



National Unit specification: general information

Unit title: Marine Engineering Practice: An Introduction
(SCQF level 6)

Unit code: F9K6 12

Superclass: XQ

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Summary

This Unit is designed to provide candidates with knowledge and understanding of the machinery in a ship's engine room and its interdependency. During delivery of the Unit candidates will learn the construction of both marine diesel engines and steam propulsion plant. Candidates will also develop the knowledge and understanding of the many different systems to be found onboard ship. Candidates will also learn the regulations regarding the overboard discharge of oil from the machinery spaces of a ship.

This Unit is suitable for candidates training to be marine engineer officers or engineers involved in the repair and construction of plant within a ship.

Outcomes

- 1 Demonstrate knowledge of the construction of motor propulsion plant.
- 2 Demonstrate knowledge of the construction of a steam propulsion plant.
- 3 Demonstrate knowledge of pumps and pumping systems.
- 4 Demonstrate knowledge of auxiliary systems onboard ships.

Recommended entry

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ Physics or Technological Studies at SCQF level 5
- ◆ Physics or Technological Studies at SCQF level 5

General information (cont)

Credit points and level

1 credit at SCQF level 6 (6 SCQF credit points at SCQF level 6*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Core Skills

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

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

National 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.

Outcome 1

Demonstrate knowledge of the construction of motor propulsion plant.

Performance Criteria

- (a) Describe correctly the difference between two-stroke and four-stroke cycles.
- (b) State correctly the component parts of a marine diesel engine.
- (c) Sketch correctly the support systems for a marine diesel engine.

Evidence Requirements

Candidates must:

- ◆ be able to correctly demonstrate the difference between a two-stroke and four-stroke cycle by replicating the timing diagram of a diesel engine and identifying the salient points
- ◆ be able to correctly state the component parts of marine diesel engine
- ◆ sketch correctly support systems for a marine motor propulsion plant and identify the component parts

Outcome 2

Demonstrate knowledge of the construction of a steam propulsion plant.

Performance Criteria

- (a) Sketch correctly the layout of a marine steam propulsion plant.
- (b) State correctly the component parts of a marine boiler.
- (c) State correctly the component parts of a marine steam turbine.

Evidence Requirements

Candidates must:

- ◆ sketch correctly the layout of a marine steam propulsion plant and identify the component parts
- ◆ be able to identify and correctly state the components of a marine boiler
- ◆ be able to identify and correctly state the components of a marine steam turbine

National Unit specification: statement of standards (cont)

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Outcome 3

Demonstrate knowledge of pumps and pumping systems.

Performance Criteria

- (a) State correctly the difference between dynamic and displacement pumps.
- (b) State correctly the component parts of a centrifugal pump.
- (c) State correctly the constructional details of different types of displacement pumps.
- (d) Sketch correctly a typical pumping system.

Evidence Requirements

Candidates must:

- ◆ correctly state the difference between the principles of operation of dynamic and displacement pumps
- ◆ be able to identify and correctly state the components of a centrifugal pump
- ◆ be able to identify and correctly state the constructional details of the different types of displacement pumps
- ◆ be able to sketch correctly a pumping system and identify the component parts

Outcome 4

Demonstrate knowledge of auxiliary systems onboard ships.

Performance Criteria

- (a) Sketch correctly shipboard pneumatic systems.
- (b) Sketch correctly shipboard refrigeration and air conditioning systems.
- (c) Identify correctly the operation of deck and cargo handling machinery.
- (d) Sketch correctly fresh water generation and sewage plant.
- (e) State correctly the regulations regarding oil pollution from ships.

Evidence Requirements

Candidates must:

- ◆ be able to sketch correctly a shipboard pneumatic system and identify the component parts
- ◆ be able to sketch correctly a shipboard refrigeration plant and marine air conditioning plant, identifying the component parts
- ◆ be able to identify the different types of deck machinery and cargo handling equipment and its principle of operation
- ◆ be able to sketch correctly a shipboard fresh water plant and marine sewage treatment plant, identifying the component parts
- ◆ be able to state the regulations regarding pollution by oil from ships

National Unit specification: statement of standards (cont)

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Evidence Requirements for this Unit

Outcomes 1, 2, 3 and 4 may be assessed on an individual basis, as a combination of Outcomes (eg Outcomes 1 and 2 assessed together and Outcomes 3 and 4 together), or as a single, holistic assessment covering all four Outcomes. The total time for assessment(s) of the four Outcomes must not exceed two hours. Assessment(s) must be conducted under supervised, closed-book conditions in which candidates may use reference materials provided by the centre but are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment.

