Group Award Specification for:

SQA Advanced Certificate in Marine Engineering at SCQF level 7

Group Award Code: GN1Y 47

SQA Advanced Diploma in Marine Engineering at SCQF level 8

Group Award Code: GN20 48

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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	Updated Introduction section	June 2023

Contents

1 Introduction

This is the Arrangements Document for the Group Awards in SQA Advanced Certificate Marine Engineering and the SQA Advanced Diploma Marine Engineering.

The purpose of this document is to:

- assist centres to implement, deliver and manage the qualification.
- provide a guide for new staff involved in offering the qualification.
- inform course managers teaching staff, assessors, learners, employers and HEIs of the aims and purpose of the qualification.
- provide details of the range of learners the qualification is suitable for and progression opportunities.

For the safety of life at sea and the protection of the marine environment it is essential that seafarers have a level of competence that enables them to carry out their duties safely and effectively.

It is, therefore, a requirement of the International Maritime Organisation (IMO) that Merchant Navy vessels are operated by seafarers who hold 'Certificates of Competency' relevant to the level or rank to which they are employed.

The initial training programmes for Merchant Navy Training which lead to the award of initial and subsequent Certificates of Competency have been under review for a number of years. The creation of a cadetship route has resulted in a change in the training and qualification framework required within the shipping industry.

Centres who would like to gain approval to offer this award as part of the underpinning knowledge for a UK CoC must contact the MCA prior to gaining SQA approval: exams@mcga.gov.uk.

This qualification has been designed in order to support the training and promotion of Marine Engineering Officers in the Merchant Navy, in accordance with the academic syllabus laid out by the Maritime and Coastguard Agency (MCA). These qualifications are aimed at school leavers and experienced sea-farers, who are pursuing a career as an Engineering Officer or working in a marine engineering sector.

Although the group awards have been specifically written for the Merchant Navy, there are a range of transferrable knowledge and skills that could be used within the oil and gas industry as well as in the offshore industry.

Learners who successfully achieve the SQA Advanced Certificate in Marine Engineering can progress to the SQA Advanced Diploma in Marine Engineering. On completion of the SQA Advanced Diploma, articulation to a degree programme is possible.

2 Qualifications structure

2.1 Structure — SQA Advanced Certificate in Marine Engineering Framework

In the design of the SQA Advanced Certificate in Marine Engineering, a high level of priority has been placed on producing an award which will allow learners to develop appropriate technical and practical skills that will meet the requirements of employers. This will be in addition to preparing learners for the level of responsibility aboard ship they will have upon qualifying.

In order to prepare learners to meet the changing requirements of the modern maritime industry, a solid foundation of theory and practice is required, so that they can build new knowledge, understanding and skills.

This SQA Advanced Certificate will provide an operational level of technical competencies and knowledge needed for employment as a professional within the maritime sector and allow individuals to serve successfully as a fourth engineer on a range of vessels within the Merchant Navy.

This qualification is made up of 12 SQA unit credits. It comprises 96 SCQF credit points, of which 11 are at SCQF level 7 in the mandatory section, including a graded unit of 8 SCQF credit points at SCQF level 7. A mapping of Core Skills development opportunities is available in Section 5.3.

In order to achieve the group award, learners must successfully complete all 12 of the SQA unit credits.

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
HW5K	47	Marine Engineering: Graded Unit 1	1	8	7
HW5F	47	Marine Engineering: Thermodynamics	1	8	7
HW5J	47	Marine Engineering: Mechanical Principles	1	8	7
HW5H	47	Marine Engineering: Electro-Technology	1	8	7
HW5G	47	Marine Engineering: Stability and Structure of Merchant Ships	1	8	7
HW5A	47	Marine Engineering: Pneumatics and Hydraulic Systems	1	8	7
HW5C	47	Marine Engineering: Auxiliary Systems	1	8	7
HW5E	47	Marine Engineering: Propulsion	1	8	7
HT1R	47	Fundamentals of Control Systems and Transducers	1	8	7
HP48	46	Engineering Mathematics 1	1	8	6
HW5D	47	Marine Legislation and Leadership	1	8	7
HT7P	47	Safety Engineering and the Environment	1	8	7

2.2 Structure — SQA Advanced Diploma in Marine Engineering Framework

In the design of the SQA Advanced Diploma in Marine Engineering, a high level of priority has been placed on producing an award which will allow learners to develop appropriate technical and practical skills which will meet the requirements of employers, in addition to preparing learners for the level of responsibility aboard ship they will have upon qualifying.

In order to prepare the learners to meet the changing requirements of the modern maritime industry, a solid foundation of theory and practice is required so that learners can build new knowledge, understanding and skills.

This SQA Advanced Certificate will provide an operational level of technical competencies and knowledge needed for employment as a professional within the maritime sector and allow individuals to serve successfully as a fourth engineer on a range of vessels within the Merchant Navy.

This SQA Advanced Diploma will provide the opportunity for career enhancement and promotion upon the learner gaining further industrial experience, through granting exemptions from management level academics.

This qualification is made up of 30 SQA unit credits. It comprises 240 SCQF credit points, of which 14 are at SCQF level 8 in the mandatory section, including a graded unit of 16 SCQF credit points at SCQF level 8 and in addition to a graded unit of 8 SCQF credit points at SCQF level 7. A mapping of Core Skills development opportunities is available in Section 5.3.

In order to achieve the group award, students must successfully complete all 30 of the SQA unit credits.

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
HW5K	47	Marine Engineering: Graded Unit 1	1	8	7
HW5F	47	Marine Engineering: Thermodynamics	1	8	7
HW5J	47	Marine Engineering: Mechanical Principles	1	8	7
HW5H	47	Marine Engineering: Electro-Technology	1	8	7
HW5G	47	Marine Engineering: Stability and Structure of Merchant Ships	1	8	7
HW5A	47	Marine Engineering: Pneumatics and Hydraulic Systems	1	8	7
HW5C	47	Marine Engineering: Auxiliary Systems	1	8	7
HW5E	47	Marine Engineering: Propulsion	1	8	7
HT1R	47	Fundamentals of Control Systems and Transducers	1	8	7
HP48	46	Engineering Mathematics 1	1	8	6
HW5D	47	Marine Legislation and Leadership	1	8	7
HT7P	47	Safety Engineering and the Environment	1	8	7
HW6D	48	Marine Engineering: Graded Unit 2	2	16	8
HP49	47	Engineering Mathematics 2	1	8	7

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4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
HW5W	48	Marine Engineering: Management	1	8	8
HW5N	48	Marine Engineering: Strength of Materials	1	8	8
HW5R	48	Marine Engineering: Applied Mechanics	1	8	8
HW61	48	Marine Engineering: Applied Thermodynamics	1.5	12	8
HW62	48	Marine Engineering: Heat Engine Principles	1	8	8
HW5Y	48	Marine Engineering: Naval Architecture	2	16	8
HW68	48	Marine Engineering: Ship Construction and survey	1	8	8
HW67	47	Marine Engineering: Electrical Power	1	8	7
HW63	48	Marine Engineering: Electrical Distribution Systems	1	8	8
HW5T	47	Marine Engineering: Process Control	1	8	7
HW5P	48	Marine Engineering: Mechanics	1.5	12	8
HW64	48	Marine Engineering: Electrical Machines	1	8	8
HR7J	47	Project Management for IT	1	8	7

Units with Embedded Core Skills

Unit code	Unit name	Embedded Core Skill/Core Skill compoment — Validation decision	Grouping unit appears in
HW67 47	Marine Engineering: Electrical Power	Using Number@6 Critical Thinking@5	Marine Engineering (GN20 48)
HW5H 47	Marine Engineering: Electro-Technology	Using Number@6 Critical Thinking@5	Marine Engineering (GN1Y 47) Marine Engineering (GN20 48)
HW5J 47	Marine Engineering: Mechanical Principles	Using Number@6 Critical Thinking@5	Marine Engineering (GN1Y 47) Marine Engineering (GN20 48)
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	Using Number@6 Critical Thinking@5	Marine Engineering (GN1Y 47) Marine Engineering (GN20 48)
HW63 48	Marine Engineering: Electrical Distribution Systems	Using Number@6	Marine Engineering (GN20 48)
HW61 48	Marine Engineering: Applied Thermodynamics	Using Number@6	Marine Engineering (GN20 48)

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Unit code	Unit name	Embedded Core Skill/Core Skill compoment — Validation decision	Grouping unit appears in
HW5F 47	Marine Engineering: Thermodynamics	Using Number@6 Critical Thinking@5	Marine Engineering (GN1Y 47) Marine Engineering (GN20 48)
HW5Y 48	Marine Engineering: Naval Architecture	Using Number@6	Marine Engineering (GN20 48)
HW5R 48	Marine Engineering: Applied Mechanics	Using Number@6	Marine Engineering (GN20 48)
HW5P 48	Marine Engineering: Mechanics	Using Number@6	Marine Engineering (GN20 48)
HW5N 48	Marine Engineering: Strength of Materials	Using Number@6	Marine Engineering (GN20 48)
HW62 48	Marine Engineering: Heat Engine Principles	Using Number@6	Marine Engineering (GN20 48)

3 Aims of the qualifications

The main purpose of this qualification is to meet the mandatory training requirements for the MCA academic syllabus in order to allow students to progress and become an Engineering Officer of the Watch.

3.1 General aims of the qualifications

1 Develop the ability to analyse and plan tasks commonly encountered in the workplace.
2 Develop approaches to problem solving and critical thinking.
3 Develop an evaluative and reflective approach to work and studies.
4 Develop the ability to plan and organise studies.
5 Develop skills for employability and progression to higher qualifications.
6 To enable the learner to consolidate knowledge and skills to enhance career progression.
7 To develop Core Skills required by employers.
8 To develop skills which are capable of being transferred to any employment.
9 Progression within the SCQF framework.

3.2 Specific aims of the SQA Advanced Certificate qualifications

10 Prepare learners for written and oral examinations for Engineer Officer of the Watch.
11 Contribute towards developing skills to enable learners to operate a vessel in a safe and effective manner.
12 Contribute towards developing skills to enable learners to work with others in safe and effective manner.
13 Contribute towards developing skills to deal with emergency situations.
14 Develop awareness of current maritime legislation.

3.3 Specific aims of the SQA Advanced Diploma qualifications

15 Provide an award that on successful completion will allow learners to progress to a degree in engineering or a related subject discipline area.
16 Provide an award that will give academic exemptions for STCW10 Reg III/2 Chief Engineer Unlimited Engineering Certification.
17 Develop knowledge and understanding of the external and internal factors that influence the performance of modern marine plant and vessels.
18 Develop a range of communication knowledge and skills relevant to the needs of marine engineers.
19 Develop a range of project management skills.
20 Develop the analysis and synthesis skills necessary to ensure the efficient operation of marine plant.

