners will be expected to adhere to the Project Plan, explore and consider possible solutions, and using computer aided technological approaches, arrive at an appropriate design solution for the Project Brief set. The solutions will be communicated visually, pictorially and in hard copy or electronic format, and substantiated by clear, supporting documentation, including the rationale for the solutions reached. Digital animations should be created to demonstrate the functionality of the design, with physical Prototypes to support this.

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.

While the introduction should last approximately 2 hours, be robust with clear deadlines for all three stages given at the outset of the project and time for questions and answers, the remaining time spent on each stage could be:

Stage 1: 16 hours

Stage 2: 48 hours

Stage 3: 14 hours

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

Opportunities for developing Core and other essential skills

There are opportunities to develop the Core Skills in this Unit, although there is no automatic certification of Core Skills or Core Skills components. Further detail is articulated below.

The Graded Unit gives further opportunities to broaden and develop a range of Core Skills especially that of *Problem Solving*. The Core Skills of *Numeracy*, *Problem Solving*, *Information and Communication Technology (ICT)* and *Communication*, may all be developed to SCQF level 6. These Core Skills are utilised to plan develop and evaluate this practical assignment project.

History of changes to Graded Unit

Version	Description of change	Date
02	Update of Conditions of Assessment	06/08/18

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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

Graded Unit title: Computer Aided Draughting and Design: Graded Unit 2 (SCQF level 8)

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

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 over the second year of your 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.