National Unit specification: support notes

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This part of the Unit specification is offered as guidance. The support notes 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

This Unit forms part of the National Qualification Group Award in Shipping and Maritime Operations at SCQF level 6, but may also be offered on a free standing basis.

The aim of this Unit is to provide candidates with an introduction to the propulsion plant and various ancillary systems to be found onboard ship. On successful completion of the Unit candidates will be able to identify the component parts of a marine propulsion plant. They will have developed the knowledge and understanding of the dependency of the propulsion plant on various support systems. Candidates will also understand the choice of pump used in particular systems. They will have developed the knowledge and understanding of the auxiliary systems found onboard ship. Candidates will be made aware of the significance of the regulations regarding oil pollution.

Due to the complementary nature of their content the delivery of this Unit may be integrated with that of the Unit *F7HB 12: Shipboard Operations: An Introduction* at SCQF level 6.

Due to the close relationship between the content of Outcomes 1 and 2, centres may choose to integrate their delivery. In Outcome 1, candidates should be introduced to the difference between two-stroke and four-stroke engines and their timing diagrams. The component parts of a marine diesel engine are identified and the layout of the support systems for the plant is defined. The layout of a marine steam propulsion plant is defined in Outcome 2. The component parts of marine boilers and steam turbines are identified.

In Outcome 3 the operating principles of dynamic and displacement pumps are explained. The component parts of the centrifugal pump are identified and the different types of displacement pumps established. The circumstances for the use of particular pumps are explained. Typical pumping system layouts are defined.

In Outcome 4 shipboard auxiliary systems are introduced. Typical pneumatic systems are defined. The provision of refrigeration plant is defined as is a typical shipboard air conditioning plant. The principles of operation of the various deck machinery are detailed. The shipboard equipment used in the loading and unloading of cargo is identified as well as their principle of operation. Cargo conditioning plant is defined. The plant used to convert sea water to fresh water is explained as is that for the treatment of sewage. The regulations for the prevention of pollution by oil from a ship's machinery space are explained and the penalties for ignoring these regulations emphasised. Although not formally covered in the Unit, centres may wish to make reference to the other pollution regulations.

National Unit specification: support notes

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Guidance on learning and teaching approaches for this Unit

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit may be delivered by a combination of lectures, tutorial work, and computer simulation. While the majority of the Unit can be delivered in a classroom centres should try to allow candidates to visit a vessel in order that they can better understand the size and complexity of the engine room of a ship.

Manufacturers' DVDs may be used to illustrate typical plant and their operation and/or maintenance.

Computer simulation illustrating the different shipboard systems and principles of operation of different types of plant may also provide a good source of learning.

The Internet contains a rich source of materials on marine engineering. Wall charts illustrating different propulsion plant and auxiliary plant can also be a very useful learning and teaching aid.

The Unit should be fully supported with relevant learning materials (eg handouts in paper and electronic form, textbooks, on-line materials etc.)

Opportunities for developing Core Skills

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

Information and Communication Technology: Accessing Information at SCQF level 5.
In Outcomes 1, 3 and 4 candidates will be expected to identify ship types from outline diagrams and sketches plus within a particular ship type they will have to be able to identify the functions of the various compartments within the vessel. Candidates may make effective, independent, and responsible use of ICT to access information on ship types.

Information and Communication Technology: Providing/Creating Information at SCQF level 5.

Candidates may have opportunities to use a ship simulator during this Unit which will involve them in evaluating information and extracting information to screen.

Communication: Written Communication (Reading) at SCQF level 5.
In all Outcomes candidates will identify significant information, ideas, and supporting details when learning about propulsion plant and auxiliary systems.

Working with Others: Working Co-operatively with Others at SCQF level 5.
In all Outcomes candidates will provide support to others to complete activities in class work and present this information to the group.

Problem Solving: Critical Thinking at SCQF level 5.
In Outcome 2 candidates will be asked to consider what precautions are required, on board a ship during the loading, discharging and carriage of liquid bulk cargoes to ensure that marine pollution does not occur.

National Unit specification: support notes (cont)

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Guidance on approaches to assessment for this Unit

Centres are encouraged to use formative assessment extensively as it plays a particularly important role in allowing candidates to develop a sound knowledge and understanding of engineering concepts, principles and equations.

Regardless of whether assessment is carried out on an individual basis, as a combination of Outcomes or on a single, holistic basis any assessment paper(s) used may comprise a suitable balance of short answer, restricted response and structured questions.

Opportunities for the use of 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 e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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