SEMME2008

Carrying out tests on marine electrical and electronic equipment and circuits

Overview

This standard identifies the competences you need to carry out i tests on marine electrical and electronic equipment and circuits, in accordance with approved procedures. The marine electrical equipment to be tested could include such items as single phase, three phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires and electrically powered domestic equipment. You will be required to carry out specified tests, including protective insulation and resistance values, load current, voltage levels and power ratings, on a range of electrical equipment, to establish that it is 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 either a high level of supervision or as a member of a team. You will take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard and competence in all the areas required by the standard must be demonstrated.

Your underpinning knowledge will be sufficient to provide a sound basis for your work and will provide an informed approach to applying specified testing procedures to marine electrical and electronic equipment and circuits. You will have a basic understanding of the equipment being worked on, the test equipment to be used and the various testing procedures, in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, you will be expected to record and report the results in the appropriate format.

You will understand the safety precautions required when carrying out the testing activities, especially those for isolating the equipment and for taking the necessary safeguards to protect yourself against direct and indirect electric shock. You will be required to demonstrate safe working practices throughout and will understand the

responsibility you owe to yourself and others in the workplace.

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 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. carry out quality checks to ensure accuracy of the tests carried out
5. record the results of the tests in the appropriate format
6. review the results and carry out further tests if necessary

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the work area where you are carrying out the testing activities and the responsibility they place on you
2. the equipment isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (to include electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
3. the specific safety precautions to be taken when carrying out formal testing of marine electrical equipment
4. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the electrical testing activities
5. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down compartments in the case of fire or other major incident)
6. the precautions to be taken to prevent electrostatic discharge (ESD) damage to circuits and sensitive components (such as use of earthed wrist straps)
7. what constitutes a hazardous voltage and how to recognise victims of electric shock
8. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
9. protection techniques for electrical systems (to prevent burn or fire risk)
10. how to obtain and interpret job instructions, drawings and specifications used in the testing process
11. types of test equipment to be used and their selection for particular types of tests
12. how to check that test equipment is in calibration and that it is free from damage and defects
13. how to set up the test equipment to be used
14. how to connect the appropriate test equipment into the circuit/equipment (for the measurement of areas such as resistance, current, voltage, power, capacitance, inductance, power factor and protective device disconnection/trip times)
15. displaying/recording test results and the documentation to be used
16. how to interpret the test readings obtained and the significance of the readings

gained

17. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
18. why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
19. potential problems or errors that could occur and which may affect the test results and how they can be avoided
20. the environmental control and company operating procedures relating to the testing activities
21. the documentation required and the procedures to be followed on completion of the testing
22. the extent of your own responsibility 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 activities:

1.1 plan the testing activities to cause minimal disruption to normal working
1.2 use the correct issue of vessel/craft/structure 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 inspection and testing activities, using appropriate techniques and procedures
1.7 re-connect and return the system to service on completion of the testing activities
1.8 functionally test and adjust equipment to specification
1.9 dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in the prescribed category of cleanliness

2.

Carry out tests on three of the following types of marine electrical/electronic equipment:

2.1 distribution switchgear
2.2 control panels
2.3 sensors
2.4 wiring systems
2.5 programmable logic control (PLC) systems
2.6 power electronic systems
2.7 actuators
2.8 electric motors
2.9 auxiliary systems
2.10 alarm systems
2.11 contactors and relays
2.12 domestic equipment
2.13 heating and lighting systems
2.14 communication
2.15 monitoring
2.16
navigation
2.17
computer
2.18 other specific equipment

3.

Carry out tests using a range of tools and test equipment, to include three of the

following:

3.1 oscilloscope
3.2 insulation resistance tester
3.3 portable appliance tester (PAT)
3.4 ohmmeter
3.5 loop impedance tester
3.6 specialist test equipment (such as for sound, speed, light, temperature)
3.7 ammeter
3.8 residual current device (RCD) tester
3.9 voltmeter
3.10 multimeter
3.11 communication analyser
3.12 power meter
3.13 other specific test equipment

4.

Use appropriate test equipment to carry out three of the following tests:

4.1 protective resistance values
4.2 power rating
4.3 inductance
4.4 insulation resistance values
4.5 resistance
4.6 safety device trip speed
4.7 load current
4.8 capacitance
4.9 specialist tests (such as speed, sound, light, temperature)
4.10 voltage levels
4.11 frequency values
4.12 functional
4.13 voltage standing wave ratio checks
4.14 other specific test

5.

Carry out all of the following checks, to ensure the accuracy and quality of the tests carried out:

5.1 the test equipment is correctly set up/calibrated
5.2 test equipment used is appropriate for the tests being carried out
5.3 test procedures used are as recommended in the appropriate electrical codes of practice/regulations
5.4 test equipment is operated within its specification range

6.

Provide a record/report of the test outcome, using one of the following:

6.1 preventative maintenance log/report
6.2 company specific reporting procedure
6.3 testing schedule
6.4 specific test report
6.5 other specific reporting method

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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