



Regulated Qualifications Unit and Assessment Specification

Unit title	Marine Heat Engines
Regulator unit code	Y/616/7395
SQA unit code	FF25 57

History of changes

Publication date: January 2011

Version: 02 (December 2017)

Version number	Date	Description	Authorised by
02	December 2017	Unit Specification updated to reflect current Ofqual terminology.	Qualifications Officer

© Scottish Qualifications Authority 2011

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Regulated unit specification

Title	Marine Heat Engines	
Level	3	
Credit value	4	
Outcomes	Assessment criteria	
The learner will:	The learner can:	
1 Be able to determine the effects of applying heat energy to solids and liquids.	1.1	State practical examples, related to the marine industry, of thermal expansion and contraction.
	1.2	Solve problems relating to change of temperature and change of dimensions of solids and liquids.
	1.3	Solve problems relating to mass, specific heat capacity and temperature change.
	1.4	Describe how changes of state occur without change of temperature.
2 Understand heat transfer and the effect of insulation.	2.1	Define and give examples of conduction, convection and radiation applied to the marine industrial environment.
	2.2	Identify the direction of transfer of heat energy.
	2.3	Determine the heat transfer through a single wall.
	2.4	State the effects of insulation on heat transfer.
3 Be able to determine the properties of working fluids.	3.1	Explain the meaning of the term working fluid and the concept of the state of the working fluid.
	3.2	Apply the gas equations and determine the properties of ideal gases.
4 Be able to sketch thermodynamic processes on p-V diagrams.	4.1	Sketch thermodynamic processes on p-V diagrams for an ideal gas.
	4.2	Determine the properties of vapours using thermodynamic property tables.

Outcomes	Assessment criteria
The learner will:	The learner can:
<p>5 Be able to determine the energy of different marine thermodynamic systems using the non-flow and steady flow energy equations.</p>	<p>5.1 State the types of energy and their Units relevant to marine thermodynamic systems.</p> <p>5.2 State the terms in the non-flow energy equation.</p> <p>5.3 Apply the non-flow energy equation to closed marine thermodynamic systems.</p> <p>5.4 State the terms in the steady flow energy equation.</p> <p>5.5 Apply the steady flow energy equation to an open marine thermodynamic system.</p>
<p>6 Understand, using an analysis by mass, the combustion of marine grade fuels.</p>	<p>6.1 State the types of fuels available for use in marine internal combustion engines and boilers.</p> <p>6.2 State the combustion equations for carbon, hydrogen and sulphur.</p> <p>6.3 Define the higher and lower calorific values of a marine fuel.</p> <p>6.4 Calculate the combustion analysis of a marine grade fuel by mass.</p> <p>6.5 State the effect of insufficient and excess air in relation to marine internal combustion engines and boilers.</p>

Additional information about the unit
Unit purpose and aim(s)
To provide learners with knowledge and understanding of engineering thermodynamics applied to marine heat engines.
Unit start date
01/01/2011
Details of the relationship between the unit and relevant national occupational standards (if appropriate)
MNTB NOS (Jan 2006) — C11 Prepare and operate vessel propulsion machinery and ancillary systems C12 Operate vessel auxiliaries and service machinery C34 Carry out maintenance of vessel mechanical machinery and systems
Details of the relationship between the unit and other standards or curricula (if appropriate)
Maritime and Coastguard Agency Marine Guidance Notice regarding Certificates of Competency — Engine Department.
Assessment requirements specified by a sector or regulatory body (if appropriate)
MSA Assessment Strategy MCA Requirements
Endorsement of the unit by a sector or other appropriate body (if required)
MCA
Location of the unit within the subject/sector classification system
4.3 Transportation Operations and Maintenance
Name of the organisation submitting the unit
SQA
Guided learning hours
36

Regulated qualifications assessment specification

Assessment (evidence) requirements

The following evidence is required to demonstrate that learners have the appropriate level of knowledge to undertake *Marine Heat Engines*. All outcomes and assessment criteria must be achieved.

Written and/or recorded oral evidence produced either on or off-the-job is required for the following:

- ◆ Outcomes 1, 2, 3, 4, 5 and 6

An approved Maritime Skills Alliance (MSA) approved Training Record Book (TRB) should be used to record evidence of achievement.

Guidance on assessment

Short answer written questions could be used supplemented by oral questions.