Arrangements for

SQA Advanced Certificate in Engineering Practice
(Group Award Code — GM9R 47)

Date of publication: November 2017

Version: 02

Acknowledgement

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.

History of Changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. Centres are advised to check SQA Connect to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version number	Description	Date
02	**Addition of Units:** J1CH 47 Computer Programming and J1S1 47 Data Security added as optional units.	15/04/19

Contents Page

1 Introduction

This is the Arrangements Document for the SQA Advanced Certificate in Engineering Practice. This document includes background information on the Group Award, its aims, details of the Group Award structure, and guidance on delivery.

2 Rationale for the awards

The SQA Advanced Certificate in Engineering Practice is designed to equip candidates with the knowledge, understanding and skills required for success in current and future employment or for progression to further academic and/or professional qualifications.

2.1 The Target Client Groups

The SQA Advanced Certificate in Engineering Practice award allows candidates to develop important knowledge and skills needs to become an engineering supervisor or team leader.

The SQA Advanced Certificate in Engineering Practice would normally be studied by candidates who attend a centre on a day-release or other part-time basis. It has been designed to be sufficiently flexible enough to allow centres to use various modes of delivery: for example, two-year day-release, evening attendance, block-release etc.

Where centres decide to offer the SQA Advanced Certificate in Engineering Practice on a full-time basis it is strongly recommended that candidates are provided with opportunities to take a number of practical engineering Units so that they acquire some useful practical skills and gain some experience of what it would be like to work in a practical engineering environment (s). Centres should also arrange appropriate industrial visits for candidates so that they can see the applications of subjects learnt on their course in practical engineering situations.

2.2 Links to National Occupational Standards

While the SQA Advanced Certificate in Engineering Practice has not been designed to match specific occupational standards in engineering, it may provide important underpinning knowledge and understanding for SVQs in Engineering or Management at level 3.

2.3 Employment Opportunities/Progression/Professional Recognition

For details on employment opportunities see Aim 3.1.1 in Section 3.3 and Aim 3.2.1 in Section 3.4. For details of progression routes and professional recognition from SQA Advanced Certificate in Engineering Practice see Aim 3.2.2 and 3.2.3 in Section 3.4 and Section 5.6.

3 Aims of the award

The general and specific aims are shown below.

3.1 General Aims

The general aims of the award are to:

3.1.1 enhance candidates' employment prospects

3.1.2 support candidates' Continuing Professional Development and career development

3.1.3 enable progression within the SCQF (Scottish Credit and Qualifications Framework)

3.1.4 develop candidates' abilities to apply analysis skills to the solution of engineering and supervisory problems

3.1.5 develop learning and transferable skills (including Core Skills)

3.2 Specific Aims

The specific aims of the award are to:

3.2.1 provide awards that will allow candidates to work now, or in the future, at advanced engineering craft and supervisory level in an engineering environment

3.2.2 provide awards that create a route towards meeting the academic requirements for Engineering Technician and Incorporated Engineer status

3.2.3 develop awards that on successful completion will allow candidates to progress to a relevant SQA Advanced Diploma in Engineering or further qualifications in a supervisory or management area

3.2.4 develop a range of Communication knowledge and skills relevant to the needs of advanced engineering craft persons and engineering supervisors

3.2.5 on successful completion of the SQA Advanced Certificate in Engineering Practice, achieve the Core Skill of *Communication* at SCQF level 6. Candidates will also be provided with opportunities to develop the following Core Skills: *Information and Communication Technology, Numeracy, Problem Solving* and *Working with Others*

3.2.6 develop knowledge, understanding and skills in advanced engineering craft principles and technologies in fabrication and welding or engineering manufacture or engineering maintenance or electrical engineering

3.2.7 provide for a degree of specialisation at advanced craft level in fabrication and welding or engineering manufacture or engineering maintenance or electrical engineering

3.2.8 develop knowledge, understanding and skills to undertake the role of an engineering supervisor in an engineering business environment

3.3 How the General Aims are met in the SQA Advanced Certificate in Engineering Practice Structures and Content

Aim No.	How it is met in the SQA Advanced Certificate in Engineering Practice
3.1.1	There are a large number of people (approx 23, 000) working as skilled tradespersons in the engineering industry. The SQA Advanced Certificate in Engineering Practice has been designed to meet many of the education and training needs of such individuals.
3.1.2	Candidates in employment can take the SQA Advanced Certificate in Engineering on a part-time basis to increase their knowledge, understanding and skills in a branch of Engineering and, thus, enhance their technical education and career development. The SQA Advanced Certificate in Engineering Practice provides a very important route for those candidates who wish to enhance their knowledge, understanding and skills in advanced engineering crafts and engineering supervisory skills. More specifically the Unit *Engineering Supervision: Teamworking and Continuing Professional Development* allows some of the key issues associated with being an engineering supervisor to be explored. Candidates will develop a Continuous Professional Development Action Plan with a view to developing their supervisory and other knowledge and skills over the following three to five years of their career. CPD action planning has been introduced in this Unit to encourage candidates to engage in the CPD process throughout the whole of their careers.

Aim No.	How it is met in the SQA Advanced Certificate in Engineering Practice
3.1.3	All Units within the SQA Advanced Certificate in Engineering Practice have been levelled at SCQF levels 6, 7 or 8.
3.1.4	The nature of the Engineering discipline lends itself to the development of analysis skills. For example, such skills are required by candidates when solving electrical circuit problems or a lighting design, or when solving mechanical engineering problems or when working on a fabrication design. Analysis skills are also required when, for example, analysing quality costs or reviewing the role of an engineering supervisor in different scenarios.
3.1.5	The SQA Advanced Certificate in Engineering Practice provides centres with an opportunity to enhance learning skills not least by creating opportunities for candidates to combine theory and practice to achieve a real understanding of a subject. For example, the core engineering Units recommend significant use of practical work and/or computer simulation to reinforce learning. It is also anticipated that centres will use innovative delivery approaches that may make use of engineering laboratory/workshop equipment and/or on-line delivery and/or Virtual Learning Environments to enhance candidate learning. Industrial visits are also highly recommended to consolidate learning in the centre. By their very nature, Engineering courses require the transfer of technical knowledge and skills from one area to another. This is particularly the case with the SQA Advanced Certificate in Engineering Practice, where candidates are often required to transfer their knowledge of craft engineering principles and technologies from one area to the solution of problems in another area of engineering. Candidates will also have an opportunity to use the Communication knowledge and skills developed in the mandatory core SQA Advanced Unit in other parts of the award to support such activities as report writing and working in groups. Core Skills in general, and problem solving in particular, were regarded as very important by the QDT, since it is recognised that a good level of competence in these is essential in the work of advanced craft persons and engineering supervisors.