3.4 Graded units

3.4.1 SQA Advanced Marine Engineering Graded Unit 1

The SQA Advanced Certificate in Marine Engineering is an integral component of a Merchant Navy engineer cadet training scheme. At the end of an engineering cadetship the learner should have gained the theoretical and practical knowledge to gain their initial Maritime and Coastguard Agency (MCA) Certificate of Competency. In order to gain this certificate the learners must sit a written and an oral MCA examination. These examinations, which take place at the end of the cadetship, are designed to cover the full range of knowledge the cadet has studied throughout his or her cadetship. Although many of the Units in the SQA Advanced Certificate programme will be assessed by end of unit examinations these exams will normally be based on a relatively narrow subject area. Introducing a graded unit examination which tests a learner's knowledge across the award subjects will help to prepare the learner for their Engineer Officer of the Watch examinations.

In addition to this, the *Graded Unit 1* will also support delivery within MCA approved 1+1 overseas programmes, where the first year of the SQA Advanced Diploma programme is delivered at a non-EU partner college. By utilising examination based graded units as an assessment, it will allow external bodies such as the MCA, to monitor the quality of the delivery and assessment of partner colleges. The responsibility for the setting and marking of the graded unit at level 7 will remain with the approved centre.

3.4.2 SQA Advanced Marine Engineering Graded Unit 2

A project was preferred at SQA Advanced Diploma level because an investigative project-based assignment provides learners with opportunities to demonstrate not only their knowledge and skills in a technical area(s) relating to modern marine plant, but also in areas such as planning, scheduling, testing, evaluating and reporting which are important generic aims within the SQA Advanced Diploma Marine Engineering award.

An investigative assignment will allow learners to demonstrate research, analytical and evaluative skills acquired during the course. It allows them to use reporting skills by producing a logbook/diary of their activities as well as the final report including practical recommendations for improvement.

An investigative project based assessment allows learners to develop their research skills as well as require them to work with other learners thus developing interpersonal skills.

4 Recommended entry to the qualifications

Entry to this qualification is at the discretion of the centre. The following information on prior knowledge, skills, experience or qualifications that provide suitable preparation for this qualification has been provided by the Qualification Design Team as guidance only.

Learners would benefit from having attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- National Certificate in Shipping and Marine Operations (with marine engineering options) [SCQF level 6]
- At least two Higher level (SCQF level 6) passes (grade C or above) of which one should be Mathematics or a Physical Science. Learners should also have National 5 English at SCQF level 5 or better.

Where non-UK qualifications are used to measure suitable entry level, then the learner would have equivalent qualifications to the above, including English language as necessary.

Whilst the sea service articulated is an integral element of the certification to MCA Certificate of Competency, it does not form part of the SQA Advanced award. For MCA certification a sea service requirement is required.

In all cases, the learner will be informed that for progression into a career in the Merchant Navy a level of physical health and fitness is required. This will be assessed via the MCA Medical Standard as detailed within Merchant Guidance Notice (MGN) 264.

4.1 Core Skills entry profile

The Core Skill entry profile provides a summary of the associated assessment activities that exemplify why a particular level has been recommended for this qualification. The information would be used to identify if additional learning support needs to be put in place for learners whose Core Skills profile is below the recommended entry level or whether learners should be encouraged to do an alternative level or learning programme.

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Communication	6	Read, understand and evaluate a complex document which either: contains a set of facts and an analysis of them, or a sustained argument. It will be a substantial and detailed text with complex sentences, specialist words, and concepts that may be unfamiliar to you. It is likely to have more than one purpose. Produce a well-structured document or a collection of related documents, totalling 700 words or more, which conveys several items of complex information, opinions or ideas. Make a substantial contribution to a discussion on a complex topic with at least one other person, or make a presentation to others on a complex topic lasting a minimum of five minutes, including time for questions.

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Core Skill	Recommended SCQF entry profile	Associated assessment activities
Numeracy	6	Apply a wide range of numerical and statistical skills to solve complex problems. Extract, analyse and interpret information from complex graphical forms such as qualitative graphs, or graphs where part of the axis has been omitted, histograms, graphs showing relationships or complex variables, graphs requiring interpolation and extrapolation. Select an appropriate graphical form and use it to communicate information such as a table, line graph, bar chart, pie chart, histogram, diagram, qualitative form.
Information and Communication Technology (ICT)	6	Carry out ICT activities including using hardware responsibly and presenting information in an appropriate mode. Carry out a range of straightforward ICT activities which involve application software. Use ICT to locate information in different formats from a range of local or remote data sources, applying a search strategy, evaluating information found against given criteria and evaluating search strategy. Demonstrate safe practice in using ICT to handle information by keeping data secure.
Problem Solving	6	Investigate and analyse a complex problem. The problem is likely to involve a situation which is unfamiliar to you and the analysis of complex or unfamiliar variables. Plan, organise and carry out your suggested approach, working out an action plan, choosing and obtaining resources and carrying out your action plan. Check how well the problem solving activity worked in practice, identifying the criteria you will use to decide how effective every aspect of your problem solving activity has been, gathering evidence relevant to chosen criteria, recommending ways of solving similar problems in future.

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Core Skill	Recommended SCQF entry profile	Associated assessment activities
Working with Others	6	Work co-operatively with at least one other person to analyse and organise the requirements of your own role and the roles of others. Negotiate working methods, modify your behaviour, and motivate yourself and others to progress towards a common goal. Check how well you and others involved contributed to the co-operative working activity, developing criteria to evaluate your own and others contribution, seeking and considering feedback and advice, using your chosen criteria and feedback to evaluate how well you co-operated and co-operative working arrangements worked overall, using conclusions and reflection to set objectives for improving own co-operative working skills and make recommendations on any future co-operative working arrangements.

5 Additional benefits of the qualification in meeting employer needs

This qualification was designed to meet a specific purpose and what follows are details on how that purpose has been met through mapping of the units to the aims of the qualification. Through meeting the aims, additional value has been achieved by linking the unit standards with those defined in National Occupational Standards and/or trade/professional body requirements. In addition, significant opportunities exist for learners to develop the more generic skill, known as Core Skills through doing this qualification.

5.1 Mapping of qualification aims to units

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Code	Unit title	Aims													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
HW5K 47	Marine Engineering: Graded Unit 1	X	X	X	X	X	X	X	X	X	X				
HW5F 47	Marine Engineering: Thermodynamics	X	X			X		X		X	X				
HW5J 47	Marine Engineering: Mechanical Principles	X	X			X		X		X					
HW5H 47	Marine Engineering: Electro-Technology	X	X			X		X		X	X	X	X		
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	X	X			X		X		X					
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems	X	X			X		X			X	X	X		
HW5C 47	Marine Engineering: Auxiliary Systems	X				X	X	X			X	X	X	X	X
HW5E 47	Marine Engineering: Propulsion	X				X	X	X			X	X	X	X	X
HT1R 47	Fundamentals of Controls and Transducers	X	X			X		X		X	X	X			
HP48 46	Engineering Mathematics 1		X			X		X		X					
HW5D 47	Marine Legislation and Leadership	X		X	X	X		X	X	X	X	X	X	X	X
HT7P 47	Safety Engineering and the Environment	X		X	X			X	X		X	X	X		X

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Code	Unit title	Aims																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HW5K 47	Marine Engineering: Graded Unit 1	X	X	X	X	X	X	X	X	X	X					X	X		X	X	X
HW5F 47	Marine Engineering: Thermodynamics	X	X			X		X		X	X					X	X	X	X		X
HW5J 47	Marine Engineering: Mechanical Principles	X	X			X		X		X						X	X	X	X		X
HW5H 47	Marine Engineering: Electro-Technology	X	X			X		X		X	X	X	X			X	X	X	X		X
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	X	X			X		X		X						X	X	X	X		X
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems	X	X			X		X			X	X	X				X	X	X		
HW5C 47	Marine Engineering: Auxiliary Systems	X				X	X	X			X	X	X	X	X		X	X	X		X
HW5E 47	Marine Engineering: Propulsion	X				X	X	X			X	X	X	X	X		X	X	X		X
HT1R 47	Fundamentals of Controls and Transducers	X	X			X		X		X	X	X				X	X	X	X		X
HP48 46	Engineering Mathematics 1		X			X		X		X						X	X		X		
HW5D 47	Marine Legislation and Leadership	X		X	X	X		X	X	X	X	X	X	X	X		X	X	X		
HT7P 47	Safety Engineering and the Environment	X		X	X			X	X		X	X	X		X		X		X		

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Code	Unit title	Aims																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HW6D 48	Marine Engineering: Graded Unit 2	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
HP49 47	Engineering Mathematics 2		X			X		X		X						X	X		X		
HW5W 48	Marine Engineering: Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
HW5N 48	Marine Engineering: Strength of Materials	X	X			X		X								X	X	X	X		X
HW5R 48	Marine Engineering: Applied Mechanics	X	X			X		X								X	X	X	X		X
HW61 47	Marine Engineering: Applied Thermodynamics	X	X			X		X			X	X				X	X	X	X		X
HW62 48	Marine Engineering: Heat Engine Principles	X	X			X		X								X	X	X	X		X
HW5Y 48	Marine Engineering: Naval Architecture	X	X			X		X								X	X	X	X		X
HW68 48	Marine Engineering: Ship Construction and survey	X	X			X		X			X	X				X	X	X	X		X
HW67 47	Marine Engineering: Electrical Power	X	X			X		X			X	X				X	X	X	X		X
HW63 48	Marine Engineering: Electrical Distribution Systems	X	X			X		X			X	X				X	X	X	X		X
HW5T 47	Marine Engineering: Process Control	X	X			X		X			X	X				X	X		X		X
HW5P 48	Marine Engineering: Mechanics	X	X			X		X								X	X	X	X		X
HW64 48	Marine Engineering: Electrical Machines	X	X			X		X			X					X	X	X	X		X
HR7J 47	Project Management for IT	X	X	X	X	X	X	X	X	X			X				X		X	X	

5.2.1 Mapping of National Occupational Standards (NOS) and/or trade body standards

Section A — Safety and Management

A01 Contribute to the stability and watertight integrity of a vessel

A02 Ensure the stability and watertight integrity of a vessel

A11 Take personal emergency action on board a vessel

A12 Respond to emergencies on board a vessel

A13 Control the response to emergencies on board a vessel

A14 Direct the response to emergencies on board a vessel

A15 Take control of survival craft and rescue boats

A16 Provide Medical Services on board a vessel

A21 Maintain Steelwork and deck equipment on board a vessel

A22 Plan and organise the maintenance of a vessel's structure, fittings and equipment

A31 Maintain personal health, safety and environmental standards on-board a vessel

A32 Maintain safe, legal and effective working practices on-board a vessel

A33 Ensure safe, legal and effective working practices on-board a vessel

A34 Create, maintain and enhance productive working relationships on-board a vessel

