



Australian Government

AURRTE011 Overhaul two and four-stroke cycle marine outboard engines

Release: 1

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Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to return marine outboard engines to original manufacturer tolerances and clearances. It involves preparing for the task, dismantling and evaluating the engine, carrying out the overhaul procedures, reassembling and testing the engine, and completing workplace processes and documentation.

It applies to those working in the marine service and repair industry. The marine outboard engines include two and four-stroke spark ignition engines.

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Competency Field

Marine

Unit Sector

Technical - Engines

Elements and Performance Criteria

Elements	Performance Criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold and italicised text is used, further information is detailed in the range of conditions section.
1. Prepare to dismantle engine	1.1 Job requirements are determined from workplace instructions 1.2 Dismantling information is sourced and interpreted 1.3 Dismantling options are analysed and those most appropriate to the circumstances are selected

Elements Elements describe the essential outcomes.	Performance Criteria Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold and italicised text is used, further information is detailed in the range of conditions section.
	1.4 Hazards associated with the work are identified and risks are managed 1.5 Dismantling tools and equipment are selected and checked for serviceability
2. Dismantle and evaluate engine and components	2.1 Engine and relevant components are dismantled in a logical sequence according to manufacturer and workplace procedures, and safety and environmental requirements , and without causing unnecessary damage to components or systems 2.2 Components are cleaned for evaluation according to workplace procedures and safety and environmental requirements 2.3 Components are measured and compared with manufacturer specifications and serviceability is determined 2.4 Component repair method is determined 2.5 Unserviceable parts are identified and replacement parts sourced
3. Carry out overhaul	3.1 Overhaul information is sourced and interpreted 3.2 Overhaul options are analysed and those most appropriate to the circumstances are selected 3.3 Overhaul tools and equipment are selected and checked for serviceability 3.4 Components are machined, repaired and replaced as required, and adjustments are carried out according to manufacturer specifications, workplace procedures, and safety and environmental requirements, and without causing damage to components or systems
4. Assemble engine and components	4.1 Engine is assembled according to manufacturer specifications, workplace procedures, and safety and environmental requirements 4.2 Tolerances and clearances are measured against manufacturer specifications and adjustments are made as required 4.3 Assembly of engine is completed within workplace timeframes and without causing damage to other components or systems 4.4 Post-assembly testing is carried out according to workplace procedures, and safety and environmental requirements, and any problems detected as having been introduced during the assembly process are rectified
5. Complete work processes	5.1 Final inspection is made to ensure work is to workplace expectations and engine is presented ready for use or storage 5.2 Work area is cleaned, waste and non-recyclable materials are

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	disposed of, and recyclable material is collected 5.3 Tools and equipment are checked and stored according to workplace procedures 5.4 Workplace documentation is processed according to workplace procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance and are not explicit in the performance criteria.

Skills	Description
Learning skills to:	locate sources of information for engines efficiently.
Reading skills to:	interpret and assess information from manufacturer and workshop literature when seeking engine specifications and procedures.
Writing skills to:	legibly and accurately fill out workplace documentation when reporting diagnostic findings, making repair recommendations, and recording parts and material used.
Oral communication skills to:	clarify instructions, report evaluation findings and make overhaul recommendations.
Numeracy skills to:	measure engine components and use basic mathematical operations, including addition, subtraction, multiplication and division, to calculate distances, areas, volumes, tolerances and deviations from manufacturer specifications.
Planning and organising skills to:	plan own work requirements and prioritise and sequence actions to achieve required outcomes and ensure tasks are completed within workplace timeframes.
Technology skills to:	- use precision measuring equipment, such as micrometers and dial bore gauges - use specialised engine overhaul equipment, such as: - hones - valve and valve seat cutting machinery.

Range of Conditions

This section specifies work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included. Bold italicised wording, if used in the performance criteria, is detailed below.