3.4 How the Specific Aims are met in the SQA Advanced Certificate in Engineering Practice Structure and Content

Aim No.	How it is met in the SQA Advanced Certificate in Engineering Practice
3.2.1	The SQA Advanced Certificate in Engineering Practice has been recognised by employers and other stakeholders as an appropriate qualification for persons wishing to work at advanced craft and engineering supervisory levels in an engineering business environment. Market research indicates that there is still a solid demand for people with advanced engineering craft and supervisory skills in Scottish companies. Thus, it is confidently anticipated that those achieving the SQA Advanced Certificate in Engineering Practice will find employment as skilled tradespersons or supervisors in a wide range of small, medium and large companies.
3.2.2 and 3.2.3	The QDT has been advised by the Institution of Engineering and Technology (IET)/The Institution of Mechanical Engineers (IMechE) that a SQA Advanced Certificate Engineering Practice award partially meets their academic requirements for registration as an Incorporated Engineer and may meet fully their academic underpinning requirements for registration as an Engineering Technician. The QDT was informed by university staff that an SQA Advanced Certificate in Engineering Practice is unlikely to give any advanced standing with engineering degree course although studying at 1st year degree level may be a possibility. Candidates may have to do additional Mathematics along with their SQA Advanced Certificate in Engineering Practice to gain entry to the first year of a degree course. Alternatively candidates may wish to pursue further studies by undertaking an appropriate SQA Advanced Diploma in Engineering. The SQA Advanced Certificate in Engineering Practice will provide some credit transfer opportunities towards such awards, the precise nature of which will depend on the SQA Advanced Engineering award the candidate wishes to study. Following on from the SQA Advanced Certificate in Engineering Practice candidates may wish to pursue supervisory or management qualifications to further their careers as supervisors or managers. Individual centres will be able to provide information on what supervisory or management qualifications are available at the centre.

Aim No.	How it is met in the SQA Advanced Certificate in Engineering Practice
3.2.4	Market research information gathered through various consultations indicates that there continues to be solid support for the inclusion of a distinct Communication Unit in the mandatory core of SQA Advanced Certificate in Engineering Practice. The benefit of having a separate Communication Unit is that it significantly improves the prospect of sufficient attention being given to the teaching of this key skills area. A separate Unit also makes it possible to ensure that the Communication Core Skill at SCQF level 6 is fully embedded within the SQA Advanced Certificate in Engineering Practice. Award designers considered this a more appropriate way to ensure that this Core Skill is included in the SQA Advanced Certificate than trying to embed such a Core Skill across, say, a range of engineering Units. Opportunities to develop the Communication Core Skill are signposted in a number of the Units in the SQA Advanced Certificate in Engineering Practice.
3.2.5	As noted above, the Communication Core Skill at SCQF level 6 has been incorporated into the SQA Advanced Certificate in Engineering Practice award through the mandatory core Unit, Communication: Practical Skills. Opportunities to develop the Core Skills *Numeracy, Information and Communication Technology, Problem Solving* and *Working with Others* are signposted within individual Unit specifications. Candidates may achieve the *Information and Communication Technology* Core Skills at SCQF level 6 if they take the Unit *Information Technology: Applications Software 1* in the optional sections. The Core Skill component Using Number at SCQF level 6 can be obtained if a candidate successfully achieves *Engineering Mathematics 1* within the optional section of the SQA Advanced Certificate in Engineering Practice.

Aim No.	How it is met in the SQA Advanced Certificate in Engineering Practice
3.2.6	Candidates will be provided with opportunities to develop knowledge, understanding and skills in a range of engineering craft principles and technologies by undertaking the mandatory Units in the relevant specialism to their area of employment or interest. For example, by undertaking Units from the Fabrication and Welding specialism, candidates will be able to develop knowledge, understanding and skills about welding principles and applications, container design and manufacture, inspection systems and steelwork preparation, joining and assembly. Candidates undertaking Units in the Engineering Manufacture specialism will have the opportunity to develop knowledge, understanding and skills in mechanical engineering principles, CAD, CNC and engineering measurement. Candidates studying the Engineering Maintenance specialism will have the opportunity to develop knowledge, understanding and skills in plant systems services and utilities, mechanical engineering principles and industrial plant maintenance. Candidates undertaking the Electrical Engineering specialism will be able to develop knowledge, understanding and skills in electrical engineering principles, use of electrical instruments and electrical motors and motor starting.
3.2.7	Candidates can choose Units relevant to their area of employment, and/or future career or educational development.
3.2.8	The SQA Advanced Certificate in Engineering Practice has been designed to allow candidates to develop much of the knowledge, understanding and skills they require to be an engineering supervisor. Candidates will be able to study such subjects as: the role of an engineering supervisor in an organisation, effective team working and team leadership, constructing a CPD action plan, identifying the differences between Quality Control and Quality Assurance, explaining the stages in obtaining ISO 9000, selecting and applying quality improvement tools, applying quality cost models, and applying Value Engineering techniques to engineering products or processes or services. Candidates will also be able to choose one Unit credit from the optional section from the following range of subjects: Production Planning and Control, Engineering Supervision: Staff and Budget Issues, Mathematics, Workplace Communication in English or Personal Development Planning.

