
Overview

This standard identifies the competences you need to test engines/propulsion systems and other mechanical systems and equipment in yachts or boats, in accordance with approved procedures. You will be required to use appropriate specifications and test documentation to set up and test the various types of equipment. You will be required to select the appropriate tools and equipment to use, based on the operations to be performed. The engine/propulsion equipment to be tested will include items such as inboard and outboard engines, direct current electric motors and steam engines, propeller shafts and steering mechanisms. The mechanical equipment to be tested will include such items as gearing, universal joints, support bearings, cables, pulleys and turnbuckles, levers and linkages, control rods, pivots and bell cranks, servo actuators and tie rods, anchor windlass, winches and hoists, pumps and valves. You will be required to carry out the tests under no load, partial load and full load conditions, meeting a range of operational criteria to establish that the units on test are functioning at optimal level and to specification.

Your responsibilities will require you to comply with organisational policy and procedures for the testing activities undertaken and to report any problems with these activities, or with the tools and equipment used, that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. **

Your underpinning knowledge will provide a sound understanding of your work and will provide an informed approach to applying appropriate testing procedures to yacht or boat engines, steering mechanisms and mechanical equipment and systems. You will understand the equipment being worked on, any test equipment to be used and the various testing procedures, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the equipment functions to the required specification. In addition, you will be expected to review the outcome of the tests, to compare the results with appropriate standards, to determine the action required and to record and report the results in the appropriate format.

You will understand the safety precautions required when carrying out the testing of the yacht or boat engines and mechanical equipment, especially those relating to the risk of seizure or mechanical failure and for taking the necessary safeguards to protect yourself and others against injury. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace, both ashore and afloat.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. follow the appropriate procedures for use of tools and equipment to carry out the required tests
3. set up and carry out the tests using the correct procedures and within agreed timescales
4. record the results of the tests in the appropriate format
5. review the results and carry out further tests if necessary

Knowledge and understanding

You need to know and understand:

1. the specific safety practices and procedures that you need to observe when carrying out the testing of yacht or boat engines and mechanical control equipment and systems (including any specific legislation, regulations and codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the work area in which you are carrying out the testing activities and the responsibility they place on you
3. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)
4. the safety procedures that must be carried out before work is started on testing the engines and mechanical controls (such as warning notices, notification of trials to be conducted)
5. the specific safety precautions to be taken when carrying out formal inspection, safety checks and testing of yacht or boat engines and mechanical control equipment
6. how to recognise and deal with emergencies (including methods of safely controlling equipment in the case of seizure or mechanical failure of the equipment under test)
7. the importance of applying the appropriate behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
8. protection techniques to be used for the engine and mechanical systems, to prevent risk of seizure
9. how to obtain and interpret testing specifications, manufacturers' manuals, history/maintenance reports, graphical symbols and other documents needed for the testing process
10. how to carry out currency/issue checks of the specifications you are working with
11. the correct operating procedures of the equipment and system being set up and tested
12. the basic principle of operation of the yacht or boat engine and mechanical equipment being tested and the function of the various components within the system
13. the adjustments/corrections/tuning required to bring the equipment/system to operational standard through full range parameters
14. types of test equipment to be used and their selection for particular types of tests
15. the various testing methods and procedures, as recommended in

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- approved operating manuals and how to apply them to different operating conditions
 - 16. displaying/recording test results and the documentation to be used
 - 17. how to recognise defects (such as under or over performance)
 - 18. how to interpret the test readings obtained and the significance of the readings gained
 - 19. the various fault finding techniques that can be used if the system fails the test
 - 20. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
 - 21. potential problems or errors that could occur and which may affect the test results and how they can be avoided
 - 22. the environmental control and company operating procedures relating to the testing activities
 - 23. authorisation procedures for changes to test procedures
 - 24. the documentation required and the procedures to be followed on completion of the testing
 - 25. the extent of your own authority and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1. Carry out **all** of the following during the testing of the yacht or boat engines and mechanical equipment:
 1. use the correct issue of company and/or vessel/craft manufacturers drawings and testing documentation
 2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
 3. obtain the appropriate test equipment and check that it is in a safe and usable condition (especially equipment associated with fire fighting and personnel protection)
 4. provide safe access and working arrangements for the testing area
 5. check all tools and test equipment are in date for calibration
 6. carry out the testing activities using appropriate techniques and procedures
 7. reconnect and return system to service on completion of activities
 8. leave the work area in a safe condition and to the prescribed category of cleanliness

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2. Carry out tests on **one** of the following types of yacht or boat engines/propulsion systems:
 1. in-board engine (petrol, diesel)
 2. out-board engine
 3. direct current electric motor
 4. steam engine

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3. Carry out tests on **five** of the following types of yacht or boat mechanical components/systems:
 1. propeller shafts, drives and bearings
 2. steering and rudder arrangement
 3. gearboxes
 4. clutches and couplings
 5. control valves
 6. seals
 7. ventilation equipment

8. pumps (such as freshwater systems, bilge pumping systems, sanitary systems)
9. lifting equipment (such as anchor windlass, winches, hoists)
10. drive mechanisms (such as couplings, levers and linkages, cables and pulleys)
11. generation equipment (such as wind turbines)
12. water jets
13. surface drives
14. stern drives
15. sail drives
16. other specific mechanical equipment

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4. Carry out **nine** of the following tests on the yacht or boat engine/propulsion systems:

1. carrying out engine coolant and lubrication checks
2. carrying out engine start up checks
3. carrying out engine idling checks
4. checking fuel flow is operating correctly
5. carrying out running and handling checks
6. checking throttle operates smoothly
7. carrying out performance curves
8. carrying out vibration analysis surveys
9. checking engine pressure ratios are within specification
10. checking engine temperature is within specification
11. ensuring maximum engine power is achieved
12. checking engine emissions
13. removing and checking engine oil magnetic chip detectors for contamination
14. checking all systems and connections for leaks

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5. Carry out **all** of the following checks/tests on the yacht or boat mechanical components/systems, as is applicable to the equipment concerned:

1. visual inspection for damage or wear
2. functional checks for correct operation
3. freedom and range of movement
4. shaft alignment
5. leak test
6. vibration analysis
7. torque loading
8. travel
9. timings

- 10. operating clearance checks
- 11. no load checks
- 12. checks under load

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6. Carry out **one** of the following trials on the engine and mechanical equipment:

- 1. trials with the boat on short
- 2. trials with the boat afloat
- 3. partial repair trials

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7. Deal with **both** of the following during the testing of the engine and mechanical equipment:

- 1. equipment without fault
- 2. equipment with fault

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8. Carry out **all** of the following checks to ensure the accuracy and quality of the tests carried out:

- 1. the test equipment is correctly calibrated and in date for use
- 2. test equipment used is appropriate for the tests being carried out
- 3. test procedures used are as recommended in the appropriate testing specifications
- 4. test equipment is operated within its specification range

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9. Test yacht or boat engines and mechanical equipment which complies with **one** of the following:

- 1. BS or ISO standards and procedures
- 2. customer (contractual) standards and requirements
- 3. company standards and procedures
- 4. specific equipment requirements/manufacture's data
- 5. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
- 6. other accepted international standards

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10. Provide a record/report of the test outcome, using **one** of the following:
1. job cards
 2. vessel/craft log
 3. maintenance log or reports
 4. inspection/test schedule
 5. company specific test report
 6. other specific reporting method

Behaviours

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

SEMME3209

Testing engine/propulsion systems and mechanical equipment in yachts and boats



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