A35 Ensure compliance with the commercial obligations of a vessel

A42 Plan and execute search and rescue operations in a marine environment

A43 Locate, recover and transfer casualties in a marine environment

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Code	Unit title	National Occupational Standard																
		A01	A02	A11	A12	A13	A14	A15	A16	A21	A22	A31	A32	A33	A34	A35	A42	A43
HW5K 47	Marine Engineering: Graded Unit 1																	
HW5F 47	Marine Engineering: Thermodynamics																	
HW5J 47	Marine Engineering: Mechanical Principles									X								
HW5H 47	Marine Engineering: Electro-Technology																	
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	X	X							X								
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems																	
HW5C 47	Marine Engineering: Auxiliary Systems										X		X	X				
HW5E 47	Marine Engineering: Propulsion			X	X						X		X	X				
HT1R 47	Fundamentals of Controls and Transducers																	
HP48 46	Engineering Mathematics 1																	
HW5D 47	Marine Legislation and Leadership			X	X	X	X				X	X	X	X	X			
HT7P 47	Safety Engineering and the Environment				X							X						

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Code	Unit title	National Occupational Standard																
		A01	A02	A11	A12	A13	A14	A15	A16	A21	A22	A31	A32	A33	A34	A35	A42	A43
HW5K 47	Marine Engineering: Graded Unit 1																	
HW5F 47	Marine Engineering: Thermodynamics																	
HW5J 47	Marine Engineering: Mechanical Principles									X								
HW5H 47	Marine Engineering: Electro-Technology																	
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	X	X							X								
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems																	
HW5C 47	Marine Engineering: Auxiliary Systems										X		X	X				
HW5E 47	Marine Engineering: Propulsion			X	X						X		X	X				
HT1R 47	Fundamentals of Controls and Transducers																	
HP48 46	Engineering Mathematics 1																	
HW5D 47	Marine Legislation and Leadership			X	X	X	X				X	X	X	X	X			
HT7P 47	Safety Engineering and the Environment				X							X						
HW6D 48	Marine Engineering: Graded Unit 2																	
HP49 47	Engineering Mathematics 2																	
HW5W 48	Marine Engineering: Management			X	X	X	X				X	X	X	X	X			
HW5N 48	Marine Engineering: Strength of Materials									X								
HW5R 48	Marine Engineering: Applied Mechanics																	
HW61 48	Marine Engineering: Applied Thermodynamics																	
HW62 48	Marine Engineering: Heat Engine Principles																	
HW5Y 48	Marine Engineering: Naval Architecture	X	X															
HW68 48	Marine Engineering: Ship Construction and Survey	X	X							X								
HW67 47	Marine Engineering: Electrical Power																	

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SQA Advanced Diploma in Marine Engineering (cont)

Code	Unit title	National Occupational Standard																
		A01	A02	A11	A12	A13	A14	A15	A16	A21	A22	A31	A32	A33	A34	A35	A42	A43
HW63 48	Marine Engineering: Electrical Distribution Systems																	
HW5T 47	Marine Engineering: Process Control																	
HW5P 48	Marine Engineering: Mechanics																	
HW64 48	Marine Engineering: Electrical Machines																	
HR7J 47	Project Management for IT																	

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Section C — Engineering

C01 Monitor and operate engine room machinery
C02 Contribute to an engine room watch
C03 Take charge of an engine room watch
C11 Prepare and operate vessel propulsion machinery and ancillary systems
C12 Operate vessel auxiliaries and service machinery
C13 Operate and adjust vessel electrical equipment
C14 Operate and adjust vessel electrical propulsion
C15 Operate and maintain equipment in hazardous areas on-board a vessel
C16 Operate and maintain vessel internal communication and hardware systems
C17 Operate and maintain high voltage equipment on-board a vessel
C21 Manage the operation of vessel propulsion machinery and ancillary systems
C22 Manage the operation of vessel auxiliaries, auxiliary boilers and service machinery
C23 Manage the operation of vessel electrical, electronic and control equipment
C31 Contribute to maintenance of vessel mechanical equipment
C32 Contribute to maintenance of vessel electrical equipment
C33 Carry out maintenance of vessel electrical machinery and systems
C34 Carry out maintenance of vessel mechanical machinery and systems
C35 Carry out maintenance of vessel telecommunication and navigation systems
C36 Carry out maintenance of vessel instrumentation and control systems
C37 Manage maintenance of vessel instrumentation and control systems
C41 Identify and report variations in vessel electrical, instrumentation and control systems
C42 Diagnose the causes of vibration in vessel mechanical systems
C43 Diagnose the causes of variation in vessel electrical and electronic systems
C44 Diagnose the causes of variations in vessel instrumentation and control systems
C45 Diagnose the causes of variations in vessel telecommunications and navigation systems
C51 Plan and schedule vessel engineering operations
C52 Direct vessel engineering operations
C53 Plan maintenance for vessel engineering systems
C54 Develop maintenance plans for vessel engineering systems
C55 Prepare vessel response for engineering contingency solutions
C61 Operate vessel propulsion, ancillary, auxiliary and service machinery and systems
C62 Transfer fuel, oil and lubricants from vessels
C63 Maintain vessel machinery and systems

SQA Advanced Certificate and Diploma

SQA Advanced Certificate in Marine Engineering

Code	Unit title	National Occupational Standard																																
		C01	C02	C03	C11	C12	C13	C14	C15	C16	C17	C21	C22	C23	C31	C32	C33	C34	C35	C36	C37	C41	C42	C43	C44	C45	C51	C52	C53	C54	C55	C61	C62	C63
HW5K 47	Marine Engineering: Graded Unit 1																																	
HW5F 47	Marine Engineering: Thermodynamics																	X																
HW5J 47	Marine Engineering: Mechanical Principles																	X					X											
HW5H 47	Marine Engineering: Electro-Technology	X					X	X			X			X		X	X							X										
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships																																	
HW5A 47	Marine Engineering: Pneumatics and Hydraulics	X																X																
HW5C 47	Marine Engineering: Auxiliary Systems	X			X	X			X			X	X		X			X				X	X			X	X	X	X	X	X	X	X	X
HW5E 47	Marine Engineering: Propulsion	X			X				X			X	X		X			X				X	X			X	X	X	X	X	X	X	X	X
HT1R 47	Fundamentals of Controls and Transducers	X					X	X						X			X			X	X	X			X									
HP48 46	Engineering Mathematics 1																																	
HW5D 47	Marine Legislation and Leadership		X	X																						X								
HT7P 47	Safety Engineering and the Environment		X												X											X								

SQA Advanced Certificate and Diploma

SQA Advanced Diploma in Marine Engineering

Code	Unit title	National Occupational Standard																																
		C01	C02	C03	C11	C12	C13	C14	C15	C16	C17	C21	C22	C23	C31	C32	C33	C34	C35	C36	C37	C41	C42	C43	C44	C45	C51	C52	C53	C54	C55	C61	C62	C63
HW5K 47	Marine Engineering: Graded Unit 1																																	
HW5F 47	Marine Engineering: Thermodynamics																	X																
HW5J 47	Marine Engineering: Mechanical Principles																	X					X											
HW5H 47	Marine Engineering: Electro-Technology	X					X	X			X			X		X	X							X										
HW5G 47	Marine Engineering: Stability and Structure for Merchant Ships																																	
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems	X																X																
HW5C 47	Marine Engineering: Auxiliary Systems	X			X	X			X			X	X		X			X				X	X			X	X	X	X	X	X	X	X	X
HW5E 47	Marine Engineering: Propulsion	X			X				X			X	X		X			X				X	X			X	X	X	X	X	X	X	X	X
HT1R 47	Fundamentals of Controls and Transducers	X					X	X						X			X			X	X	X			X									
HP48 46	Engineering Mathematics 1																																	
HW5D 47	Marine Legislation and Leadership		X	X																						X								
HT7P 47	Safety Engineering and the Environment		X												X											X								
HW6D 48	Marine Engineering: Graded Unit 2																																	

SQA Advanced Certificate and Diploma

SQA Advanced Diploma in Marine Engineering (cont)

Code	Unit title	National Occupational Standard																																
		C01	C02	C03	C11	C12	C13	C14	C15	C16	C17	C21	C22	C23	C31	C32	C33	C34	C35	C36	C37	C41	C42	C43	C44	C45	C51	C52	C53	C54	C55	C61	C62	C63
HP49 47	Engineering Mathematics 2																																	
HW5W 48	Marine Engineering: Management		X									X															X	X	X	X				
HW5N 48	Marine Engineering: Strength of Materials																																	
HW5R 48	Marine Engineering: Applied Mechanics	X													X			X					X											
HW61 48	Marine Engineering: Applied Thermodynamics	X											X					X					X											
HW62 48	Marine Engineering: Heat Engine Principles	X													X			X																
HW5Y 48	Marine Engineering: Naval Architecture																																	
HW68 48	Marine Engineering: Ship Construction and survey																																	
HW67 47	Marine Engineering: Electrical Power	X												X		X	X							X										
HW63 48	Marine Engineering: Electrical Distribution Systems	X												X		X	X							X										
HT9X 47	Process Control																			X	X	X			X									
HW5P 48	Marine Engineering: Mechanics														X			X						X										
HW64 48	Marine Engineering: Electrical Machines	X		X			X							X		X	X																	
HR7J 47	Project Management for IT		X																															

5.2.2 Mapping of MCA Management Syllabus

Naval Architecture	Resultant hydrostatic force on an area immersed at any depth in a liquid.	Centre of Pressure of an area immersed at any depth in a liquid.	Archimedes Principle.	Principles of flotation.	Simpson's Rules.	Procedures for determining transverse stability.	Procedures for determining longitudinal stability (trim).	Methods of evaluating shear forces and bending moments on ships of simple geometric form.	Factors involved in the resistance to motion and the power required for a ship at any given speed.	Methods of estimating power and fuel consumption	Propeller terminology and the relationships between engine power and the propeller performance.	Principles of propeller cavitation.	Types of rudders and the effect on the stability of the vessel when helm is applied
Marine Engineering: Stability and Structure of Merchant Ships													
Apply the principles of hydrostatics to solve problems relating to merchant navy vessels	X	X	X	X									
Determine Small Angle Stability including Free Surface Effect on typical merchant navy vessel					X	X	X						
Analyse Basic Ship Construction of standard merchant ship types											X		
Marine Engineering: Naval Architecture													
Calculate small and large angle stability in marine vessels					X	X	X						
Calculate ship powering and resistance from model test data								X	X	X			
Calculate ship fuel consumption from propeller dimensions										X	X	X	X