4 Access to the awards

4.1 Access requirements

Admission to the SQA Advanced Certificate in Engineering Practice should be based on a broad approach to candidate selection but, at the same time, should ensure that candidates are chosen who have the potential and ability to complete the award successfully. To this end, the following are simply recommendations and should not be seen as a definitive or prescriptive list of entry requirements. Their purpose is simply to give guidance on the selection of candidates. It is recommended that candidates should possess the qualifications in one of the following categories:

- One Higher from Physics, Technological Studies or Mathematics and at least three Standard Grades 1–2/Intermediate 2 passes including Mathematics, Physics/Technological Studies and English.

- An appropriate National Certificate Group Award in Engineering Practice or Engineering (eg for candidates wishing to undertake the Engineering Manufacture specialism within the award, it is recommended that they possess a National Certificate in Engineering Practice or Engineering. Likewise, it is recommended that for candidates wanting to study the Electrical Engineering specialism that they have achieved a National Certificate in Electrical Engineering Practice or Electrical Engineering).

- Qualifications comparable to the above, gained through other awarding bodies such as City and Guilds, Edexcel etc.

- At the discretion of the Principal of the presenting centre for applicants with a different experiential background who could benefit from taking the course or Units within the course, eg adult returners, overseas students with relevant work experience.

4.2 Recommended Core Skills Entry Level

The recommended Core Skills Entry levels for the SQA Advanced Certificate in Engineering Practice are as follows:

- *Communication* at SCQF level 5
- *Information and Communication Technology* at SCQF level 5
- *Numeracy* at SCQF level 5
- *Problem Solving* at SCQF level 5
- *Working with Others* at SCQF level 5

4.3 Alternative Access Arrangements

The presenting centre may operate alternative access arrangements in cases where the candidate is convinced that he/she already has the required competences in a given area. These arrangements are as follows:

- Assessment on demand
- Credit transfer
- Accreditation of prior learning
- Relevant work experience

Individual presenting centres will require to outline their systems for each of these as a part of any approval procedure.

4.4 Candidates who have English as an additional language

A Unit entitled Workplace Communication in English has been included in the optional section of the SQA Advanced Certificate in Engineering Practice for those candidates for whom English is an additional language.

4.5 Articulation route

SQA has developed a number of National Certificates in Engineering. Each qualification has been mapped to allow candidates to articulate to the SQA Advanced Certificate in Engineering Practice. These National Certificates are:

- National Certificate in Electrical Engineering at SCQF level 5
- National Certificate in Electronic Engineering at SCQF level 5
- National Certificate in Fabrication and Welding Engineering at SCQF level 5
- National Certificate in Manufacturing Engineering at SCQF level 5
- National Certificate in Mechanical Maintenance Engineering at SCQF level 5

5 Awards structure

The SQA Advanced Certificate in Engineering Practice is made up of 12 SQA credits. This consists of the **five** mandatory SQA credits plus **one** optional SQA Credit, and **six** SQA credits making up the appropriate specialism chosen.

5.1 Framework

SQA Advanced Certificate in Engineering Practice (12 SQA Credits)

Group Award Code — GM9R 47

Mandatory Units (5 SQA credits) – Candidates must achieve all Units in this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Communication: Practical Skills	HP4A 47	8	7	1
Engineering Supervision: Teamworking and Continuing Professional Development	HV33 47	8	7	1
Quality Management: An Introduction	HT7A 47	8	7	1
Value Engineering	HV34 47	8	7	1
Engineering Practice: Graded Unit 1	HV2D 47	8	7	1

Optional Units (1 SQA Credit) – Candidates must achieve 1 SQA credit from this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Engineering Mathematics 1	HP48 46	8	6	1
Engineering Supervision: Staff and Budget Issues	HV37 47	8	7	1
Production Planning and Control	HV2J 48	8	8	1
Workplace Communication in English	HR1C 46	8	6	1
Personal Development Planning	HP6M 47	8	7	1

A further 6 SQA credits must be achieved from one of the specialist routes.

Fabrication and Welding specialism — 6 SQA credits needed

Mandatory Units (4 SQA Credits) — All units must be completed

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Welding Principles and Applications: 1	HV2T 47	8	7	1
Containers: Design and Manufacture	HV2M 47	8	7	1
Inspection Systems	HV2P 47	8	7	1
Fabrication: Preparation, Joining and Assembly	HV2R 47	8	7	1

Optional Units (2 SQA Credits) — two units must be completed from this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Mechanical Engineering Principles	HV2V 47	8	7	1
Computer Aided Draughting for Engineers	HT73 47	8	7	1
Safety Engineering and the Environment	HT7P 47	8	7	1
Advanced Pattern Development: An Introduction	HV2E 46	8	6	1
Welding Procedures: Specification, Qualification and Testing	HV2N 47	8	7	1
Materials Selection	HT76 47	8	7	1
Electrical Engineering Principles 1	HV2F 46	8	6	1
Information Technology: Applications Software 1	HP6L 47	8	7	1
Computer Programming	J1CH 47*	8	7	1
Data Security	J1S1 47*	8	7	1

Engineering Manufacture specialism — 6 SQA credits

Mandatory Units (4 SQA Credits) — All units must be completed

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Mechanical Engineering Principles	HV2V 47	8	7	1
Computer Aided Draughting for Engineers	HT73 47	8	7	1
CNC	HT77 47	8	7	1
Engineering Measurement	HT7D 47	8	7	1

Optional Units (2 SQA Credits) — two units must be completed from this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Computer Integrated Manufacture	HV38 47	8	7	1
Safety Engineering and the Environment	HT7P 47	8	7	1
Alternative Machining Operations	HV31 47	8	7	1
Materials Selection	HT76 47	8	7	1
Pneumatics and Hydraulics	HT7F 47	8	7	1
Electrical Engineering Principles 1	HV2F 46	8	6	1
Information Technology: Applications Software 1	HP6L 47	8	7	1
Computer Programming	J1CH 47*	8	7	1
Data Security	J1S1 47*	8	7	1

