

## Overview

This standard identifies the competences you need to carry out planned maintenance on marine steam plant and equipment, without complete removal of the unit(s) for overhaul. You will be required to maintain a range of marine steam plant and equipment, such as fire tube boilers, machinery and systems; water tube boilers, machinery and systems; controlled superheat boilers, machinery and systems; and other associated equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine steam plant and equipment assemblies.

The marine steam plant and equipment to be maintained could include boilers, superheaters, economisers, air pre-heaters, dampers, drain coolers, fuel pumps, feed pumps, soot blowers, boiler internal gear, turbine gearing, combustion equipment, boiler mountings, steam turbines, steam reciprocating engines, high pressure saturated steam systems, low pressure saturated steam systems, drain systems, forced draft blowers, brickwork/casings, gearing oil pumps, turbine governors, superheated steam systems, mechanical controls, safety devices and other associated mechanical equipment. The maintenance activities will include making all necessary checks and adjustments to ensure that components are correctly replaced, positioned, aligned, locked and fastened and that the correct sealants are used.

You will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning and adjusting components, torque loading components and making 'off-load' checks before starting up the maintained equipment.

Your responsibilities will require you to comply with organisational policy and procedures for the marine maintenance 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 maintenance activities are removed from the work area 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.

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Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying mechanical maintenance procedures to marine steam plant and 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 maintenance activities, correcting faults and ensuring that the repaired equipment functions 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 maintenance activities associated with marine steam plant and equipment, especially those for isolating 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 maintenance activity is to take place and the responsibility they place on you
2. the isolation and lock-off procedures or permit-to-work procedure that applies
3. the specific health and safety precautions to be applied during the maintenance procedure and their effects on others
4. 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)
5. hazards associated with carrying out maintenance activities on marine steam plant and equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures)
6. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during maintenance
7. how to obtain and interpret drawings, specifications, manufacturers' manuals and other documents for the maintenance process
8. how to carry out currency/issue checks of the specifications you are working with
9. the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance
10. company policy on the repair/replacement of components during the maintenance process
11. the sequence to be adopted for the dismantling/reassembling of various types of assemblies
12. the methods and techniques used to dismantle/assemble marine steam plant and equipment (such as release of pressure/force, proof marking, extraction, pressing, alignment)
13. methods of checking that components are fit for purpose, how to identify defects and wear characteristics and the need to replace 'lifer' items (such as seals and gaskets)
14. how to make adjustments to components/assemblies to ensure that they

function correctly (such as bedding in of white metal bearings, balancing of rotating components such as armatures and turbines, setting working clearance, setting travel, setting backlash in gears, preloading bearings)

15. the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact

16. the identification, application, fitting and removal of different types of bearings (such as roller, ball, thrust, shell)

17. methods and techniques of fitting keys and splines

18. the identification, application, fitting and removal of different types of gears

19. how to set up timing marks and position and set tension of belts and chains, correctly

20. the identification and application of different types of locking devices

21. the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices)

22. the importance of making 'off-load' checks before running the equipment under power

23. 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

24. the generation of maintenance documentation and/or reports following maintenance activities

25. the equipment operating and control procedures to be applied during the maintenance activity

26. how to use lifting and handling equipment in the maintenance activity

27. the problems associated with the marine maintenance activity and how they can be overcome

28. the organisational procedure to be adopted for the safe disposal of waste of all types of materials

29. the extent of your own authority and whom you should report to if you have a problem that you cannot resolve

## Scope/range related to performance criteria

1.

Carry out all of the following during the maintenance of the marine steam plant and equipment:

- 1.1 plan the maintenance activities to cause minimal disruption to normal working
- 1.2 use the correct issue of company and/or manufacturers' drawings and maintenance documentation
- 1.3 adhere to risk assessment, COSHH and other relevant safety standards
- 1.4 ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids, steam)
- 1.5 provide safe access and working arrangements for the maintenance area
- 1.6 use lifting and handling equipment in accordance with health and safety guidelines and procedures
- 1.7 carry out the maintenance activities using appropriate techniques and procedures
- 1.8 re-connect and return the system to service on completion of the maintenance activities
- 1.9 dispose of waste items in a safe and environmentally acceptable manner and leave the work area in a safe condition

2.