SQA Advanced Certificate and Diploma

Electro-Technology	Resistive Direct Current (DC) Circuits.	DC Transient Circuits.	Construction and operation of 3 Phase Synchronous Alternating Current (AC) Generators.	Balanced and unbalanced 3 Phase AC Circuits.	Construction and operation of 3 Phase AC Motors.	Construction and operation of AC Transformers.	AC distribution load sharing.	Use of electronics in marine applications.		
Marine Engineering: Electrical Distribution Systems										
Solve Problems on three phase balanced and unbalanced AC circuits				X						
Solve problems on three phase AC motors					X					
Solve problems on Distribution systems and load sharing							X			
Explain and solve problems on AC transformers						X				
Marine Engineering: Electrical Machines										
Explain the layout and component parts of typical marine electrical distribution systems						X	X			
Explain the construction and operation of AC generators			X							
Explain the construction and operation of AC motors					X					
Explain the operation of electronic devices in power circuits								X		
Marine Engineering: Electrical Power										
Solve problems on Resistive DC circuits connected in series and parallel	X									
Solve problems on Non-linear DC transient circuits, Resistive/Capacitive and Resistive Inductive circuits		X								
Solve problems on parallel single phase AC circuits comprising resistance, capacitance and inductance				X						
Evaluate Electronics in marine applications								X		

SQA Advanced Certificate and Diploma

Applied Heat	Individual and sequences of thermodynamic processes;	Heat engine cycles;	Single and multistage reciprocating compressors;	Combustion of solid, liquid and gaseous fuels by mass and by volume.	Heat transfer through thick cylinders, spheres, heat exchangers and insulated systems;	Hydrodynamics;	Two phase steam systems and steam cycles;	Steam flow through a nozzle;	Steam turbines;	Two phase refrigeration and heat pump cycles.
Marine Engineering: Thermodynamics										
Calculate and explain the effect of applying heat energy to solids and liquids	X									
Apply the Gas Laws for thermodynamic systems and evaluate the work done	X									
Explain and analyse combustion cycles associated with Marine Engines		X		X						
Apply the data from Property Tables to solve problems on processes										X
Marine Engineering: Applied Thermodynamics										
Analyse the use of multistage reciprocating air compressors			X							
Apply the concept of reverse heat engine to refrigeration and recognise the properties of common refrigerants										X
Determine the efficiency of steam plant and power from a velocity and a pressure compound steam turbine							X	X	X	
Solve problems involving fluid mechanics in pipes, pumps, meters and jets						X				

SQA Advanced Certificate and Diploma

Applied Heat	Individual and sequences of thermodynamic processes;	Heat engine cycles;	Single and multistage reciprocating compressors;	Combustion of solid, liquid and gaseous fuels by mass and by volume.	Heat transfer through thick cylinders, spheres, heat exchangers and insulated systems;	Hydrodynamics;	Two phase steam systems and steam cycles;	Steam flow through a nozzle;	Steam turbines;	Two phase refrigeration and heat pump cycles.
Marine Engineering: Heat Engine Principles										
Apply the fundamental properties of thermodynamics to a process	X									
Evaluate and apply heat engine cycles to marine engines		X								
Calculate heat transfer through complex systems					X					
Calculate the properties of constituent parts during combustion of marine fuels				X						

SQA Advanced Certificate and Diploma

Applied Mechanics	The conditions of equilibrium of a body subject to a system of both coplanar and non-coplanar forces and/or moments.	Apply conditions of equilibrium.	Pin jointed frameworks.	Centre of gravity and centroid.	The effects of static and dynamic friction on rigid bodies at rest and moving on an inclined plane with uniform velocity.	Linear, angular and relative motion.	Motion of projectiles and moving objects.	The concept of relative and absolute velocity.	Force and energy.	The laws of motion applied to rotational dynamics.	Simple harmonic motion.	The principles of simple machines.	The effects on a material caused by the application of external forces.	The effect of temperature change on materials.	Stresses in thin cylinders and thin rotating rims.	Cantilevers, simply supported beams and the stability of axially loaded columns.	Torsion of circular shafts.	Elastic strain energy.	Stresses on oblique planes.
Marine Engineering: Mechanical Principles																			
Analyse linear and angular motion within an engineering environment						X	X	X											
Evaluate the forces and moments concerned with static equilibrium	X	X			X				X										
Evaluate the of strength of materials in a range of engineering environments													X			X			
Analyse simple machines and their uses within a marine engineering environment												X							
Marine Engineering: Mechanics																			
Explain and solve problems relating to centripetal and centrifugal forces involving clutches and governors	X	X							X	X									
Explain and solve problems relating to moments of area and mass				X															
Explain and solve problems relating to forces in engineering frameworks	X	X	X																
Explain and solve problems relating to the stability of axially loaded columns and stresses found within thin cylinders													X		X	X			

Applied Mechanics	The conditions of equilibrium of a body subject to a system of both coplanar and non-coplanar forces and/or moments.	Apply conditions of equilibrium.	Pin jointed frameworks.	Centre of gravity and centroid.	The effects of static and dynamic friction on rigid bodies at rest and moving on an inclined plane with uniform velocity.	Linear, angular and relative motion.	Motion of projectiles and moving objects.	The concept of relative and absolute velocity.	Force and energy.	The laws of motion applied to rotational dynamics.	Simple harmonic motion.	The principles of simple machines.	The effects on a material caused by the application of external forces.	The effect of temperature change on materials.	Stresses in thin cylinders and thin rotating rims.	Cantilevers, simply supported beams and the stability of axially loaded columns.	Torsion of circular shafts.	Elastic strain energy.	Stresses on oblique planes.
Marine Engineering: Applied Mechanics																			
Solve equilibrium problems related to bodies subjected to coplanar and non-coplanar force systems.	X	X			X														
Solve problems involving combinations of linear, angular and relative motion.						X	X	X				X							
Solve problems involving simple harmonic motion.									X	X	X								
Solve problems involving the dynamics of motion.		X			X	X			X										
Marine Engineering: Strength of Materials																			
Explain terminology as used in strength of materials and solve related problems.													X	X					
Explain and solve problems relating to shear forces and bending moments on simply supported and cantilever beams.																X			
Explain and solve problems on the theory of torsion involving circular sections and close coiled helical springs																	X		
Explain and solve problems on elastic strain energy and stresses on oblique planes of stressed material																		X	X

SQA Advanced Certificate and Diploma

Mathematics	The rules of Algebra	Logarithms,	Complex numbers	Graphs	Trigonometry	Binary, Hexadecimal Number systems and Logic	Calculus: Differentiation	Calculus: Integration
Engineering Mathematics 1								
Solve problems involving functions and trigonometric equations	X			X	X			
Solve problems involving exponential and logarithmic equations	X	X		X				
Apply mathematical techniques involving vectors and complex numbers			X	X				
Engineering Mathematics 2								
Solve trigonometric and hyperbolic function problems	X			X	X			
Use differentiation techniques to solve Engineering problems	X						X	
Use integration techniques to solve Engineering problems	X							X

SQA Advanced Certificate and Diploma

Engineering, Systems and Ship's Drawings	Mechanical Assembly Drawings	Piping Systems Drawings	Hydraulic and Pneumatic Systems Drawings	Electrical Systems Drawings	Ships Construction Drawings
Marine Engineering Pneumatics and Hydraulics					
Explain the operation of pneumatic and hydraulic systems			X		
Design, assemble and test a fluid power and control system			X		
Demonstrate fault-finding competence on a fluid power system			X		
Marine Engineering: Electrical Machines					
Explain the layout and component parts of typical marine electrical distribution systems				X	
Maintaining electrical equipment/systems (workshop unit)				X	
Marine vessel plant maintenance (workshop unit)	X	X			
Marine Engineering: Propulsion	X	X			
Marine Engineering: Auxiliary Systems	X	X			
Marine Engineering: Stability and Hydrostatics					
Analyse Basic Ship Construction of standard merchant ship types					X
Marine Engineering: Naval Architecture					
Discuss constructional details used to resist stress.					X

5.3 Mapping of SQA Advanced Certificate to EOOW Syllabus

IAMI Science A mapping

	Marine Engineering: Mechanical Principles SQCF Level 7	1 Analyse linear and angular motion within an engineering environment	2 Evaluate the forces and moments concerned with static equilibrium	3 Evaluate the of strength of materials in a range of engineering environments	4 Analyse simple machines and their uses within a marine engineering environment	**Marine Engineering: Stability and Structure of Merchant Ships (SCQF level 7)**	1 Apply the principles of hydrostatics to solve problems relating to merchant navy vessels	2 Determine Small Angle Stability including Free Surface Effect on typical merchant navy vessel	3 Analyse Basic Ship Construction of standard merchant ship types
Marine Engineering: Mechanics									
The relationship of linear and angular velocity, distance and acceleration.		X							
The effect of forces and torques on motion and lifting machines.					X				
Forces in equilibrium.			X						
The Conservation of Energy theory and momentum.		X	X						
The relationship between mass, volume and density.							X		
Static and dynamic friction.			X						
The effects of tensile, compressive and shear forces.				X					
The relationship between stress and strain.				X					
The mechanical properties of materials.				X					
Factor of safety				X					
Marine Engineering: Stability and Structure for Merchant Ships									
The relationship between centre of gravity and centre of buoyancy and the significance of the relative position of these points.							X	X	
The changes to the vessel's condition when weights are added, removed and moved								X	

IAMI Science B mapping

	Marine Engineering: Stability and Structure of Merchant Ships (SCQF level 7)	1 Apply the principles of hydrostatics to solve problems relating to merchant navy vessels	2 Determine Small Angle Stability including Free Surface Effect on typical merchant navy vessel	3 Analyse Basic Ship Construction of standard merchant ship types	**Marine Engineering: Thermodynamics (SCQF Level 7)**	1 Calculate and explain the effect of applying heat energy to solids and liquids	2 Apply the Gas Laws for thermodynamic systems and evaluate the work done.	3 Explain and analyse combustion cycles associated with Marine Engines	4 Apply the data from Property Tables to solve problems on processes	**Marine Engineering: Electro-Technology (SCQF level 7)**	1 Explain fundamental electrical concepts and quantifying their electrical units.	2 Solve problems on DC circuits with resistances in parallel and series.	3 Solve problems on series single phase AC circuits comprising resistance, capacitance and	4 Explain High Voltage at operational level in marine electrical practice.
Marine Engineering: Thermodynamics														
The heat required to change the temperature of solids, liquids and gases.						X								
The transfer of heat through solids, liquids and gases.						X								
The dimensional effects on liquids and solids of changes in temperature.						X								
The change of state of water as it is heated and the relationship between temperature and heat.									X					
The use of steam tables to determine the state of water and steam.									X					
The application of the gas laws.							X							
The application of the steady flow energy equation.							X							
The relevance of the calorific values of fuels.								X						
The combustion process and the effects of excess and insufficient air supply.								X						
The use of indicator diagrams to determine the power of an engine.								X						
The heat balance of an internal combustion engine.								X						
The basic refrigeration cycle and the components within a refrigeration plant.									X					