SQA Advanced Certificate

Engineering Maintenance specialism — 6 SQA credits

Mandatory Units (4 SQA Credits) — All units must be completed

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Plant Systems: Services	HV35 47	8	7	1
Plant Systems: Utilities	HV36 47	8	7	1
Mechanical Engineering Principles	HV2V 47	8	7	1
Industrial Plant Maintenance	HV2K 47	8	7	1

Optional Units (2 SQA Credits) — two units must be completed from this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Pneumatics and Hydraulics	HT7F 47	8	7	1
Engineering Systems Interfaced with Programmable Logic Controllers	HV39 47	8	7	1
Engineering Measurement	HT7D 47	8	7	1
Computer Aided Draughting for Engineers	HT73 47	8	7	1
Safety Engineering and the Environment	HT7P 47	8	7	1
Electrical Engineering Principles 1	HV2F 46	8	6	1
Information Technology: Applications Software 1	HP6L 47	8	7	1
Applications of Programmable Logic Controllers	HT1K 47	8	7	1
Computer Programming	J1CH 47*	8	7	1
Data Security	J1S1 47*	8	7	1

Electrical Engineering specialism — 6 SQA credits

Mandatory Units (4 SQA Credits) — All units must be completed

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Electrical Engineering Principles 1	HV2F 46	8	6	1
Electrical Engineering Principles 2	HV32 47	8	7	1
Application of Electrical and Electronic Instruments	HV2H 46	8	6	1
Electrical Motors and Motor Starting	HV30 47	8	7	1

Optional Units (2 SQA Credits) — two units must be completed from this section

Unit Title	Code	SCQF credit points	SCQF level	SQA credit value
Electrical Safety	HV3A 47	8	7	1
Inspection and Testing of Low Voltage Electrical Installations	HV2L 47	8	7	1
Electrical Design Systems: An Introduction	HV2W 47	8	7	1
Electrical Installation Design (Computer Aided): An Introduction	HV2X 47	8	7	1
Lighting Design in Buildings	HV2Y 47	8	7	1
Applications of Programmable Logic Controller	HT1K 47	8	7	1
Mechanical Engineering Principles	HV2V 47	8	7	1
Fundamental Electronic Components, Devices and Applications	HV2G 46	8	6	1
Industrial Plant Maintenance	HV2K 47	8	7	1
Plant Systems: Utilities	HV36 47	8	7	1
Information Technology: Applications Software 1	HP6L 47	8	7	1
Engineering Systems Interfaced with Programmable Logic Controllers	HV39 47	8	7	1
Computer Programming	J1CH 47*	8	7	1

SQA Advanced Certificate

Data Security	J1S1 47*	8	7	1

5.2 Core Skills Exit Profile

A candidate who successfully achieves an SQA Advanced Certificate in Engineering Practice will automatically obtain the following Core Skill:

- Communication at SCQF level 6 (fully embedded in the Unit Communication: Practical Skills)

Candidates who achieve the *Engineering Mathematics 1* Unit will automatically be awarded the Core Skills component Using Number at SCQF level 6. Opportunities for candidates to develop Core Skills components as a part of the delivery of the SQA Advanced Certificate in Engineering Practice are shown in Table 6.1(b).

Centre staff are asked to refer to individual optional Unit specifications for details of other Advanced Certificate Core Skill component development opportunities.

5.3 SCQF levels

The five mandatory Unit credits within the SQA Advanced Certificate in Engineering Practice (see Section 5.1) are levelled at SCQF level 7, giving 40 SCQF level 7 points. All four specialist groupings contained within the qualification have as a minimum 2 SQA Credits at SCQF level 7 within their mandatory sections corresponding to 16 SCQF level 7 points. This satisfies SQA Design Principles.

5.4 Mapping information

Information on the way in which individual Units map into the aims of the awards can be found in the Tables in Sections 3.3 and 3.4.

5.5 Articulation, professional recognition and credit transfer

5.5.1 Articulation

Articulation arrangements exist between a number of Scottish, UK and international universities where SQA Advanced Certificates and Diplomas will be accepted as advanced entry to either the second or third year of a related degree programme. Depending on the specific degree programme, certain units may be required as part of the SQA Advanced Certificate/Diploma. The optional section of the framework is sufficiently broad to ensure that centres are able to comply with reasonable articulation requests. A high proportion of our candidates have articulated to degree programmes and successfully completed them.

Candidates successfully completing a SQA Advanced Certificate in Engineering Practice may alternatively pursue further studies through an appropriate SQA Advanced Engineering qualification (eg SQA Advanced Certificate/Diploma in Electrical Engineering or SQA Advanced Certificate/Diploma in Mechanical Engineering). A SQA Advanced Certificate in Engineering Practice will provide some credit transfer opportunities towards such awards, the precise nature of which will depend on the SQA Advanced Certificate Engineering award the candidate is pursuing. Following on from the SQA Advanced Certificate in Engineering Practice, candidates may wish to pursue supervisory or management qualifications

to further their careers as supervisors or managers. Individual centres will be able to provide information on what supervisory or management qualifications are available to candidates.

5.5.2 Professional Body Recognition

The Institution of Engineering and Technology (IET)/The Institution of Mechanical Engineers (IMechE) have advised that a SQA Advanced Certificate Engineering Practice award partially meets the underpinning knowledge and understanding requirements for registration as an Incorporated Engineer and may meet fully the underpinning knowledge and understanding requirements for registration as an Engineering Technician.

6 Approaches to delivery and assessment

6.1 Delivery

The QDT were firmly of the view that the SQA Advanced Certificate in Engineering Practice suite is principally for candidates in employment and would therefore normally be studied by candidates who attend a centre on a day-release or other part-time basis. The SQA Advanced Certificate in Engineering Practice is sufficiently flexible enough to allow centres to deliver it by various modes of delivery for example, two-year day-release, evening attendance, block-release etc.

