

## Overview

This standard identifies the competences you need to carry out planned or corrective maintenance activities on marine electrical power generation and distribution equipment and systems, in accordance with approved procedures. You will be required to carry out maintenance activities on a range of electrical generation and distribution equipment, such as single, three-phase and direct current power supplies and control systems, switchgear, breakers, transformers, voltage regulators, frequency converters and distribution panels. This will involve checking equipment and cables for signs of damage, removing and replacing faulty units and checking and adjusting equipment to maintain optimal operational performance. You will be expected to apply a range of testing procedures in order to ensure that the equipment is adjusted correctly.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken and to report any problems with these activities or with the tools and equipment that are 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 full 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 will provide an informed approach to applying maintenance procedures to marine electrical power generation and distribution systems. You will understand the maintenance process and its application, in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, you will be expected to report where the outcome identifies the need for further investigation or maintenance work.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and for taking the necessary safeguards to protect the equipment and associated systems. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace

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## 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 procedure or permit-to-work procedure that applies to the maintenance activities (to include electrical isolation, locking off switchgear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
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. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance process
6. hazards associated with carrying out maintenance activities on marine electrical power generation and distribution equipment (such as exposure to live conductors, misuse of tools) and how they can be minimised
7. the precautions to be taken to prevent electrostatic discharge (ESD) damage to circuits and sensitive components (such as use of earthed wrist straps, anti-static mats, special packaging and handling areas)
8. what constitutes a hazardous voltage and how to recognise victims of electric shock
9. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
10. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, IET wiring regulations and other documents needed in the maintenance process
11. how to carry out currency/issue checks of the specifications you are working with
12. the maintenance schedules and methods to be followed to comply with

company procedures for maintenance on marine electrical power generation and distribution equipment

13. the basic principles of operation of the equipment/circuits being maintained and the purpose of individual components within the circuit

14. the different types of cabling, terminations and their application such as (multicore cables, single core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables)

15. the different sources of power generation and their maintenance requirements

16. the different types of control systems, their various components and maintenance requirements

17. the application and use of a range of electrical components (such as contactors and relays, switchgear, overload protection devices, plugs, switches, sockets, junction boxes) and the likely functions that will require checking

18. the various cable distribution characteristics and circuit protection devices

19. the different types of wiring enclosures that are used (to include conduit, trunking, traywork systems and bulkhead penetrations) and what to check during the maintenance activities

20. methods of checking that components are fit for purpose and the need to replace 'lived' items

21. how to check that the replacement components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, ambient temperatures)

22. the various maintenance schedules that are generally used (such as condition based maintenance, scheduled maintenance and total productive maintenance (TPM))

23. the procedure for obtaining consumables to be used during the maintenance activity

24. the appropriate testing procedures to be adopted during the maintenance activity

25. the importance of making 'off-load' checks before proving the equipment with the electrical supply on

26. the importance of ensuring that the equipment is maintained to the prescribed category of cleanliness

27. how to compile maintenance records/logs/reports which satisfy company policy and procedures

28. the problems that can occur whilst carrying out the maintenance activities and how they can be avoided

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29. the organisational procedure to be adopted for the safe disposal of waste of all types of materials
  30. 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 maintenance of the electrical power generation equipment:

- 1.1 undertake the maintenance activities to cause minimal disruption to normal working
- 1.2 use the correct issue of structure/vessel/craft system drawings and maintenance documentation
- 1.3 adhere to risk assessment, COSHH and other relevant safety standards
- 1.4 obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures
- 1.5 provide safe access and working arrangements for the maintenance area
- 1.6 carry out the maintenance activities, using appropriate techniques and procedures
- 1.7 re-connect and return the system to service on completion of the maintenance activities
- 1.8 functionally test and adjust the equipment to the prescribed level, as specified
- 1.9 leave the work area in the prescribed category of cleanliness

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1.

Carry out maintenance activities on **five** of the following groups of marine electrical power generation and distribution equipment/systems:

- 1.1 single phase power supplies/breakers
- 1.2 direct current power supplies/breakers
- 1.3 generators and motor generators
- 1.4 three-phase power supplies/breakers
- 1.5 voltage regulators (automatic and/or manual)
- 1.6 changeover switches (automatic and/or manual)
- 1.7 switchgear
- 1.8 batteries
- 1.9 rectifiers
- 1.10 fuse panels
- 1.11 alternators
- 1.12 transformers
- 1.13 static frequency changers
- 1.14 distribution panels and boxes

2.

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

- 2.1 visual examination of the condition and security of wiring enclosures (such as conduit, trunking, traywork)
- 2.2 removing excessive dirt and dust from panels
- 2.3 making visual checks of equipment and cables
- 2.4 checking the integrity of all connections
- 2.5 monitoring the condition of switches/contactors
- 2.6 changing damaged or burnt contactors
- 2.7 making sensory checks (such as sight, sound, smell)
- 2.8 ensuring that spring tensions function as specified
- 2.9 replacing damaged or defective connectors
- 2.10 replacing dated overload protection devices
- 2.11 re-soldering dry joints and connections
- 2.12 servicing back-up battery systems
- 2.13 tuning and adjusting components
- 2.14 taking timing checks of release mechanisms
- 2.15 making 'off-load' checks before powering up
- 2.16 testing and reviewing the system function
- 2.17 removing and replacing damaged or faulty units/components
- 2.18 replacing damaged or missing locking and retaining devices (cable ties, clips, proprietary fasteners)
- 2.19 recording the results of the maintenance and reporting any defects found

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Carry out **five** of the following checks on the maintained equipment/system:

- 1.1 earth bonding
- 1.2 insulation checks
- 1.3 continuity checks
- 1.4 resistance checks
- 1.5 frequency checks
- 1.6 phase balance checks
- 1.7 functional checks of safety devices
- 1.8 over voltage and under voltage checks
- 1.9 speed/rotational checks
- 1.10 standing waveform reflection checks
- 1.11 clearance checks
- 1.12 liquid level checks
- 1.13 battery capacity testing

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1.

Ensure that the maintained equipment meets **all** of the following:

- 1.1 all components and sub-assemblies are fit for purpose
- 1.2 all connections are safe and sound
- 1.3 equipment static checks, after maintenance, meet specification
- 1.4

all potential defects are identified, recorded and reported for future action

1.5

load testing requirements under operation

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Maintain marine electrical power generation equipment, in compliance with **one** of the following standards:

1.1 BS or ISO standards and procedures

1.2 customer (contractual) standards and requirements

1.3 company standards and procedures

1.4 specific equipment requirements/manufacturer's data

1.5 Institute of Electrical Technicians (IET) regulations

1.6 recognised compliance agency/body's standards

1.7 other accepted international standards

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complete the relevant documentation in line with organisational procedures, including **one** from the following and pass it to the appropriate people:

1.1 job cards

1.2 system log

1.3 maintenance logs or reports

1.4 work authorisation documents

1.5 vessel wiring documentation (power distribution and lighting documentation)

1.6 other specific reporting method

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## 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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Maintaining marine electrical power generation and distribution equipment and systems



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