

## Overhauling marine propulsion systems

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### Overview

This standard identifies the competences you need to carry out a complete overhaul of marine propulsion systems, in accordance with approved procedures. The equipment to be overhauled will have been removed from the vessel or craft and the overhauling activities may take place in a shipyard or manufacturer's workshops. The marine propulsion equipment covered by this standard includes alternating and direct current motors, steam turbines, gas turbines, two-stroke and four-stroke internal combustion engines. The overhauling activities will involve stripping the equipment down to component level, cleaning and inspecting the components for wear, replacing all defective and 'lived' components and rebuilding the equipment in line with the overhauling specification.

The marine propulsion units to be overhauled will include turbo blowers, air intakes, combustion system, engine control units/nozzle boxes, fuel systems, fire detection systems, exhaust units and other associated mechanical equipment. The overhauling activities will include making all necessary checks and adjustments to ensure that components are correctly replaced, positioned, aligned, adjusted, torque loaded, locked and fastened and that the correct sealants are used.

Your responsibilities will require you to comply with organisational policy and procedures for the marine equipment overhauling 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 must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area and equipment on completion of the activities and that all necessary job/task documentation is completed accurately and legibly. 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 good understanding of your work and provide an informed approach to applying overhauling procedures to marine propulsion equipment. You will understand the dismantling and reassembly methods and procedures used and their application. You will know how the equipment functions, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities to the required specification. In addition, you will have sufficient in-depth knowledge of these components, to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

You will understand the safety precautions required when carrying out the overhauling activities associated with marine propulsion equipment, especially those for lifting and handling the equipment. You will be required to demonstrate safe working practices throughout and will understand your responsibility for taking the necessary safeguards to protect 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 and other relevant regulations, directives and guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities in the specified sequence and in an agreed time scale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete relevant documentation in line with organisational procedures, and pass them on to the appropriate person
7. dispose of waste materials in accordance with safe working practices and approved procedures

## Knowledge and understanding

### You need to know and understand:

1. the health and safety requirements of the area in which the overhauling activity is to take place and the responsibility they place on you
2. the specific health and safety precautions to be applied during the overhaul procedure and their effects on others
3. hazards associated with carrying out overhaul activities on marine propulsion equipment (such as using lifting and handling equipment, handling oils, greases, release of stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures)
4. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the overhaul
5. how to obtain and interpret drawings, specifications, manufacturers' manuals and other documents needed in the overhauling process
6. how to carry out currency/issue checks of the specifications you are working with
7. the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul
8. company policy on the repair/replacement of components during the overhauling process
9. the sequence to be adopted for the dismantling/reassembling of various types of assemblies
10. the methods and techniques used to dismantle/reassemble marine propulsion systems (such as release of pressures/force, proof-marking, extraction, pressing, alignment)
11. methods of checking that components are fit for purpose, how to identify defects and wear characteristics and the need to replace 'lived' items (such as seals, belts and gaskets)
12. how to make adjustments to components/assemblies to ensure that they function correctly (such as bedding in of white metal bearings, laser alignment of propeller shafts, balancing of rotating components such as armatures and turbines, setting working clearance, setting travel, setting backlash in gears, pre-loading bearings)
13. the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact
14. the identification, application, fitting and removal of different types of bearings (such as roller, ball, thrust, shell)
15. methods and techniques of fitting keys and splines
16. the identification, application, fitting and removal of different types of gears
17. how to set up timing marks and position and set the tension of belts and chains, correctly

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18. the identification and application of different types of locking devices
19. the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices)
20. how to check that tools and equipment are free from damage or defect, are in a safe and usable condition and are configured correctly for the intended purpose
21. the generation of technical documentation and/or reports following completion of the overhauling activity
22. the equipment operating and control procedures to be applied during the overhauling activity
23. how to use lifting and handling equipment in the overhauling activity
24. the problems associated with the overhauling of marine propulsion equipment and how they can be overcome
25. the organisational procedure to be adopted for the safe disposal of waste of all types of materials
26. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