Where centres decide to offer the SQA Advanced Certificate in Engineering Practice on a full-time basis, it is strongly recommended that candidates are provided with opportunities to take a number of practical engineering Units in conjunction with Units in the relevant specialist route, so that they can acquire some useful practical skills and gain some exposure to what it may be like working in a practical engineering environment(s). Centres are also encouraged to arrange a number of industrial visits for their candidates so that they can see some applications of subjects learnt on their course in practical engineering environments.

Centres may timetable the SQA Advanced Certificate in Engineering Practice in sequence (ie the chosen six specialist units first followed by the six units all candidates have to take) as illustrated in the first timetable for the Engineering Manufacture specialism in Appendix 1. Alternatively, centres may mix the timetabling to meet different candidate and employer needs as illustrated in the second timetable for the Electrical Engineering specialism.

Centres should take account of information contained in the Recommended Prior Knowledge and Skills statements in Unit specifications in sequencing the delivery of Units (eg it would be normal to deliver the *Electrical Engineering Principles 1* Unit before the *Electrical Engineering Principles 2* Unit).

Centres, working on their own or in partnership, might also wish to consider the following approaches to delivering the SQA Advanced Certificate in Engineering Practice:

- Identification and sharing of good candidate learning support materials on the internet
- Use of the Internet by candidates to undertake more in-depth investigations in given subject areas
- Development or purchase of paper based and/or electronic candidate learning support and assessment materials for individual Units (eg for certain optional Units)
- Development of on-line Unit and Graded Unit assessment materials
- Use of e-mentoring arrangements to support candidates who study at a distance

One of the key reasons the QDT has sought to reduce the time candidates have to spend on summative Unit assessment is to provide lecturers with more time to deliver Units. Lecturers are encouraged, in particular, to use this additional time to reinforce learning in core engineering and supervisory concepts and principles and in the transfer of knowledge, understanding and skills across subject boundaries.

Lecturers may use a variety of teaching and learning approaches in delivering the Units. These may include lecturing, group work, laboratory and practical work,

computer simulation (using appropriate software packages), project work and case studies. The use of open and distance learning and on-line materials may help to supplement and support the learning that takes place in the classroom, laboratory or workshop.

Lecturers should also seek opportunities to integrate Core Skills within their teaching and learning programmes. Such opportunities may include the following:

Communication

- Providing candidates opportunities to develop their oral skills by allowing them to give full answers to questions asked by the lecturer
- Developing complex, vocationally specific reading skills (eg Communication: Practical Skills.)
- Developing report writing skills in a number of Units (eg Computer Aided Manufacture, Value Engineering)
- Allowing candidates to develop their Communication skills in group work activities (eg Communication: Practical Skills, Engineering Supervision: Teamworking and Continuing Professional Development)

Numeracy

- Reinforcing Numeracy and Mathematical skills when teaching engineering principles (eg Mechanical Engineering Principles, Electrical Engineering Principles 1, Electrical Engineering Principles 2)
- Reinforcing Using Graphical Information skills by use of a range of graphical representations (eg Electrical Installation Design (Computer Aided): An Introduction, Containers: Design and Manufacture)

Information and Communication Technology

- Develop Information and Communication Technology skills through the application of IT within engineering systems (eg Computer Aided Draughting for Engineers, Quality Management: An Introduction)

Problem Solving Skills

- Develop Critical Thinking Skills through the application of engineering concepts and principles to solve engineering systems (eg Lighting Design in Buildings, Value Engineering)
- Develop Planning and Organisational Skills within an engineering and supervisory context (eg Industrial Plant Maintenance, Engineering Supervision: Teamworking and Continuing Professional Development)
- Develop review and evaluation skills within an engineering and supervisory context (eg Inspection Systems, Value Engineering)

Working with Others

- Develop Working with Others skills through identifying approaches to developing high performance team and group discussions on the solution to engineering problems (eg Engineering Supervision: Teamworking and Continuing Professional Development, Containers: Design and Manufacture)

Opportunities for candidates to develop some Core Skill components as part of the delivery of specialist Units are identified in Table 6.1(a). Core Skill component development opportunities within the other core units is shown in Table 6.1(b). Centre staff are asked to refer to individual optional Unit specifications for details of other Core Skill component development opportunities.

Table 6.1(a) Core Skills development opportunities in mandatory Units

Note: CT = Critical Thinking: P and O = Planning and Organisation and R and E = Reviewing and Evaluating

Unit Title	Communication			Numeracy		Information and Communication Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Inform.	Using Information Technology	CT	P and O	R and E	Working with Others
Fabrication and Welding Units										
Welding Principles and Applications 1	SCQF level 6	SCQF level 6					SCQF level 6	SCQF level 6		
Containers: Design and Manufacture	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 5
Inspection Systems	SCQF level 6	SCQF level 6			SCQF level 6		SCQF level 6	SCQF level 6	SCQF level 6	
Fabrication: Steelwork Preparation, Joining and Assembly	SCQF level 6						SCQF level 6	SCQF level 6		

Table 6.1(a) Core Skills development opportunities in mandatory Units (continued)

Unit Title	Communication			Numeracy		Information and Communication Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Inform.	Using Information Technology	CT	P and O	R and E	Working with Others
Engineering Manufacture Units										
Mechanical Engineering Principles		SCQF level 5		SCQF level 5			SCQF level 5			
Computer Aided Draughting for Engineers						SCQF level 6				
CNC		SCQF level 5				SCQF level 6	SCQF level 6			
Engineering Measurement					SCQF level 6					
Engineering Maintenance Units										
Plant Systems: Service		SCQF level 6			SCQF level 6		SCQF level 6			
Plant Systems: Utilities		SCQF level 6					SCQF level 6			

Table 6.1(a) Core Skills development opportunities in mandatory Units (continued)