	Marine Engineering: Stability and Structure of Merchant Ships (SCQF level 7)	1 Apply the principles of hydrostatics to solve problems relating to merchant navy vessels	2 Determine Small Angle Stability including Free Surface Effect on typical merchant navy vessel	3 Analyse Basic Ship Construction of standard merchant ship types	**Marine Engineering: Thermodynamics (SCQF Level 7)**	1 Calculate and explain the effect of applying heat energy to solids and liquids	2 Apply the Gas Laws for thermodynamic systems and evaluate the work done.	3 Explain and analyse combustion cycles associated with Marine Engines	4 Apply the data from Property Tables to solve problems on processes	**Marine Engineering: Electro-Technology (SCQF level 7)**	1 Explain fundamental electrical concepts and quantifying their electrical units.	2 Solve problems on DC circuits with resistances in parallel and series.	3 Solve problems on series single phase AC circuits comprising resistance, capacitance and	4 Explain High Voltage at operational level in marine electrical practice.
Marine Engineering: Stability and Structure for Merchant Ships														
The thrust on horizontal and vertical immersed surfaces.		X												
Determine that pressure increases with depth and the pressure acting at a specified depth.		X												
The relationship between the centre of pressure and the centroid of an immersed surface.		X												
The reaction at surface supports of immersed and partially immersed surfaces.		X												
The principles of Archimedes.		X												
The application of the Principles of Archimedes to floating rectangular shaped vessels		X												
Marine Engineering: Electro Technology														
DC circuits with resistances in parallel and series.											X	X		
Power and energy in DC circuits.												X		
AC circuits comprising resistance capacitance and inductance, voltage and current magnification factor.													X	
True power, apparent power and power factor.													X	

Control

	Fundamentals of Control Systems and Transducers	1 Explain control system elements and signals.	2 Explain the operation and application of a range of transducers used in control systems.	3 Describe the structure and behaviour of control systems.	4 Demonstrate the application of transducers in control systems
Control	X				
Instruments			X		X
Regulators		X			X
Control Systems				X	X
System Diagrams		X			X

HV (O) /HELM

	Marine Engineering: Electro-Technology (SCQF level 7)	1 Explain fundamental electrical concepts and quantifying their electrical units.	2 Solve problems on DC circuits with resistances in parallel and series.	3 Solve problems on series single phase AC circuits comprising resistance, capacitance and inductance.	4 Explain High Voltage at operational level in marine electrical practice.	**Marine Legislation and Leadership (SCQF Level 7)**	Analyse leadership and management techniques applied to the marine industry	Management styles	Authority and assertiveness	Situational awareness	Communication	Effects of fatigue and stress	Judgement and decision making	Team work	Leadership in emergencies	Cultural factors within multi-national crews
High Voltage at the operational Level					X											
HELM Operational							X	X	X	X	X	X	X	X	X	X

5.4 Mapping of Core Skills development opportunities across the qualifications

SQA Advanced Certificate in Marine Engineering Framework

E = Embedded **S = Signposted**

Unit code	Unit title	Communication			Numeracy		ICT		Problem Solving			Working with Others	
		Written (Reading)	Written (Writing)	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HW5K 47	Marine Engineering: Graded Unit 1	E	E		E	E			E	E	E		
HW5F 47	Marine Engineering: Thermodynamics	E	E		E	E	S		E	E	E		
HW5J 47	Marine Engineering: Mechanical Principles	E	E		E	E	S		E	E	E		
HW5H 47	Marine Engineering: Electro-Technology	E	E		E	E	S		E	E	E		
HW5G 47	Marine Engineering: Stability and Structure for Merchant Ships	E	E		E	E	S		E	E	E		
HW5A 47	Marine Engineering: Pneumatics and Hydraulics	E	E		E	E	S		E	E	E	S	S
HW5C 47	Marine Engineering: Auxiliary Systems	E	E	S			S		E	E	E		
HW5E 47	Marine Engineering: Propulsion	E	E	S			S		E	E	E		
HT1R 47	Fundamentals of Controls and Transducers	E	E	S	E	E	E	E	E	E	E	S	
HP48 46	Engineering Mathematics 1	E	E		E	E			E	E	E		
HW5D 47	Marine Legislation and Leadership	E	E	S			E	E	E	E	E	E	E
HT7P 47	Safety Engineering and the Environment	E	E	S			E	E	E	E	E	E	E

SQA Advanced Diploma Marine Engineering Framework (cont)

E = Embedded **S = Signposted**

Unit code	Unit title	Communication			Numeracy		ICT		Problem Solving			Working with Others	
		Written (Reading)	Written (Writing)	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HW5K 47	Marine Engineering: Graded Unit 1	E	E		E	E			E	E	E		
HW5F 47	Marine Engineering: Thermodynamics	E	E		E	E	S		E	E	E		
HW5J 47	Marine Engineering: Mechanical Principles	E	E		E	E	S		E	E	E		
HW5H 47	Marine Engineering: Electro-Technology	E	E		E	E	S		E	E	E		
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	E	E		E	E	S		E	E	E		
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems	E	E		E	E	S		E	E	E	S	S
HW5C 47	Marine Engineering: Auxiliary Systems	E	E	S			S		E	E	E		
HW5E 47	Marine Engineering: Propulsion	E	E	S			S		E	E	E		
HT1R 47	Fundamentals of Controls and Transducers	E	E	S	E	E	E	E	E	E	E	S	
HP48 46	Engineering Mathematics 1	E	E		E	E			E	E	E		
HW5D 47	Marine Legislation and Leadership	E	E	S			E	E	E	E	E	E	E
HT7P 47	Safety Engineering and the Environment	E	E	S			E	E	E	E	E	E	E

SQA Advanced Diploma Marine Engineering Framework (cont)

E = Embedded **S = Signposted**

Unit code	Unit title	Communication			Numeracy		ICT		Problem Solving			Working with Others	
		Written (Reading)	Written (Writing)	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HW6D 48	Marine Engineering: Graded Unit 2	E	E	E	S	S	E	E	E	E	E	S	S
HP49 47	Engineering Mathematics 2	E	E		E	E			E	E	E		
HW5W 48	Marine Engineering: Management	E	E	S		S	E	E	E	E	E	S	S
HW5N 48	Marine Engineering: Strength of Materials	E	E		E	E	S		E	E	E		
HW5R 48	Marine Engineering: Applied Mechanics	E	E		E	E	S		E	E	E		
HW61 48	Marine Engineering: Applied Thermodynamics	E	E		E	E	S		E	E	E		
HW62 48	Marine Engineering: Heat Engine Principles	E	E		E	E	S		E	E	E		
HW5Y 48	Marine Engineering: Naval Architecture	E	E		E	E	S		E	E	E		
HW68 48	Marine Engineering: Ship Construction and survey	E	E		E	E	S		E	E	E		
HW67 47	Marine Engineering: Electrical Power	E	E		E	E	S		E	E	E		
HW63 48	Marine Engineering: Electrical Distribution Systems	E	E		E	E	S		E	E	E		
HT9X 47	Marine Engineering: Process Control	E	E		E	E	E	E	E	E	E		
HW5P 48	Marine Engineering: Mechanics	E	E		E	E	S		E	E	E		
HW64 48	Marine Engineering: Electrical Machines	E	E			E	S		E	E	E	S	
HR7J 47	Project Management for IT	E	E	S			E	E	E	E	E	S	S

5.4 Assessment strategy for the qualifications

An appropriate assessment strategy is in place for both the SQA Advanced Certificate and SQA Advanced Diploma in Marine Engineering. This strategy had to reflect the needs of the award with regards to STCW and therefore MCA certification. The assessment strategy is outlined below:

Aims

To ensure that:

- a consistent, rigorous and efficient approach to assessment is used.
- assessment instruments for general and graded units satisfy national agreed standards.
- the assessment load on learners and staff; is reasonable and does not unduly detract from teaching and learning elements.
- reliable and rigorous verification processes are put in place in order to ensure that national standards are achieved.

Objectives

Adopt an holistic approach to assessment. The implications of this are:

- Assessment instruments will be designed to sample knowledge and skills in each unit.
- 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 minimum number of assessment instruments should be used.
- While not seeking to be entirely prescriptive with regards to time spent on assessment in each SQA Advanced unit, over assessment should be avoided.
- Ensure that consistent and rigorous internal and external verification procedures operate throughout.

Holistic assessment

The learning outcomes of each unit should be combined together into one, holistic assessment paper, wherever possible. Learners are permitted to use scientific calculators and also data books/formula sheets developed by the centre during examinations. Assessments should take place under invigilated conditions and follow the assessment centre's examination policy.

In cases where a single error at one stage of an extended calculation sequence has a cumulative effect on the final answer, provided that working/formulae are correct, acknowledgement of the correct working should be given.

Formative assessment

Formative assessment should be used throughout unit delivery to reinforce learning, build learner's confidence and prepare them for summative assessment.

Re-assessment

The way in which centres re-assess learners is integral to the way they manage the award assessment process as a whole. Re-assessment should be subject to same rigorous internal verification as the primary assessment process.

Due to the sampling nature of assessment for the group award units, all learners must be reassessed utilising a substantially different and alternative assessment. This will be

undertaken by the re-assessment of the unit that has not yet achieved the pass grade, and should be based on a substantially different assessment paper.

Re-assessment should be operated in accordance with a centre's assessment policy and the professional judgement of the assessor. The award will utilise current SQA advice that there should normally be at least one re-assessment opportunity available to all learners.

Developing alternative assessments

The design of original assessments should inform the re-assessment process to a large extent as the original determines the type of assessment instruments used and the purpose of the assessment. It is normal practice for centres to build up a bank of assessments which can be used for re-assessment purposes.

Assessment writers should always refer to the unit specification when developing an alternative assessment to ensure that it is of equal demand to the original and that it covers the relevant criteria.

Academic Exemption from IAMI Engineering Officer of the Watch

The SQA Advanced Certificate in Marine Engineering is more than a 70% match with the IAMI syllabus and as such, completing the SQA Advanced Certificate in Marine Engineering will give exemptions for the following courses:

- General Engineering Science A and B examinations
- Control Engineering Examination
- HELM operational level course
- High Voltage operational level course

Academic Exemption from MCA Management Academics

The SQA Advanced Diploma in Marine Engineering is more than a 70% match for the MCA Management academic syllabus. In order to achieve exemptions from MCA Management Academics, learners must achieve an overall average mark of 50% or greater. Successful completion of the SQA Advanced Diploma in Marine Engineering will grant the learner exemption from the following MCA management engineer III/2 (unlimited) level examination:

- Mathematics
- Applied Mechanics
- Applied Heat
- Engineering, Systems and Ship Drawing
- Electro-Technology
- Naval Architecture

The assessment centre must issue an academic transcript of a student's results before academic exemptions can be given.