### Scope/range related to performance criteria

1. Carry out all of the following during the overhaul of the marine propulsion equipment:
  1. use the correct issue of company and/or manufacturers' drawings and overhauling documentation
  2. adhere to risk assessment, COSHH and other relevant safety standards
  3. ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids, steam)
  4. provide safe access and working arrangements for the overhauling area
  5. use lifting and handling equipment, in accordance with health and safety guidelines and procedures
  6. carry out the overhauling activities using appropriate techniques and procedures
  7. comply with organisational requirements with regard to renewal or replacement of existing components
  8. ensure that the overhauled equipment meets the required specification
  9. ensure that there are no foreign objects left in the completed equipment
  
2. Carry out overhauling activities on one of the following types of marine propulsion equipment:
  1. direct current electric motor
  2. steam turbine
  3. alternating current electric motor
  4. gas turbine
  5. two-stroke turbine/mechanically/naturally aspirated diesel engine
  6. four-stroke turbine/mechanically/naturally aspirated diesel engine
  
3. Carry out overhauling activities on four of the following marine propulsion system components:
  1. air Intake
  2. engine control unit
  3. air start system
  4. air charger
  5. cylinder head
  6. fuel system
  7. shafts

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8. combustion system
  9. turbine
  10. fire extinguishing system
  11. bearings
  12. exhaust system
  13. electrical start system
4. Carry out eighteen of the following activities on the equipment being overhauled:
1. dismantling equipment to unit/sub-assembly level
  2. draining fluids
  3. flushing out and cleaning
  4. removing and refitting cylinder liners
  5. dismantling units to component level
  6. bedding in of white metal bearings
  7. proof-marking/labelling of components
  8. lapping in valves
  9. checking components for wear and serviceability
  10. pre-loading bearings
  11. replacing all 'lived' items (such as seals, bearings, gaskets)
  12. setting backlash in gears
  13. replacing all damaged or defective components
  14. electrical bonding of components
  15. setting timings and adjusting replaced components
  16. applying gaskets and sealant/adhesives
  17. re-assembling components to sub-assembly level
  18. tightening fastenings to the required torque
  19. balancing of rotating components (such as armatures and turbines)
  20. re-assembling sub-assemblies to unit level
  21. carrying out crankshaft deflection
  22. re fill system fluids to the correct level
  23. securing components using mechanical fasteners and threaded devices
  24. applying bolt locking methods (such as split pins, wire locking, lock nuts, stiff nuts, swage nuts)
  25. carrying out any required tests on the completed equipment
5. Replace a range of propulsion system components, to include sixteen of the following:
1. shafts
  2. shell bearings
  3. slides
  4. couplings
  5. bearing housings
  6. rollers
  7. gears

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8. fitting keys
  9. static and dynamic seals
  10. clutches
  11. springs
  12. housings
  13. brakes
  14. diaphragms
  15. actuating mechanisms
  16. valves and seats
  17. injectors
  18. pumps
  19. burners
  20. chambers (such as combustion)
  21. cams and followers
  22. structural components
  23. pistons
  24. chains and sprockets
  25. wire thread inserts
  26. splines
  27. pulleys and belts
  28. shims and packing
  29. roller or ball bearings
  30. levers and links
  31. pipes and unions
  32. locking and retaining devices (such as circlips, pins)
  33. other specific components
6. Overhaul marine propulsion equipment, in compliance with one of the following standards:
1. BS or ISO standards and procedures
  2. customer (contractual) standards and requirements
  3. company standards and procedures
  4. specific system requirements
  5. recognised compliance agency/body's standards
  6. other accepted international standards
7. Complete the relevant documentation in line with organisational procedures, to include one of the following and pass it to the appropriate people:
1. job cards
  2. permit to work/formal risk assessment
  3. overhaul log or report
  4. chart of dimensional inspection
  5. 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

## Overhauling marine propulsion systems

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Developed by	Enginuity
Version Number	3
Date Approved	31 Mar 2019
Indicative Review Date	30 Mar 2021
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMME3118
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	engineering; marine; overhaul; propulsion system; DC motors; AC motors; steam turbines; gas turbines; two stroke diesel; four stroke diesel

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