Unit Title	Communication			Numeracy		Information and Communication Technology	Problem Solving			Working with Others
	Read	**Write**	**Oral**	**Using Number**	**Using Graphical Inform.**	**Using Information Technology**	**CT**	**P and O**	**R and E**	**Working with Others**
Engineering Maintenance Units (continued)										
Mechanical Engineering Principles		SCQF level 5		SCQF level 5			SCQF level 5			
Industrial Plant Maintenance	SCQF level 6	SCQF level 6			SCQF level 5	SCQF level 5	SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 4
Electrical Engineering Units										
Electrical Engineering Principles 1				SCQF level 5			SCQF level 5			
Electrical Engineering Principles 2				SCQF level 6			SCQF level 6			
Applications of Electrical and Electronic Instruments		SCQF level 6			SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 5	
Electrical motors and motor starting					SCQF level 5		SCQF level 6			

Table 6.1(b) SQA Advanced Certificate in Engineering Practice — Core Skills development opportunities in mandatory Units

Note: CT = Critical Thinking: P and O = Planning and Organisation and R and E = Reviewing and Evaluating

Unit Title	Communication			Numeracy		Information and Communication Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Inform.	Using Information Technology	CT	P and O	R and E	Working with Others
Communication: Practical Skills	SCQF level 6 Embed-ded	SCQF level 6 Embed-ded	SCQF level 6 Embed-ded							
Engineering Supervision: Team working and Continuing Professional Development	SCQF level 6	SCQF level 6	SCQF level 6				SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6
Quality Management: An Introduction		SCQF level 6			SCQF level 6	SCQF level 6	SCQF level 6			
Value Engineering		SCQF level 6	SCQF level 6				SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 6
Engineering Practice: Graded Unit 1	SCQF level 6	SCQF level 6		SCQF level 6			SCQF level 6			

6.2 Assessment

6.2.1 Introduction to the Assessment Strategy

From the outset, the QDT recognised the need to have an appropriate assessment strategy in place for the SQA Advanced Certificate in Engineering Practice. Such a strategy was developed and is shown below:

Aims

The aims of the strategy are to ensure that:

1 Consistent, rigorous and efficient approaches are adopted to the development and administration of SQA Advanced Certificate in Engineering Practice assessment instruments at both Unit and Graded Unit levels, which satisfy nationally agreed standards.

2 The assessment load on candidates and staff is sensible and that assessment does not unduly detract from teaching and learning.

3 As far as possible reliable and rigorous verification processes are put in place in order to ensure that consistent national standards are achieved for all SQA Advanced Certificate Engineering Practice assessments.

Objectives

Listed below are the measures that have been put in place to meet the aims:

1 Develop nationally one assessment exemplar pack for each mandatory Unit in the specialist and core groupings that clearly sets out the standards of assessment expected in Units.

2 Adopt a holistic approach to Unit assessment. The implications of this are as follows:

   i Assessment instruments will normally be designed only to sample knowledge and skills in a Unit (this is consistent with the SQA Advanced Unit format)

   ii A Unit assessment strategy will be adopted, where possible, to produce a single assessment instrument for the whole Unit. Where this is not possible, the assessment strategy will seek to ensure that the minimum number of assessment instruments is required whilst maintaining agreed national standards.

3 Whilst not seeking to be entirely prescriptive with regard to the time spent on assessment in each SQA Advanced Unit, over assessment should be avoided if the following guidelines are adopted for the maximum time spent on SQA Advanced Unit assessment:

   One and a half hours per Unit credit for SQA Advanced Units at SCQF levels 6 and 7, and two hours per Unit credit for SQA Advanced Units at SCQF level 8.

4 Produce assessment exemplar packs for the Graded Unit. In addition, for the Graded Unit examination produce at least one sample exam paper to show the standards expected in such a paper

5 Actively encourage centres to work in partnership in producing Graded Unit assessment materials, which meet nationally agreed standards reducing, in turn, the workload on staff in individual colleges.

6 Ensure that consistent and rigorous internal and external verification procedures operate through both SQA Advanced Unit level and Graded Unit assessment processes. This places a clear responsibility on both centres and the SQA.

As far as has been practical the above objectives have been adhered to when developing assessment exemplar and Graded Unit materials.

6.2.2 Graded Unit

The purpose of the Graded Unit is to assess the candidate's ability to apply and integrate knowledge and/or skills gained within individual Units. Candidates will demonstrate that they have achieved the aims of the awards as detailed in Section 3. The Graded Unit also provides the means by which candidate achievement can be graded.

Candidates will undertake a **one** credit Graded Unit at SCQF level 7. This will be in the form of a 3-hour written examination.

Engineering Practice: Graded Unit 1 — Examination

The unit specification for the Engineering Practice: Graded Unit 1 can be found on the SQA website (**www.sqa.org.uk**). The Graded Unit draws on the Outcomes in the mandatory sections of the relevant specialist and core units contained within the SQA Advanced Certificate in Engineering Practice.

The examination paper consists of the two sections, Section A and Section B.

Section A should be subdivided into up to four individual sub-sections to reflect the four different engineering disciplines candidates may have studied: namely Fabrication and Welding, Engineering Manufacture, Engineering Maintenance and Electrical Engineering. Each sub-section should comprise of a suitable balance of between 8 to 12 short answer, restricted response and structured questions. Candidates should answer all questions in the relevant sub-section of Section A. Candidates should be able to score up to a maximum of 50% from the sub-section they have answered questions from.

Section B should comprise of a Case Study based around the SQA Advanced Certificate in Engineering Practice mandatory Units in which candidates have to answer questions on appropriate engineering supervisory issues and problems. All candidates, irrespective of which engineering discipline they have studied, should answer all questions in Section B. The question paper associated with the Case Study should comprise of between 6 and 10 restricted response questions. Candidates should be able to score a maximum of 50% from Section B. Candidates should be given a copy of the Case Study only, a minimum of 14-days before they sit the examination.