SQA Advanced Certificate in Marine Engineering Framework

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Graded Unit 1	This graded unit will be assessed by the use of a *closed-book examination* developed by centres. The examination should provide the learner with the opportunity to produce evidence that demonstrates she/he has met the aims of this graded unit. The assessment is an examination lasting three hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Thermodynamics	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessment for all four outcomes should be combined together into one assessment paper which learners should sit at one single assessment event lasting no more than two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Mechanical Principles	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment that should last two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			

SQA Advanced Certificate and Diploma

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Electro-Technology	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. It is recommended that the assessment be completed within two hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Stability and Structure of Merchant Ships	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Each Outcome could be assessed separately in a paper which lasts no more than one hour. However, the assessment could take place as one assessment event which combines all outcomes. Standard formula and appropriate data sheets will be provided to learners.			[redacted]

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Pneumatics and Hydraulic Systems	This Outcome should be assessed as one single assessment and should last no more than one hour. Written and/or oral recorded evidence is required. This assessment should be conducted under closed-book, controlled, supervised conditions and learner should not be allowed to bring any notes text books or other materials into the assessment.	All Knowledge and/or Skills items in Outcome 2 should be assessed. The evidence should be presented in response to an assignment in which learners are asked to complete a series of tasks which will enable them to design, assemble and test a fluid power and control circuit to meet a given design specification. A pneumatic or hydraulic circuit should be chosen for the assignment.	All Knowledge and/or Skills items in Outcome 3 should be assessed. The evidence should be presented in response to an assignment in which the learner is set the task of undertaking fault finding on a practical or computer simulated faulty fluid power system. The system should contain a minimum of two constructional and two operational faults.	[redacted]

SQA Advanced Certificate and Diploma

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Auxiliary Systems	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Written and/or oral evidence for Outcomes 1 and 2 could be combined to one assessment which will be assessed under closed-book supervised conditions of two hours duration. Outcomes 1 and 2 could also be assessed separately each consisting of a single assessment, each lasting one hour which will be assessed under closed-book supervised conditions.		[redacted]	

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Propulsion	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Written and/or oral evidence for Outcomes 1 and 2 could be combined to one assessment which will be assessed under closed-book supervised conditions and should be two hours duration. Outcomes 1 and 2 could also be assessed separately each consisting of a single assessment, each lasting one hour which will be assessed under closed-book supervised conditions.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Fundamentals of Controls and Transducers	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessment for all Outcomes 1, 2 and 3 in this unit should be combined together into one written assessment paper. This paper should be taken by learners at one single assessment event that should last two hours. Standard formula and appropriate data sheets will be provided to learners.			This is a practically based Outcome and **all** of the knowledge and/or skills items should be assessed. The evidence should be presented in response to a practical, laboratory assignment in which each learner is set the task of constructing and demonstrating the operation of a circuit or system that incorporates a transducer.
Engineering Mathematics 1	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The summative assessment of all three outcomes — whether individually or at a single assessment event — should not exceed two hours.			[redacted]

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Legislation and Leadership	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. It is recommended that the assessment be completed within 90 minutes.		Outcome 3 should be an open-book unsupervised assessment and learners may have access to a computer or library for information retrieval.	[redacted]
Safety Engineering and the Environment	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessments for Outcomes 1 and 2 could be combined to form a question paper of 20 short answer and/or structured questions that should be answered in one hour.		Outcome 3 could be assessed by completion of a short report on the hazards associated with a specific piece of equipment. The assessment should last 30 minutes.	For Outcome 4 the learner group should be split into pairs and each pair instructed to carry out a separate risk assessment on a different piece of equipment or activity. Each learner will require to show evidence of the five step risk assessment process and provide the associated documentation to support this. On completion of the risk assessment the learner should submit the completed documentation as evidence.

SQA Advanced Diploma in Marine Engineering Framework

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Graded Unit 1	This graded unit will be assessed by the use of a *closed-book examination* developed by centres. The examination should provide the learner with the opportunity to produce evidence that demonstrates she/he has met the aims of this graded unit. The assessment is an examination lasting three hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Thermodynamics	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessment for all four outcomes should be combined together into one assessment paper which learners should sit at one single assessment event lasting no more than two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Mechanical Principles	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment that should last two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			

SQA Advanced Diploma in Marine Engineering Framework (cont)

<table>
<tr><th rowspan="2">Unit</th><th colspan="4">Assessment</th></tr>
<tr><th>Outcome 1</th><th>Outcome 2</th><th>Outcome 3</th><th>Outcome 4</th></tr>
<tr><td>Marine Engineering: Electro-Technology</td><td colspan="4">Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners.

It is recommended that the assessment be completed within two hours.

Standard formula and appropriate data sheets will be provided to learners.</td></tr>
<tr><td>Marine Engineering: Stability and Structure of Merchant Ships</td><td colspan="3">Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners.

Each outcome could be assessed separately in a paper which lasts no more than one hour. However, the assessment could take place as one assessment event which combines all outcomes.

Standard formula and appropriate data sheets will be provided to learners.</td><td></td></tr>
</table>

SQA Advanced Diploma in Marine Engineering Framework (cont)

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Pneumatics and Hydraulic Systems	This outcome should be assessed as one single assessment and should last no more than one hour. Written and/or oral recorded evidence is required. This assessment should be conducted under closed-book, controlled, supervised conditions and learner should not be allowed to bring any notes text books or other materials into the assessment.	All Knowledge and/or Skills items in Outcome 2 should be assessed. The evidence should be presented in response to an assignment in which learners are asked to complete a series of tasks which will enable them to design, assemble and test a fluid power and control circuit to meet a given design specification. A pneumatic or hydraulic circuit should be chosen for the assignment.	All Knowledge and/or Skills items in Outcome 3 should be assessed. The evidence should be presented in response to an assignment in which the learner is set the task of undertaking fault finding on a practical or computer simulated faulty fluid power system. The system should contain a minimum of two constructional and two operational faults.	

SQA Advanced Diploma in Marine Engineering Framework (cont)

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Auxiliary Systems	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Written and/or oral evidence for Outcomes 1 and 2 could be combined to one assessment which will be assessed under closed-book supervised conditions of two hours duration. Outcomes 1 and 2 could also be assessed separately each consisting of a single assessment, each lasting one hour which will be assessed under closed-book supervised conditions.		[redacted]	

SQA Advanced Diploma in Marine Engineering Framework (cont)

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Propulsion	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Written and/or oral evidence for Outcomes 1 and 2 could be combined to one assessment which will be assessed under closed-book supervised conditions and should be two hours duration. Outcomes 1 and 2 could also be assessed separately each consisting of a single assessment, each lasting one hour which will be assessed under closed-book supervised conditions.			

SQA Advanced Diploma in Marine Engineering Framework (cont)

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Fundamentals of Controls and Transducers	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessment for all Outcomes 1, 2 and 3 in this Unit should be combined together into one written assessment paper. This paper should be taken by learners at one single assessment event that should last two hours. Standard formula and appropriate data sheets will be provided to learners.			This is a practically based outcome and **all** of the knowledge and/or skills items should be assessed. The evidence should be presented in response to a practical, laboratory assignment in which each learner is set the task of constructing and demonstrating the operation of a circuit or system that incorporates a transducer.
Engineering Mathematics 1	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The summative assessment of all three outcomes — whether individually or at a single assessment event — should not exceed two hours.			

SQA Advanced Diploma in Marine Engineering Framework (cont)

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Legislation and Leadership	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. It is recommended that the assessment be completed within 90 minutes.		Outcome 3 should be an open-book unsupervised assessment and learners may have access to a computer or library for information retrieval.	[redacted]
Safety Engineering and the Environment	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The assessments for Outcomes 1 and 2 could be combined to form a question paper of 20 short answer and/or structured questions that should be answered in one hour.		Outcome 3 could be assessed by completion of a short report on the hazards associated with a specific piece of equipment. The assessment should last 30 minutes.	For Outcome 4 the learner group should be split into pairs and each pair instructed to carry out a separate risk assessment on a different piece of equipment or activity. Each learner will require to show evidence of the five step risk assessment process and provide the associated documentation to support this. On

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
				completion of the risk assessment the learner should submit the completed documentation as evidence.
Marine Engineering: Graded Unit 2	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. 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.			
Engineering Mathematics 2	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. The summative assessment of all three outcomes — whether individually or at a single assessment event - should not exceed two hours.			[redacted]

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Management	Outcomes 1 and 2 should be assessed separately. It is recommended that Outcome 1 is assessed by means of an open-book assignment or a case study with a word count of 3,000. Learners should be given clear guidelines, structure, and four subject matters based on the Evidence Requirements, and should be given a completion date. Outcome 2 may be assessed as an assignment in the form of a 3,000 word open-book investigation or case study prepared during the learners' sea phase that demonstrates evidence of four required knowledge and/or skills items concerning management theory on their ship.			
Marine Engineering: Strength of Materials	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment This combined assessment could last for two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Applied Mechanics	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment This combined assessment could last for two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Applied Thermodynamics	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment. This combined assessment could last for two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Heat Engine Principles	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment This combined assessment could last for two and a half hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Naval Architecture	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. It may be assessed outcome by Outcome (four separate one hour assessments), or using any combination of different outcomes and assessed together up to a maximum of three outcomes per single assessment (three hour assessment). Standard formula and appropriate data sheets will be provided to learners.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Ship Construction and Survey	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Each Outcome may be assessed separately or as one single paper lasting no more than two hours.			[redacted]
Marine Engineering: Electrical Power	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Written and/or oral evidence for Outcomes 1–4 should be assessed using one single holistic closed-book assessment held under supervised conditions; it is recommended that the assessment be completed within two hours. Standard formula and appropriate data sheets will be provided to learners.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Electrical Distribution Systems	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1, 2, 3, and 4 should be combined to form an holistic assessment lasting two hours and carried out under supervised, controlled conditions Standard formula and appropriate data sheets will be provided to learners.			
Process Control	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–3 should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks or handouts to the assessment. Outcomes 1–3 can be combined for assessment with assessment lasting two hours 10 minutes. Outcomes 1–3 may be assessed separately with the duration of Outcome 1 lasting 30 minutes, outcome 2 lasting 40 minutes and Outcome 3 lasting one hour.			Outcome 4 should be conducted under open book conditions and learners will be allowed to use any relevant course notes, textbooks and reference material for the control system or simulator. Length of assessment is at the centre's discretion for Outcome 4.

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Marine Engineering: Mechanics	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1–4 should be combined using holistic assessment that should last no more than three hours. Standard formula and appropriate data sheets will be provided to learners.			
Marine Engineering: Electrical Machines	Written and/or oral evidence should be generated through assessment in supervised conditions. Assessment should be conducted under closed-book conditions and as such learners should not be allowed to bring any textbooks, handouts or notes to the assessment. Learners are permitted to use a scientific calculator but not a programmable calculator. Where sampling is used an alternative sample should be used when reassessing learners. Outcomes 1, 2, 3, and 4 should be combined to form a holistic assessment lasting two hours and carried out under supervised, controlled conditions. Standard formula and appropriate data sheets will be provided to learners.			

