SQA Advanced Unit Specification

General information

Unit title: Marine Engineering Systems (SCQF level 8)

Unit code: HW7J 48

Superclass: XQ

Publication date: November 2017

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This unit is about the operating principles of marine power plants, the function of a vessel's auxiliary machinery and the concepts of control systems from the point of view of the master of a vessel. It is primarily aimed at learners who intend to seek sea-going employment as a Merchant Navy Deck Officer. However, it could also be studied by someone with an interest in the subject area.

Outcomes

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

1 Describe the operating principles of marine power plants.
2 Describe the function and operation of a vessel's auxiliary machinery.
3 Define engineering terms and describe the concepts of control systems.

Credit points and level

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

Recommended entry to the unit

Access to this unit is at the discretion of the centre. However, it would be beneficial if learners had achieved either a UK MCA 'Officer of the Watch' Certificate or equivalent, or the SQA Advanced Certificate in Nautical Science.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes for this unit specification.

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

Context for delivery

If this unit is delivered as part of a group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

This unit is included in the framework of the SQA Advanced Diploma in Nautical Science. It is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

SQA Advanced Unit Specification: Statement of standards

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Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the operating principles of marine power plants.

Knowledge and/or skills

- Operating principles of diesel and turbine plants.
- Factors affecting fuel consumption and accurately perform fuel calculations.

Outcome 2

Describe the function and operation of a vessel's auxiliary machinery.

Knowledge and/or skills

- Function and operational limitations
- Awareness of the relevant regulations
- Steering and manoeuvring systems

Outcome 3

Define engineering terms and describe the concepts of control systems.

Knowledge and/or skills

- Marine engineering terms.
- Operation of vessel monitoring and control systems.

Evidence requirements for this unit

Learners will need to provide written and/or oral recorded evidence in supervised open-book conditions. Outcomes 1, 2 and 3 should be combined for assessment and the single assessment should last no longer than two hours. MCA approved data sheets which are normally available in ship's library, manufacturers' instruction manual will be used.

Outcome 1

For Outcome 1 a minimum of two out of five knowledge and skills should be sampled. A different sample should be used on each assessment occasion.

Learners are required to provide written and or/oral recorded evidence to demonstrate their knowledge and/or skills by showing they can:

1 Describe diesel plant

(a) Diesel propulsion and associated systems
(b) Critical aspects and operational limitations of diesel engine operations

2 Describe steam turbine plant

(a) The layout of steam turbine and associated plant
(b) Critical aspects and operational limitations of boiler and turbine operations

3 Describe gas turbine plant

(a) The layout of gas turbine and associated plant
(b) Critical aspects and operational limitations of gas turbine operations

4 Describe the transmission of power to the propulsion system

5 The factors affecting fuel consumption

(a) Fuel consumption calculations
(b) Conservation of fuel
(c) Propeller pitch and slip

Outcome 2

All knowledge and skills will be assessed in Outcome 2. Learners are required to provide written and or/oral recorded evidence to demonstrate their knowledge and/or skills by showing they can:

1 Describe the function and operational limitations of the following, and have an awareness of the relevant regulations:

(a) Auxiliary boilers
(b) Distillation and freshwater systems
(c) Pumps
(d) Refrigeration and air conditioning systems
(e) Ventilation
(f) Sewage treatment plant
(g) Oily water separation and oil filtering
(h) Incinerators
(i) Electrical power generation and distribution
(j) Stabilisers

2 Describe steering and manoeuvring systems

(a) Ram and rotary systems
(b) Telemotor and transmission system
(c) Auxiliary and emergency steering systems
(d) Thrusters
(e) Relevant regulations

Outcome 3

For Outcome 3 a minimum of two out of four knowledge and skills should be sampled. A different sample should be used on each assessment occasion.

Learners are required to provide written and or/oral recorded evidence to demonstrate their knowledge and/or skills by showing they can:

1 Marine engineering terms

(a) Terms in common use consistent with use in UK regulations

2 The concept of control systems

(a) Open and closed loops and their components
(b) Types of control action
(c) Practical shipboard applications

3 Explain the need for and describe the function and operation of:

(a) Data loggers
(b) Mimic diagrams
(c) Analogue and digital displays
(d) Shipboard applications of the above

4 Describe the principles of bridge control

(a) Principles of bridge control, including fail safe, fail run and safety interlocks for:
    (i) slow speed diesel engines
    (ii) medium speed diesel engines fitted with controllable pitch propeller or reversing gearbox
    (iii) steam turbines with associated boilers
    (iv) gas turbines
    (v) thruster systems
(b) Interchanging bridge and engine room control
(c) Requirements for plant monitoring and alarm systems for UMS Operations
(d) Integrated bridge systems

SQA Advanced Unit support notes

Unit title: Marine Engineering Systems (SCQF level 8)

Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

The content of this unit forms part of the underpinning knowledge for an UK MCA Chief Mate Certificate of Competency and accordingly reflects the content of International Maritime Organisation's Standards of Training Certification and Watchkeeping (STCW).