The examination should be conducted under closed-book, supervised conditions
It is recommended that candidates do not sit the Graded Unit examination until the end of the programme of study, given the range of Units that the Graded Unit draws on.

6.2.3 Assessment Exemplar Materials

Assessment exemplar packs have been produced for the following mandatory Units from each of the specialist and core units:

HV2T 47 *Welding Principles and Applications: 1*
HV2M 47 *Containers: Design and Manufacture*
HV2P 47 *Inspection Systems*
HV2P 47 *Fabrication: Preparation, Joining and Assembly*
HV2V 47 *Mechanical Engineering Principles*
HT73 47 *Computer Aided Draughting for Engineers*
HT77 47 *CNC*
HT7D 47 *Engineering Measurement*
HV35 47 *Plant Systems: Services*
HV36 47 *Plant Systems: Utilities*
HV2K 47 *Industrial Plant Maintenance*
HV2F 46 *Electrical Engineering Principles 1*
HV32 47 *Electrical Engineering Principles 2*
HV2H 46 *Application of Electrical and Electronic Instruments*
HV30 47 *Electrical Motors and Motor Starting*
HP4A 47 *Communication: Practical Skills*
HV33 47 *Engineering Supervision: Teamworking and Continuing Professional Development*
HT7A 47 *Quality Management: An Introduction*
HV34 47 *Value Engineering*

An assessment exemplar pack and an additional sample examination paper have been produced for HV2D 47 *Engineering Practice: Graded Unit 1*.

6.2.4 Formative Assessment

Formative assessment should be used throughout the delivery of Units to reinforce learning, build candidates' confidence and prepare candidates for summative assessment.

6.3 Resources

Practical Resources

Centre staff are advised to read individual Unit specifications carefully to identify the consumables, equipment and/or software requirements to deliver Units. Some Units have specific requirements. For example, the *Computer Aided Draughting in Engineers* and *Electrical Installation Design (Computer Aided): An Introduction* require candidates to use industry specific software. The *Computer Integrated Manufacture* Unit requires candidates to be able to access CNC equipment.

While not all Units require practical resources, centres are strongly recommended to provide candidates with access to practical workshop facilities appropriate to the chosen specialism. For example, candidates undertaking Fabrication and Welding Units should have access to practical fabrication and welding facilities. Such access will allow candidates to relate the theory they are being taught to practice.

When teaching subjects such as pumps, fans, electrical motors etc centres should allow candidates to view disassembled equipment so that they can gain a greater appreciation of the construction of these items of plant. A good chart or other visual aid showing the various parts of an item of plant can also be a very good teaching aid.

The QDT strongly recommend the use of simulation software to support teaching and learning. However, the Team do not believe that such software should be used at the expense of practical workshop and laboratory activities. The Team strongly considers that such practical activities represent the best way for candidates to relate the theory they learn in the classroom to practical engineering.

The QDT believe that there is a very rich and varied range of teaching and learning resources available to deliver specialist and core units. Such learning resources include textbooks, reports, papers, standards, CDs, DVDs and numerous sites on the Internets. Some centres may already have good learning resources in their learning libraries/Virtual Learning Environments. It is anticipated that the Qualification Support Team (QST) will provide a useful forum for the identification and sharing of learning resources.

Continuing Professional Development

The QDT are firmly of the view that active staff CPD is essential if the delivery and assessment of Units are to be kept up to date, relevant and interesting. Staff CPD activities could be in subject areas such as the following (the list is not intended to be exhaustive):

- Learning to use specialist engineering software
- Modern manufacturing methods
- New or revised standards and regulations
- Issues relating to health and safety
- Quality Control and Quality Assurance
- Value Engineering
- New teaching and assessment methodologies
- E-learning

6.4 Open and Distance Learning

Advice on the use of open and distance learning is given in individual Unit specifications. However, where it is used with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangement would be required to be put in place to ensure that the assessment or assessments were conducted under the conditions specified in the Unit specification. For example, in the case of a Unit which involved a Unit end test a centre would have to make arrangements for the test to be conducted under controlled, supervised conditions. Likewise, where a Unit involves a practical based assessment, a centre would have to make arrangements for candidates to come into the centre, or another appropriate venue, to undertake the assessment under the conditions specified in the Unit specification.

It should be noted that the same requirements as specified in the previous paragraph apply where part or all of a Unit is delivered on-line.

7 General information for centres

Equality and inclusion

The unit specifications making up this group award have been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners will 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.

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external moderation can be found in SQA's Guide to Assessment **(www.sqa.org.uk)**.

8 General information for candidates

The SQA Advanced Certificate in Engineering Practice has been designed by an expert team of educators and industrialists with a view to allowing you to meet the educational and training requirements to work as an advanced craftsperson and engineering supervisor. The qualification contains up-to-date and relevant engineering and supervisory subject content and skills. The SQA Advanced Certificate in Engineering Practice consists of four, 6 SQA Credit sub-sections in Fabrication and Welding or Engineering Manufacture or Engineering Maintenance or Electrical Engineering. You should choose to study the route which best meets your employment and educational requirements. Regardless of which route you study, you will, along with other candidates, study the additional 6 SQA Credits which make up the qualification.

