



Higher National Unit specification: general information

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Unit code: H0EF 35

Superclass: XQ

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Unit purpose

This Unit is designed to enable candidates to develop their knowledge and understanding of Ship Construction. The Unit will allow candidates to apply the principles of Ship Construction.

On completion of the Unit the candidate should be able to:

- 1 Analyse the construction of various specialised vessels.
- 2 Analyse Propeller and Rudder construction and operation.
- 3 Analyse ship's structure with reference to fire protection, vibration and noise.
- 4 Analyses the Loadline Rules with particular reference to the conditions of assignment.

Recommended prior knowledge and skills

It is recommended that candidates will have completed the Unit *Marine Engineering: Ship Construction* (F913 34) and *Marine Engineering: Naval Architecture* (F911 34) before commencing this Unit.

Credit points and level

1 Higher National Unit credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**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.*

General information (cont)

Core Skills

There are opportunities to develop the Core Skills of *Communication* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery

This Unit was developed for the HND Marine Engineering award. If the Unit is delivered as part of another Group Award it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Higher National Unit specification: statement of standards

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Unit code: H0EF 35

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

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. Candidates 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

Analyse the construction of various specialised vessels.

Knowledge and/or Skills

- ◆ Cargo systems for gas.
- ◆ Secondary barriers.
- ◆ Containment systems for LNG and LPG.
- ◆ Dealing with boil-off.
- ◆ Compatibility of chemical cargoes
- ◆ Understand chemical cargo designations.
- ◆ Carriage of LNG and LPG.
- ◆ Safety measures required for liquefied gas and chemical cargoes.

Evidence Requirements

Evidence for the Knowledge and/or Skills items in Outcome 1 should be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that they can answer correctly questions based on a sample of the knowledge and skills items listed in the Outcome. In any assessment of this Outcome, **four out of eight** Knowledge and/or Skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of four out of eight Knowledge and/or Skills items are required each time the Unit is assessed. Candidates must provide a satisfactory response to all items.

Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be permitted to use scientific calculators during the assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing the candidate is able to:

- ◆ Analyse four main cargo systems and identify which gas they are most suitable for:
 - fully pressurised
 - semi-pressurised/semi refrigerated
 - Semi-pressurised/fully refrigerated
 - Fully refrigerated at atmospheric pressure
- ◆ Appraise secondary barriers
- ◆ Describe the following containment systems and how they are insulated
 - free-standing-prismatic
 - free-standing-spherical
 - membrane
- ◆ compare methods used to deal with cargo boil off
- ◆ classify compatibility with regard to chemical cargoes describing how it is catered for with respect to:
 - different cargoes
 - air
 - water
 - tank coatings
 - temperature
 - self reaction
- ◆ Differentiate between chemical cargo designations A, B and C
- ◆ Analyse the tank construction for different cargo designations, including the use of coatings and materials in cargo tanks and identify suitable materials
- ◆ Appraise the measures taken to ensure crew personal safety for liquefied gas carriers and chemical cargoes

Outcome 2

Analyse Propeller and Rudder construction and operation.

Knowledge and/or Skills

- ◆ Rudders used on Merchant ships.
- ◆ Reasons for different rudder types.
- ◆ Cavitation and its effects on propeller and rudder.
- ◆ Design features of propellers that reduce cavitation.
- ◆ Practical methods of reducing cavitation in operation.

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Evidence Requirements

Evidence for the Knowledge and/or Skills items in Outcome 2 should be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that they can answer correctly questions based on a sample of the knowledge and skills items listed in the Outcome. In any assessment of this Outcome, **three out of five** Knowledge and/or Skills items should be sampled.

Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be permitted to use scientific calculators during the assessment.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of three out of five Knowledge and/or Skills items are required each time the Unit is assessed. Candidates must provide a satisfactory response to all items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing the candidate is able to:

- ◆ Appraise the different types of rudder used and their construction:
 - unbalanced
 - semi-balanced
 - balanced
 - spade
 - hinged
- ◆ Analyse the reasons for using different types of rudders
- ◆ Identify areas affected by cavitation and the effects of net pressure on the rudder blade and vapour pressure of water, and how cavitation causes erosion of blades, vibration and reduction in efficiency
- ◆ Appraise factors of propeller design which reduce cavitation
- ◆ Evaluate practical methods of reduction of cavitation by ship staff

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Outcome 3

Analyse ship's structure with reference to fire protection, vibration and noise.