Unit	Assessment			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
Project Management for IT	Written and/or oral recorded evidence is required which demonstrates that the learner has achieved the requirements of all of the Outcomes to show that the learner has appropriate knowledge and understanding of the content of this unit. It is recommended that Outcomes 1 and 3 be assessed by means of a written and/or oral recorded test under closed-book supervised conditions to assess the learner's knowledge. These outcomes can be assessed together in one assessment presentation, however, an assessor must ensure that a learner has achieved each outcome. Outcome 2 covers the practical skills involved in developing a project schedule, so will be assessed by means of a series of practical tasks to ensure the learner's knowledge and skills.			

6 Guidance on approaches to delivery and assessment

In the design of the SQA Advanced Certificate and SQA Advanced Diploma in Marine Engineering a high level of priority has been placed on producing an award which will allow learners to develop appropriate technical and practical skills which will meet the requirements of employers, prepare learners for the level of responsibility aboard ship and allow future progression to higher rank within the industry or to progress to higher qualifications.

It is not possible to quantify such technical and practical skills in exact detail. The best way, however to prepare learners to meet the changing requirements of the modern maritime industry is to have a solid foundation of theory and practice on which they can build new knowledge, understanding and skills.

Essential skills and Core Skills have been built into the SQA Advanced Certificate award to allow easy progression on to the SQA Advanced Diploma award.

Centres should seek opportunities to integrate Core Skills within their teaching and learning programmes. Opportunities are identified in the support notes of the SQA Advanced Certificate/SQA Advanced Diploma mandatory units.

6.1 Sequencing/integration of units

The below table shows a recommended plan of when each element should be delivered. Individual centres may choose to use their own sequencing.

Unit No.	Unit title	Year	SQA credit	SCQF level	Semester
HW5K 47	Marine Engineering: Graded Unit 1	1	1	7	2
HW5F 47	Marine Engineering: Thermodynamics	1	1	7	1
HW5P 48	Marine Engineering: Mechanics	1	1	7	1
HW5H 47	Marine Engineering: Electro-Technology	1	1	7	1
HW5G 47	Marine Engineering: Stability and Structure of Merchant Ships	1	1	7	1
HW5A 47	Marine Engineering: Pneumatics and Hydraulic Systems	1	1	7	2
HW5C 47	Marine Engineering: Auxiliary Systems	1	1	7	2
HW5E 47	Marine Engineering: Propulsion	1	1	7	1
HT1R 47	Fundamentals of Control systems and Transducers	1	1	7	2
HP48 46	Engineering Mathematics 1	1	1	6	1
HW5D 47	Marine Legislation and Leadership	1	1	7	2
HT7P 47	Safety Engineering and the Environment	1	1	7	1
HR7J 47	Project Management for IT	1	1	7	1
HW62 47	Marine Engineering: Heat Engine Principles	1	1	8	2
HP49 47	Engineering Mathematics 2	1	1	7	2
HW6D 48	Marine Engineering: Graded Unit 2	2	2	8	1/2
HW5W 48	Marine Engineering: Management	2	1	8	2
HW5N 48	Marine Engineering: Strength of Materials	2	1	8	2
HW5R 48	Marine Engineering: Applied Mechanics	2	1	8	2
HW61 48	Marine Engineering: Applied Thermodynamics	2	1.5	8	1
HW5Y 48	Marine Engineering: Naval Architecture	2	2	8	1
HW68 48	Marine Engineering: Ship Construction and survey	2	1	8	2
HW67 47	Marine Engineering: Electrical Power	2	1	7	1
HW63 48	Marine Engineering: Electrical Distribution Systems	2	1	8	1
HW5T 47	Process Control	2	1	7	1
HW5P 48	Marine Engineering: Mechanics	2	1.5	8	1
HW64 48	Marine Engineering: Electrical Machines	2	1	8	2

6.2 Recognition of Prior Learning

SQA recognises that learners gain knowledge and skills acquired through formal, non-formal and informal learning contexts.

In some instances, a full Group Award may be achieved through the recognition of prior learning. However, it is unlikely that a learner would have the appropriate prior learning and experience to meet all the requirements of a full group award.

The recognition of prior learning may **not** be used as a method of assessing in the following types of Units and assessments:

- SQA Advanced Graded Units
- Course and/or external assessments
- Other integrative assessment units (which may or not be graded)
- Certain types of assessment instruments where the standard may be compromised by not using the same assessment method outlined in the unit
- Where there is an existing requirement for a licence to practise
- Where there are specific health and safety requirements
- Where there are regulatory, professional or other statutory requirements
- Where otherwise specified in an assessment strategy

Where the learner requires only the MCA Certificate of Competency, then the learner would be directed to contact the MCA for a 'Letter of Initial Assessment'.

More information and guidance on the *Recognition of Prior Learning* (RPL) may be found on our website **www.sqa.org.uk**.

The following sub-sections outline how existing SQA unit(s) may contribute to this Group Award. Additionally, they also outline how this group award may be recognised for professional and articulation purposes.

6.2.1 Articulation and/or progression

Learners who complete the SQA Advanced Certificate award will have the opportunity to progress onto the SQA Advanced Diploma course. Students who complete the SQA Advanced Diploma route will have the opportunity to progress to higher level qualifications. Students who successfully achieve the SQA Advanced Diploma programme can progress to a number of higher education programmes which match their career aspirations.
Current articulation routes include:

- Sunderland University validated BEng in Marine Engineering
- Strathclyde University validated BEng in Naval Architecture and Marine Engineering

Alternatively, learners who have completed the SQA Advanced Diploma in Marine Engineering and have three years' experience can also articulate directly into an MSc at Strathclyde University.

6.2.2 Professional recognition

One of the core aims of the SQA Advanced Certificate/SQA Advanced Diploma in Marine Engineering is to provide the core academic base in order for learners to progress to an MCA Officer of the Watch Certificate of Competency. The SQA Advanced Certificate and SQA Advanced Diploma awards comply with the academic requirements of the STCW certificates of competency as issued by the MCA.

On completion of the SQA Advanced Certificate and SQA Advanced Diploma in Marine engineering, learners have the opportunity to apply for associate membership of the Institute of Marine Engineering, Science and Technology and subsequently gain incorporated Engineer status with the Engineering Council with additional learner as outlined by IMarEST.

6.3 Opportunities for e-assessment

This mode of delivery will not form any part of the qualification, until a proven record of learner achievement is available. Support materials will utilise an e-learning platform, but this is to supplement existing learning materials.

6.4 Support materials

A list of ASPs will be available to view on SQA's website.

6.5 Resource requirements

A number of units within this group award require a practical element to be delivered. Therefore, centres must have access to the following equipment:

Pneumatics/Hydraulic circuit building facilities. (Pneumatic/Hydraulics unit).

Transducer circuit building facilities (Fundamentals of control systems and transducers unit).

Project Management Software (Project Management for IT).

Staff delivering units in this group award should have a minimum of an SQA Advanced Diploma in a subject appropriate to the unit being delivered or related industrial experience.

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 assessments used within this/these qualification(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 verification can be found in *SQA's Guide to Assessment* **(www.sqa.org.uk/GuideToAssessment)**.

8 Glossary of terms

Embedded Core Skills: is where the assessment evidence for the Unit also includes full evidence for complete Core Skill or Core Skill components. A learner successfully completing the Unit will be automatically certificated for the Core Skill. (This depends on the Unit having been successfully audited and validated for Core Skills certification.)

Finish date: The end of a Group Award's lapsing period is known as the finish date. After the finish date, the Group Award will no longer be live and the following applies:

- learners may not be entered for the group award
- the Group Award will continue to exist only as an archive record on the Awards Processing System (APS)

Graded Unit: Graded units assess learners' 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 learners to retain and adapt their skills and knowledge.

Lapsing date: When a group award is entered into its lapsing period, the following will apply:

- the group award will be deleted from the relevant catalogue
- the group award specification will remain until the qualification reaches its finish date at which point it will be removed from SQA's website and archived
- no new centres may be approved to offer the group award
- centres should only enter learners whom they expect to complete the group award during the defined lapsing period

SQA credit value: The credit value allocated to a Unit gives an indication of the contribution the Unit makes to an SQA group award. An SQA credit value of 1 given to an SQA unit represents approximately 40 hours of programmed learning, teaching and assessment.

SCQF: The Scottish Credit and Qualification Framework (SCQF) provides the national common framework for describing all relevant programmes of learning and qualifications in Scotland. SCQF terminology is used 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 credit points: SCQF credit points provide a means of describing and comparing the amount of learning that is required to complete a qualification at a given level of the Framework. One National Unit credit is equivalent to 6 SCQF credit points. One National Unit credit at Advanced Higher and one SQA Credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: The level a qualification is assigned within the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. SQA Advanced Certificates and SQA Advanced Diplomas are available at SCQF levels 7 and 8 respectively. SQA Advanced Units will normally be at levels 6–9 and Graded Units will be at level 7 and 8. National Qualification group award are available at SCQF levels 2–6 and will normally be made up of National Units which are available from SCQF levels 2–7.

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

Signposted Core Skills: refers to opportunities to develop Core Skills arise in learning and teaching but are not automatically certificated.

9 General information for learners

This section will help you decide whether this is the qualification for you by explaining what the qualification is about, what you should know or be able to do before you start, what you will need to do during the qualification and opportunities for further learning and employment.

This qualification has been designed in order to support the training and promotion of Marine Engineering Officers in the Merchant Navy, in accordance with the academic syllabus laid out by the Maritime and Coastguard Agency (MCA). These qualifications are aimed at school leavers and experienced sea-farers, who are pursuing a career as an Engineering Officer or working in a marine engineering sector.

Although the group awards have been specifically written for the Merchant Navy, there are a range of transferrable knowledge and skills that could be used within the oil and gas industry as well as in the offshore industry.

9.1 SQA Advanced Certificate in Marine Engineering

The SQA Advanced Certificate in Marine Engineering has been designed as a component of a Merchant Navy Engineer Officer Training Scheme. This five phase training scheme consists of alternating college and sea phases. The duration of the training scheme is approximately three years. Approximately eight months of the training will take place at sea.

If you wish to go to sea you should be aware that you must meet the medical standards laid down by the Maritime and Coastguard Agency.

Entry to this qualification is at the discretion of the centre; however you would benefit from having attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- National Certificate in Shipping and Marine Operations (with marine engineering options) [SCQF level 6]
- At least two Higher level (SCQF level 6) passes (grade C or above) of which one should be Mathematics or a Physical Science. Learners should also have National 5 English at SCQF level 5 or better.