Studying the specialist units will allow you to develop your knowledge, understanding and skills in your chosen advanced engineering craft discipline. Each route consists of a 4 SQA Credit mandatory section and an optional section where you can choose 2 SQA Credits from a range of Units to suit your employment and education needs. The mandatory sections of the four sub sections contain the subjects shown in the table below:

Specialist route/sub-section within the qualification	**Subjects in Mandatory section**
Fabrication and Welding	Welding principles and applications, container design and manufacture, inspection systems and fabrication steelwork preparation, joining and assembly
Engineering Manufacture	Mechanical engineering principles, CAD, CNC and engineering measurement
Engineering Maintenance	Plant Systems: services and utilities, mechanical engineering principles and industrial plant maintenance.
Electrical Engineering	Electrical principles, applications of electrical and electronic instruments and electric motors and motor starting

In the SQA Advanced Certificate in Engineering Practice, you will be provided with opportunities to develop much of the knowledge, understanding and skills to become an engineering supervisor. Five Unit credits in the SQA Advanced Certificate in Engineering Practice are mandatory. These Units are Communication: Practical Skills, Engineering Supervision: Teamworking and Continuing Professional Development, Quality Management: An introduction, Value Engineering and the Engineering Practice examination. You will be able to choose one Unit from the following options: Mathematics (with either an electrical or mechanical bias), further supervisory studies in staffing and budget control, Production Planning and Control, Workplace Communication in English or Personal Development Planning.

The teaching and learning processes that your lecturers are likely to use are as follows: lecturing, group work, practical engineering work, measurement and testing, computer simulation and project work. Industrial visits may also be included in your programme of study to allow you to see 'real life' engineering in action.

The Qualifications Design Team has ensured that assessment in the awards meet national standards. The awards have been designed to optimise assessment so that sufficient time is available for you to learn the advanced engineering craft and supervisory knowledge and skills that are essential to being a good craft/trades person and engineer supervisor.

You can expect to do assessment at individual Unit level and at qualification level. At Unit level assessments will normally consist of written tests and/or practical exercises which will include the preparation of reports. Your lecturer should tell you at the start of the Unit what form Unit assessment(s) will take. In addition to Unit assessment there will also be a 3-hour examination. This examination will be designed to assess you on your knowledge, understanding and skills in your chosen advanced craft area and in the core section of the qualification. You should ask your lecturer for more details about the composition of the examination paper and when you will sit it.

The Qualification Design Team does not wish to place any artificial barriers in the way of potential candidates wanting to study the award. However, it would be unfair to enrol a candidate into the SQA Advanced Certificate who did not have a realistic chance of successfully achieving it. The Qualification Design Team would therefore recommend that a candidate had one of the following qualifications before entering:

1 One Higher from Physics, Technological Studies or Mathematics and at least three Standard Grades 1–2/Intermediate 2 passes including Mathematics, Physics/Technological Studies and English.

2 An appropriate National Certificate in Engineering Practice or Engineering or an appropriate National Certificate in Engineering at SCQF level 5.

3 Equivalent qualifications or experience to those shown in (1) and (2).

On completion of your SQA Advanced Certificate in Engineering Practice there may be opportunities for you to progress to a SQA Advanced technician qualification in, say, Mechanical or Electrical Engineering if that is what you prefer to do. Your SQA Advanced Certificate in Engineering Practice should provide you with some credit transfer opportunities towards the technician SQA Advanced Certificate/SQA Advanced Diploma. The precise nature of credit transfer will depend on the SQA Advanced Certificate/SQA Advanced Diploma you decide to study.

Alternatively, on completion of your SQA Advanced Certificate in Engineering Practice you may decide to study a supervisory or management qualification. Many centres offer such qualifications and you are advised to obtain further information from centres on the range of supervisory or management qualifications they offer.

9 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**

SCQF credits: One SQA Advanced credit is equivalent to 8 SCQF credit points. This applies to all SQA Advanced Units, irrespective of their level.

SCQF levels: The SCQF covers 12 levels of learning. SQA Advanced Units will normally be at levels 6–9. Graded Units will be at level 7 and 8.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Graded Unit: Graded Units assess candidates' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage candidates to retain and adapt their skills and knowledge.

Dedicated Core Skill Unit: This is a Unit that is written to cover one or more particular Core Skills, eg SQA Advanced Units in Information Technology or Communications.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie outwith automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the SQA Advanced Certificate/Diploma from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised SQA Advanced Certificates and SQA Advanced Diplomas are those developments or revisions undertaken by a group of centres in partnership with SQA.

Specialist single centre and specialist collaborative devised SQA Advanced Certificates and SQA Advanced Diplomas are those developments or revisions led by a single centre or small group of centres who provide knowledge and skills in a specialist area. Like consortium-devised SQA Advanced Certificates and SQA Advanced Diplomas, these developments or revisions will also be supported by SQA.

10 Appendix

Appendix 1: Sample Teaching Timetables

See following pages for Appendix 1.

Appendix 1: Sample Teaching Timetables

1 Two year part-time study with the specialist route of Engineering Manufacture.
2 Two year part-with the specialist route of Electrical Engineering.

Two Year, Part-Time in specialist route Engineering Manufacture

First Year, First Semester

Mechanical Engineering Principles	Computer Aided Draughting for Engineers	Options 1 (from the Engineering Manufacture options)

First Year, Second Semester

Engineering Measurement	CNC	Options 2 (from the Engineering Manufacture options)

Two Year, Part-Time in specialist route Engineering Manufacture (cont)

Second Year, First Semester

Communication: Practical Skills	Engineering Supervision: Teamworking and Continuing Professional Development	Quality Management: An Introduction

Second Year, Second Semester

Value Engineering	Optional Unit (from the SQA Advanced Certificate in Engineering Practice options all candidates take)	Engineering Practice: Graded Unit 1

Two Year, Part-Time in specialist route Electrical Engineering

First Year, First Semester

Communication: Practical Skills	Engineering Mathematics 1 (from the SQA Advanced Certificate in Engineering Practice options all candidates take)	Electrical Engineering Principles 1

First Year, Second Semester

Application of Electrical and Electronic Instruments	Electrical Motors and Motor Starting	Electrical Engineering Principles 2

Two Year, Part-Time SQA Advanced Certificate in Engineering Practice (cont)

Second Year, First Semester

Engineering Supervision: Teamworking and Continuing Professional Development	Quality Management: An Introduction	Option 1 (from the Electrical Engineering options)

Second Year, Second Semester

Value Engineering	Option 2 (from the Electrical Engineering options)	Engineering Practice: Graded Unit 1