Knowledge and/or Skills

- ◆ Structural fire protection arrangements.
- ◆ Construction requirements of fire class bulkheads.
- ◆ Sources of vibration within a vessel.
- ◆ The effects of vibration.
- ◆ Vibration reduction
- ◆ The source of noise and its transmission throughout a vessel.
- ◆ Reduction of noise transmission.

Evidence Requirements

Evidence for the Knowledge and/or Skills items in Outcome 3 should be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that they can answer correctly questions based on a sample of the knowledge and skills items listed in the Outcome. In any assessment of this Outcome, **four out of seven** Knowledge and/or Skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of four out of seven Knowledge and/or Skills items are required each time the Unit is assessed. Candidates must provide a satisfactory response to all items.

Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be permitted to use scientific calculators during the assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing the candidate is able to:

- ◆ Appraise fire division classification by reference to their fire resistance and the structural arrangements for fire protection in passenger ships, dry cargo ships and oil tankers.
- ◆ Outline the requirements for openings in A-class divisions and the protection of stairways, lift shafts and ventilation trunks.
- ◆ Identify possible causes of vibration, correctly using the terms frequency, amplitude, resonance, mode, node and anti-node.
 - Action of the sea
 - Out of balance forces in machinery
 - Force on the propeller
 - Propeller-hull interaction
 - Deck machinery
- ◆ Analyse a vessels natural frequency, identifying how vibration can cause structural failure, failure of equipment and crew/passenger discomfort.
- ◆ Appraise methods of vibration reduction regarding stern design, propeller design, machinery seating and ships load condition.
- ◆ Analyse sources of noise and how its transmission throughout the vessel.
- ◆ Appraise methods of noise reduction by structural and machinery arrangement.

Outcome 4

Analyses the Loadline Rules with particular reference to the conditions of assignment.

Knowledge and/or Skills

- ◆ Assignment of freeboard.
- ◆ Factors required to maintain conditions of assignment.
- ◆ Information required for tonnage measurement.
- ◆ The tonnage certificate.

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Evidence Requirements

Evidence for the Knowledge and/or Skills items in Outcome 4 should be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that they can answer correctly questions based on a sample of the knowledge and skills items listed in the Outcome. In any assessment of this Outcome, **two out of four** Knowledge and/or Skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of two out of four Knowledge and/or Skills items are required each time the Unit is assessed. Candidates must provide a satisfactory response to all items.

Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be permitted to use scientific calculators during the assessment.

If a candidate requires to be re-assessed, a different selection of questions must be used from all sections. A significant proportion of the questions used in the re-assessment must be different from those used in the original test.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing the candidate is able to:

- ◆ Appraise the criteria used for assignment of freeboard.
 - adequate ship strength
 - adequate reserve buoyancy
 - prevention of entry of water into hull
 - safe height of working platform and protection of crew
 - deck wetness in relation to bow height
 - stability and compartmentation
- ◆ Analyse the main factors required to maintain conditions of assignment.
 - hatchways
 - machinery space openings
 - openings in freeboard and superstructure decks
 - vents, air pipes, cargo doors and other openings in hull below the freeboard deck
 - side scuttles, freeing ports
 - guard rails, gangways
- ◆ Compile the information required for tonnage measurement.
- ◆ Analyses the function of the tonnage certificate.

Higher National Unit specification: support notes

Unit title: Marine Engineering: Advanced Ship Construction and Survey

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 is primarily aimed at candidates who intend to seek sea going employment as a Merchant Navy Engineering Officer and the Unit will meet the Merchant and Coastguard Agency (MCA) requirements up to Class 1 Certificate of Competency.