Acronyms

BP	Brake Power
CPP	Controllable Pitch Propeller
DP	Delivered Power
EP	Effective Power
IP	Indicated Power
MCR	Maximum Continuous Rating
STCW	Standards of Training, Certification and Watchkeeping for Seafarers

Guidance on approaches to delivery of this unit

Learners will benefit most if this unit is delivered during the final phase of the SQA Advanced Diploma in Nautical Science at which stage learners will be best able to draw on the knowledge gained from the qualifications or units recommended as prior knowledge as well as experience gained from service at sea.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Outcomes 1, 2 and 3 may be assessed by means of a single unseen assessment using MCA approved data sheets, manufacturers' instruction manual as appropriate in open-book supervised conditions consisting of a mixture of multiple choice or short answer questions by sampling the elements of the outcomes. Combine the elements where practical to assess the learners' ability to apply the knowledge gained from these outcomes. If multiple choice questions used, the choices for the questions must elate to the verbs in outcomes.

Learners will need to provide written and/or oral recorded evidence in supervised open-book conditions. Outcomes 1, 2 and 3 should be combined for assessment and the single assessment should last no longer than 2 hours.

Outcome 1

Outcome 1 will be sample assessed by means of structured multiple choice/short answer questions under supervised conditions on the operating principles of marine power plants, the factors affecting fuel consumptions and fuel calculations.

Outcome 2

Outcome 2 will be sample assessed by means of multiple choice/short answer questions under supervised conditions on the operation of a vessel's auxiliary machinery.

Outcome 3

Outcome 3 will be sample assessed by means of multiple choice/short answer questions under supervised conditions on control systems.

Learners will need to provide written and/or oral recorded evidence in supervised open-book conditions. Outcomes 1, 2 and 3 should be combined for assessment and the single assessment should last no longer than two hours under supervised conditions.

Outcomes 1, 2 and 3 may be assessed by means of a single unseen assessment using MCA approved data sheets which are normally available in ship's library, manufacturers' instruction manual as appropriate in open-book supervised conditions consisting of a mixture of multiple choice or short answer questions. Some elements may be combined where practical to assess the learners' ability to apply the knowledge gained from these outcomes. Duration should not normally exceed two hours and can be reduced if multiple choice questions assessment is used.

Where multiple choice questions are used for assessment, these multiple choices must be of explanation/description type choices at SCQF level 8.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

There may be opportunities to gather evidence towards Core Skills in this unit, although there is no automatic certification of Core Skills or Core Skills components.
Core Skills covered in this unit are *Communication* by means of Oral and Written Communication, *Problem Solving* and *Numeracy*.

History of changes to unit

Version	Description of change	Date

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for learners

Unit title: Marine Engineering Systems (SCQF level 8)

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

This unit is about the operating principles of marine power plants, the function of a vessel's auxiliary machinery and the concepts of control systems from the point of view of the master of a vessel.

On completion of this unit you should be able to:

- Describe the operating principles of marine power plants.
- Describe the function and operation of a vessel's auxiliary machinery.
- Define engineering terms and describe the concepts of control systems.

Assessment will be on a sample basis for Outcomes 1 and 3. All knowledge and skills will be assessed in Outcome 2. All outcomes may be assessed by structured multiple choice/short answer questions under supervised conditions and should not exceed two hours.

Outcomes 1, 2 and 3 may be assessed by means of a single unseen assessment using MCA approved data sheets, manufacturers' instruction manual as appropriate in open-book supervised conditions and could consist of a mixture of multiple choice or short answer questions.

There may be opportunities to gather evidence towards Core Skills in this unit, although there is no automatic certification of Core Skills or Core Skills components.

Components of Core Skills that are covered in this unit are Oral and Written Communication, *Problem Solving* and *Numeracy*.