<i>Safety and environmental requirements</i> must include:	• work health and safety (WHS) and occupational health and safety (OHS) requirements, including procedures for: • operating specialised engine overhaul tools, equipment and machinery • using chemicals and toxic substances • operating manual and mechanical lifting equipment • environmental requirements, including procedures for trapping, storing and disposing of fluids released from engines.
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Unit Mapping Information

Equivalent to AURRTE4011 Overhaul two and four cycle outboard engines

Links

Companion Volume implementation guides are found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b4278d82-d487-4070-a8c4-78045ec695b1>

Assessment Requirements for AURRTE011 Overhaul two and four-stroke cycle marine outboard engines

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Performance Evidence

Before competency can be determined, individuals must demonstrate they can perform the following according to the standards defined in this unit's elements, performance criteria, range of conditions and foundation skills:

- overhaul three different marine outboard engines, including:
 - one two-stroke outboard engine
 - one four-stroke outboard engine.

Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to overhauling outboard engines and associated engine components, including procedures for:
 - operating specialised engine overhaul tools, equipment and machinery, including:
 - heating torches, ovens and presses
 - handling freezing substances, including liquid nitrogen
 - using chemicals and toxic substances
 - operating manual and mechanical lifting equipment
- environmental requirements, including procedures for trapping, storing and disposing of fluids released from engines
- types, characteristics and operating principles of outboard engines and associated engine components
- outboard engine overhaul procedures, including:
 - methods for cleaning and preparing engine for overhaul
 - engine dismantling procedures

- engine and engine component inspection, measuring and evaluation procedures, including:
 - non-destructive testing (NDT) procedures, including dye penetrant testing and magnetic particle testing
 - methods for measuring and calculating tolerances and clearances
- engine and engine component repair and adjustment procedures, including:
 - engine cylinder head and block machining
 - engine crankshaft and camshaft grinding
 - engine cylinder and engine sleeve fitting, boring and honing
 - engine bearing tunnel and connecting rod repair
 - engine component heat treating, straightening and reclamation
 - engine component balancing
- engine assembly and adjustment procedures for achieving component tolerances, including:
 - piston to connecting rod big-end alignment
 - big-end bearing to crankshaft journal clearance
 - big-end bearing crush with bearing blue
 - piston ring end gap, back clearance and side clearance
 - main bearing to crankshaft journal clearance
 - main bearing crush with bearing blue
 - semi-flanged thrust bearings to crankshaft clearance
 - finished camshaft bearings to camshaft clearance
 - camshafts and cam followers
 - camshaft end float
 - crankshaft end float
 - gear backlash
 - oil pump sealing and pick-up oil piping
- component assembly procedures and processes, including:
 - welsh plugs and oil gallery plugs
 - piston and connecting rod assemblies
 - big-end bearings
 - piston rings to pistons
 - main bearings and thrust washers
 - semi-flanged thrust bearings
 - crankshafts, including protection measures for crankshaft journals, bearings, rings and bores
 - finished camshaft bearings
 - camshafts and cam followers
 - timing gears
 - chains and tensioners

- oil pumps, oil squirters, and oil pump pick-ups
- balance shafts
- fitting ancillary components, including seals, crankshaft pulleys and flywheels
- post-overhaul testing procedures for outboard engines.

Assessment Conditions

Assessors must satisfy NVR/AQTF assessor requirements.

Competency is to be assessed in the workplace or a simulated environment that accurately reflects performance in a real workplace setting.

Assessment must include direct observation of tasks.

Where assessment of competency includes third-party evidence, individuals must provide evidence that links them to the marine outboard engines that they have worked on, e.g. repair orders.

Assessors must verify performance evidence through questioning on skills and knowledge to ensure correct interpretation and application.

The following resources must be made available:

- marine repair workplace or simulated workplace
- workplace instructions
- manufacturer outboard engine specifications
- three different marine outboard engines requiring overhaul, including one two-stroke engine and one four-stroke engine
- tools, equipment and materials appropriate for overhauling and adjusting marine outboard engines.

Links

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