This Unit has been written in order to allow candidates to develop knowledge and understanding of the construction of ships in the following areas:-

- 1 Analyse the construction of various specialised vessels.
- 2 Analyse Propeller and Rudder construction and operation.
- 3 Analyse ship's structure with reference to fire protection, vibration and noise.
- 4 Analyse the Loadline Rules with particular reference to the conditions of assignment.

In designing this Unit, the Unit writer has identified the range of topics expected to be covered by lecturers. In delivering the Unit material used should relate to real life examples, using marine terminology, as found aboard modern ships. As new technology is incorporated in ships the Unit delivery should be updated to reflect modern design and usage.

Guidance on the delivery of this Unit

This Unit should be delivered by a combination of whole class teaching, tutorial work and practical examples where possible such as ship visits. The latter is seen as particularly important as it provides candidates with an opportunity to relate theoretical knowledge to a practical context.

Where this Unit is incorporated into other Group Awards it is recommended that it be delivered in the context of the specific occupational area(s) that the award is designed to cover.

The Unit has been written such that there is sufficient time built in to allow candidates to practise what they have learnt through appropriate formative assessments.

Higher National Unit specification: support notes (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Guidance on the assessment of this Unit

Assessment should be carried out in supervised conditions. Each Outcome may be assessed separately or as one single paper lasting no more than 2 hours. 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. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be permitted to use scientific calculators during the assessment.

If a candidate requires to be re-assessed, a different selection of questions must be used from all sections. A significant proportion of the questions used in the re-assessment must be different from those used in the original test.

Assessment Guidelines

Outcome 1

The assessment of this Outcome could be combined together with that for Outcomes 2, 3 and 4 to form a single assessment paper, details of which are given under the Evidence Requirements for Outcome 4.

Outcome 2

The assessment of this Outcome could be combined together with that for Outcomes 1, 3 and 4 to form a single assessment paper, details of which are given under the Evidence Requirements for Outcome 4.

Outcome 3

The assessment of this Outcome could be combined together with that for Outcomes 1, 2 and 4 to form a single assessment paper, details of which are given under the Evidence Requirements for Outcome 4.

Outcome 4

The assessment of this Outcome could be combined together with that for Outcomes 1, 2 and 3 to form a single assessment paper.

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

Higher National Unit specification: support notes (cont)

Unit title: Marine Engineering: Advanced Ship Construction and Survey

Online and Distance Learning

This Unit is suitable for open learning, however candidates would require to sit assessments at a SQA centre.

Opportunities for developing Core Skills

The presentation of problems in assessments which candidates require to interpret and work through will develop the Critical Thinking component of *Problem Solving*, at SCQF level 6. This will allow candidates to develop the specific Core Skill elements 'Assess the relevance of these factors to the situation or issue' and 'Develop and justify an approach to deal with the situation or issue'.

In the answering of assessment work candidates may have the opportunity to develop Written Communication of the Core Skill *Communication* at SCQF level 6. The specific Core Skill elements that the candidate may have to complete are 'Use conventions which are effective in achieving the purpose of the piece and adapted as necessary for the target audience'.

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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General information for candidates

Unit title: Marine Engineering: Advanced Ship Construction and Survey

This Unit has been designed to allow you to further develop knowledge, skills and understanding in Ship construction and survey.

This Unit will also provide you with an opportunity to study the practical design considerations of several important aspects of ship construction and the requirements for the Load line survey.

The formal assessment for this Unit will consist of a single assessment paper lasting no more than two hours. The assessment will be conducted under closed-book conditions in which you will not be allowed to take notes, textbooks, etc. into the assessment. You will sit this assessment paper at the end of the Unit.

This Unit will consist of 4 Outcomes that you will study

- 1 Analyse the construction of various specialised vessels.
- 2 Analyse Propeller and Rudder construction and operation.
- 3 Analyse ship's structure with reference to fire protection, vibration and noise
- 4 Analyses the Loadline Rules with particular reference to the conditions of assignment.

There are opportunities for you to develop Core Skills of *Communication* and *Problem Solving* at SCQF level 6 within the assessment and teaching approaches used in this Unit.