Carry out maintenance activities on two of the following types of marine steam plant and equipment:

- 2.1 fire tube boiler, machinery and system
- 2.2 controlled superheat boiler, machinery and system
- 2.3 water tube boiler, machinery and system

3.

Carry out maintenance activities on six of the following items of marine steam plant and equipment:

- 3.1 boiler
- 3.2 soot blowers
- 3.3 low pressure saturated steam system
- 3.4 super-heater
- 3.5 boiler internal gear
- 3.6 drain systems
- 3.7 economisers
- 3.8 turbine gearing
- 3.9 forced draft blower
- 3.10 air pre-heater
- 3.11 combustion equipment
- 3.12 brickwork/casing
- 3.13 dampers

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- 3.14 boiler mountings
- 3.15 gearing oil pump
- 3.16 drain cooler
- 3.17 vertical steam turbine
- 3.18 turbine governor
- 3.19 fuel pump
- 3.20 steam reciprocating engine
- 3.21 superheated steam system
- 3.22 feed pump
- 3.23 high pressure saturated steam system
- 3.24 horizontal steam turbine

## 4.

Carry out twelve of the following maintenance activities, as applicable to the equipment being maintained:

- 4.1 dismantling equipment to unit/sub-assembly level
- 4.2 bedding in of white metal bearings
- 4.3 dismantling units to component level
- 4.4 lapping in valves
- 4.5 proof marking/labelling of components
- 4.6 preloading bearings
- 4.7 checking components for serviceability
- 4.8 setting backlash in gears
- 4.9 replacing all 'lived' items (such as seals, bearings, gaskets)
- 4.10 electrical bonding of components
- 4.11 replacing all damaged or defective components
- 4.12 making 'off-load' checks before starting up
- 4.13 setting timings and adjusting replaced components
- 4.14 replenishing oils and greases
- 4.15 tightening fastenings to the required torque
- 4.16 re-assembling components to sub-assembly level
- 4.17 applying gaskets and sealant/adhesives
- 4.18 balancing of rotating components (such as shafts and armatures)
- 4.19 re-assembling sub-assemblies to unit level
- 4.20 securing components using mechanical fasteners and threaded devices
- 4.21 applying bolt locking methods (such as split pins, wire locking, lock nuts, stiff nuts, swage nuts)
- 4.22 functionally testing the completed system

## 5.

Replace a range of marine steam plant and equipment components, to include twelve of the following:

- 5.1 shafts
- 5.2 bearing housings
- 5.3 slides
- 5.4 couplings
- 5.5 keys
- 5.6 rollers

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- 5.7 gears
- 5.8 springs
- 5.9 static and dynamic seals
- 5.10 clutches
- 5.11 diaphragms
- 5.12 housings
- 5.13 valves and seats
- 5.14 cams and followers
- 5.15 actuating mechanisms
- 5.16 pistons
- 5.17 chains and sprockets
- 5.18 structural components
- 5.19 splines
- 5.20 pulleys and belts
- 5.21 wire thread inserts
- 5.22 roller or ball bearings
- 5.23 levers and linkages
- 5.24 resilient mounts
- 5.25 pipes and unions
- 5.26 shims and packings
- 5.27 boiler water sampling device
- 5.28 instrumentation
- 5.29 sensing points
- 5.30 shutters
- 5.31 doors
- 5.32 registers
- 5.33 labyrinth glands
- 5.34 shell bearings
- 5.35 seals
- 5.36 locking and retaining devices (such as circlips, pins)
- 5.37 other specific components

6.

Maintain marine steam plant and equipment in compliance with one of the following standards:

- 6.1 BS or ISO standards and procedures
- 6.2 customer (contractual) standards and requirements
- 6.3 company standards and procedures
- 6.4 specific system requirements
- 6.5 recognised compliance agency/body's standards
- 6.6 other accepted international standards

7.

Complete relevant documentation in line with organisational procedures using one of the following:

- 7.1 job cards

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- 7.2 permit to work/formal risk assessment
- 7.3 maintenance log or report
- 7.4 chart of dimensional inspection
- 7.5 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

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