Where non-UK qualifications are used to measure suitable entry level, then you would have equivalent qualifications to the above, including English language as necessary.

Whilst the sea service articulated is an integral element of the certification to MCA Certificate of Competency, it does not form part of the SQA Advanced award. For MCA certification sea service is required.

If you study the SQA Advanced Certificate you are likely to have completed the first college and sea phase of your Engineering Cadetship and will have gained an NC in Shipping and Marine Operations. On completion of the SQA Advanced Certificate you will complete further sea time before returning to college to complete your training and sit the examinations for your Maritime and Coastguard Agency (MCA) Engineering Officer of the Watch Certificate (EOOW).

SQA Advanced Certificate and Diploma

The specific aims of the SQA Advanced Certificate are to:

- Prepare you for written and oral examinations for Engineer Officer of the Watch.
- Contribute towards developing skills to enable you to operate a vessel in a safe and effective manner.
- Contribute towards developing skills to enable you to work with others in a safe and effective manner.
- Contribute towards developing skills to deal with emergency situations.
- Develop awareness of current maritime legislation.

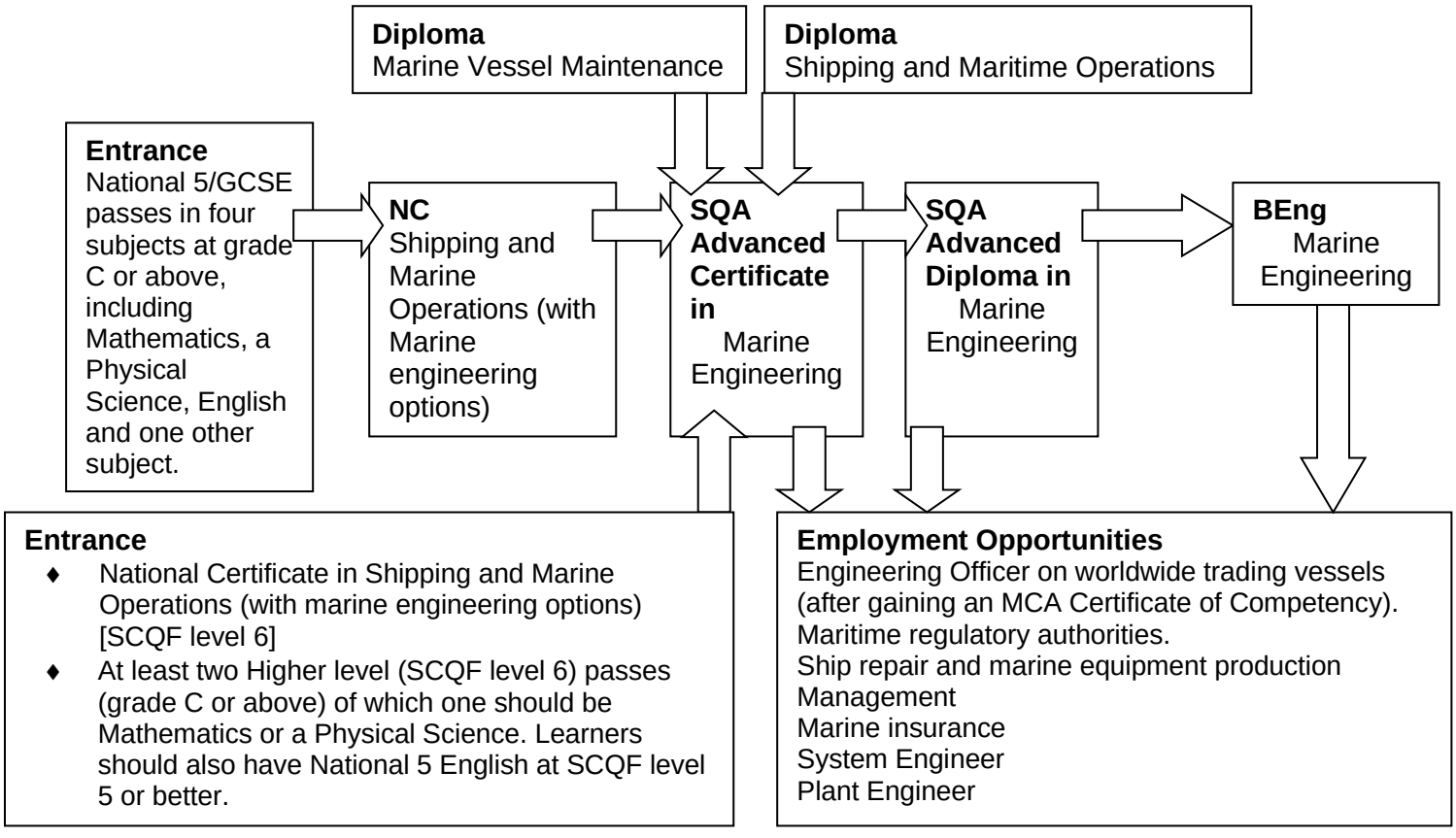
On completion of the full Merchant Navy training programme, you can progress to become an Engineering Officer of the Watch on a Merchant Navy vessel. Once in the industry you can then follow a career path through to Chief Engineer onboard a vessel.

Alternatively after completing the SQA Advanced Certificate in Marine Engineering, you can progress onto an SQA Advanced Diploma in Marine Engineering.

The majority of SQA Advanced Certificate units are assessed by one or more closed-book assessments. In addition the SQA Advanced Certificate award also contains a Graded Unit examination. This is a three hour examination which will take place towards the end of your course. The exam is based on a selection of questions from key units in the programme.

During the SQA Advanced Certificate you will develop five Core Skills — *Communication, Numeracy, Information and Communication Technology (ICT), Problem Solving* and *Working with Others*. You will develop these Core Skills to SCQF level 6.

As explained previously there are several entry possibilities to the SQA Advanced Certificate in Marine Engineering; however the progression through the qualifications would mostly likely follow the route below:



9.2 SQA Advanced Diploma in Marine Engineering

The SQA Advanced Diploma in Marine Engineering has been designed as a component of a Merchant Navy Engineer Officer Training Scheme. This five phase training scheme consists of alternating college and sea phases. The duration of the training scheme is approximately three years. Approximately eight months of the training will take place at sea.

If you wish to go to sea you should be aware that you must meet the medical standards laid down by the Maritime and Coastguard Agency.

Entry to this qualification is at the discretion of the centre; however you would benefit from having attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

The SQA Advanced Certificate in Marine Engineering at SCQF level 7.

Where non-UK qualifications are used to measure suitable entry level, then you would have equivalent qualifications to the above, including English language as necessary.

Whilst the sea service articulated is an integral element of the certification to MCA Certificate of Competency, it does not form part of the SQA Advanced award. For MCA certification sea service is required.

If you study the SQA Advanced Diploma you are likely to have completed the first college and sea phase of your Engineering Cadetship and will have gained an NC in Shipping and Marine Operations. You will then have continued on the pathway by studying the SQA Advanced Certificate in Marine Engineering. On completion of the SQA Advanced Certificate you will complete further sea time before returning to college to complete the SQA Advanced Diploma and sit the examinations for your Maritime and Coastguard Agency (MCA) Engineering Officer of the Watch Certificate (EOOW).

The specific aims of the SQA Advanced Diploma are to:

- Provide an award that on successful completion will allow you to progress to a degree in engineering or a related subject discipline area.
- Provide an award that will give academic exemptions for STCW10 Reg III/2 Chief Engineer Unlimited Engineering Certification.
- Develop knowledge and understanding of the external and internal factors that influence the performance of modern marine plant and vessels.
- Develop a range of communication knowledge and skills relevant to the needs of marine engineers.
- Develop a range of project management skills.
- Develop the analysis and synthesis skills necessary to ensure the efficient operation of marine plant.

On completion of the full Merchant Navy training programme, you can progress to become an Engineering Officer of the Watch on a Merchant Navy vessel. Once in the industry you can then follow a career path through to Chief Engineer onboard a vessel.

SQA Advanced Certificate and Diploma

If you complete the SQA Advanced Diploma route, you have the opportunity to progress to higher level qualifications to match your career aspirations.

Current articulation routes include:

- Sunderland University validated BEng in Marine Engineering
- Strathclyde University validated BEng in Naval Architecture and Marine Engineering

Alternatively, if you have completed the SQA Advanced Diploma in Marine Engineering and have three years' experience can also articulate directly into an MSc at Strathclyde University.

If you successfully complete the SQA Advanced Diploma in Marine Engineering, you will be exempt from management examinations in:

- Mathematics
- Applied Mechanics
- Applied Heat
- Engineering Drawing
- Electro-Technology
- Naval Architecture

In order to gain an SQA Advanced Diploma in Marine Engineering you must gain the 30 SQA credits from the units and graded units you study.

The majority of SQA Advanced Diploma units are assessed by one or more closed-book assessments. In addition the SQA Advanced Diploma award also contains a graded unit examination. This is a three hour examination which will take place towards the end of your course. The exam is based on a selection of questions from key units in the programme.

As part of the 2nd year SQA Advanced Diploma Marine Engineering programme of study you will have to complete a 2 credit graded unit project.

The *Marine Engineering: Graded Unit 2* has been designed to allow you to develop many of the skills you will require to see a project through from start to finish. Some of which will be technical You will also develop a very important range of non-technical skills which are required to successfully manage a project such as planning and organisation, oral and written communication, customer care, evaluation skills, time management and many more.

The project will be broken down into the following three stages: planning, development and evaluation. Your Lecturer will expect you to produce documentation for all three stages. Typical documentation will include a project brief, specification, objectives and schedule, a log book and a project report. You will also be required to do a 10 minute presentation about your project followed by a 5 minute question and answer session.

Your project will be graded based on the following:

Grade	Marks achieved
A	70%–100%
B	60%–69%
C	50%–59%

SQA Advanced Certificate and Diploma

Your Lecturer will mark your work using a 23 point checklist which will allow your mark to be identified for each of the three graded unit stages — planning, development and evaluation, each with its own minimum evidence requirements. If you meet the minimum evidence requirements and obtain the required minimum 50% mark overall, your achievement will be graded as C (competent), A (highly competent), or B (somewhere between A and C) as indicated above.

Your lecturer will provide you with a guide on how you should undertake project work and explain to you the minimum evidence requirements and the criteria on which your project work will be assessed.

During this SQA Advanced Diploma you will develop five Core Skills — *Communication, Numeracy, Information and Communication Technology (ICT), Problem Solving* and *Working with Others*. You will develop these Core Skills to SCQF level 6, and in addition you will be certificated for the Core Skill Numeracy at SCQF level 6 if you pass the *Marine Engineering: Mathematics* Unit.

As explained previously there are several entry possibilities to the SQA Advanced Diploma in Marine Engineering; however the progression through the qualifications to SQA Advanced Diploma would mostly likely follow the route below: