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## Overview

This standard identifies the competences you need to assist with the modification or addition of electrical circuits in yachts or boats, in accordance with approved procedures. The yacht or boat electrical circuits to be modified or added will include power supplies, distribution panels, control systems, motor and pumping systems, lighting circuits, entertainment systems, domestic systems, communication systems, positioning systems, instrument and autopilot systems. You will be expected to assist in removing and replacing cables, add new cables, change breakout points and change the routing of cables. You will need to show proficiency in using various tools and equipment for cutting, stripping, crimping and soldering and in the installation of the various wires, cables and components that make up the yacht and boat electrical circuits.

Your responsibilities will require you to comply with organisational policy and procedures for the modification or addition of the electrical wiring and to report any problems with the activities 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 competency 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 the appropriate modification or rewiring techniques and procedures in yachts or boats. You will have an understanding of the basic knowledge behind the circuits being modified or installed and their application and will know about the methods, tools and equipment to be used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the electrical wiring modification activities, especially those for ensuring any power supplies are correctly isolated. 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.

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## 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. obtain and follow the relevant modification specifications and job instructions
3. confirm and agree what modifications are to be carried out to meet the specification
4. assist in the preparation of the electrical system for the required modification
5. assist in the system modification using approved materials, methods and procedures
6. complete the modification within the agreed timescale
7. ensure the modified electrical system meets the specified operating conditions
8. produce accurate and complete records of all modification work carried out
9. deal promptly and effectively with problems within your control and report those that cannot be solved

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## Knowledge and understanding

### You need to know and understand:

1. the specific safety precautions and procedures to be observed whilst assisting with the modifications or addition of the yacht or boat electrical circuits (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the hazards associated with carrying out modifications or additions of yacht or boat electrical systems and how they can be minimised
3. 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)
4. the personal protective equipment and clothing (PPE) to be worn during the electrical wiring modification activities
5. the precautions to be taken to prevent electrostatic discharge (ESD) damage to circuits and sensitive components (such as use of earthed wrist straps)
6. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
8. how to obtain the necessary job instructions required for the work being carried out
9. the different types of cabling and their application (such as multicore cables, single core cables, solid and multi-stranded cables, steel wire armoured (SWA), mineral insulated (MI), screened cables, data/communications cables, fibre optics)
10. the different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units)
11. preparations to be undertaken on the circuit prior to carrying out the modification
12. how to extract and insert cables in wiring enclosures (such as conduit, trunking and through-bulkhead penetration) without causing damage to cables or components
13. the techniques used to terminate electrical cables (such as plugs and sockets; soldering; screwed, clamped and crimped connections, glands and sealed connectors) and the importance of adhering to these procedures
14. the methods and techniques to be used for crimping and heat shrinking, and the importance of adhering to these procedures
15. the various mechanical fasteners that will be used and their method of installation
16. methods of attaching markers/labels to components or cables to assist with identification (such as colour coding conductors, using coded tabs)
17. the importance of ensuring that the modified electrical circuit is free from foreign objects and that all terminations are sound and secure

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18. the importance of conducting inspections and checks to ensure that the completed modification or added circuit complies with all required standards before reconnecting to the supply (such as visual examination for loose or exposed conductors, excessive solder or solder spikes which may allow short circuits to occur, strain on terminations, insufficient slack cable at terminations, continuity and polarity checks)
  19. why electrical bonding is critical and why it must be both mechanically and electrically secure
  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. 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
  22. the problems that can occur with the modification or rewiring operations, and how these can be overcome
  23. the procedure for the safe disposal of waste materials
  24. the extent of your own authority and whom you should report to if you have problems that you cannot resolve

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## Scope/range related to performance criteria

1. Carry out all of the following during the modification or addition of the yacht or boat electrical circuits:
  1. ensure you have the necessary information to assist with the electrical wiring modification activities (such as job instructions or modification drawings)
  2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
  3. obtain clearance to work on the electrical system and observe the appropriate power isolation and safety procedures
  4. maintain safe access and working arrangements for the work area
  5. assist in modifying or adding electrical circuits, using approved techniques and procedures
  6. return all tools and equipment to the correct location on completion of the activities
  7. leave the work area in a safe and tidy condition
2. Assist in carrying out modifications or additions of three of the following yacht or boat electrical systems:
  1. power supply circuits
  2. services/domestic electrical systems
  3. pumping systems (such as freshwater systems, bilge pumping systems, sanitary systems)
  4. motor/rotating equipment circuits (such bow/stern thrusters, anchor windlass, trim tabs winches and hoists)
  5. lighting systems (such as internal, external navigational)
  6. alarm systems (such as fire, flood/liquid level, gas, intruder)
  7. emergency/temporary power supplies
  8. entertainment systems (such as sound systems, video entertainment systems)
  9. communications systems (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom)
  10. positioning systems (such as chart plotter, global positioning system (GPS), long range navigation, compass, gyro)
  11. autopilot systems
  12. instrument systems (such as speed, depth, wind, velocity made good)
  13. sensor systems (such as RADAR)
  14. other specific electrical systems

3. Carry out four of the following types of modification to the electrical circuits and equipment:
  1. replacing cables of different size or length
  2. making changes to looms or mains circuits
  3. changing the position or angle of breakout points
  4. changing the position of electrical units
  5. adding or removing components from circuits
  6. fitting new electrical systems
  7. changing the route of cables
  8. removal of cables
  9. adding new looms or mains circuits
  10. addition of cables
  11. changing or adding conduit runs
  12. removing and replacing cable end fittings
  13. changing or adding trunking and trays
  14. changing or adding components to panels or sub-assemblies
  
4. Carry out three of the following types of electrical connection:
  1. terminating PVC cables
  2. terminating co-axial cable
  3. making mechanical/screwed/clamped connections
  4. terminating mineral and armoured cables
  5. creating earth bonding points
  6. sealing and protecting cable connections
  7. soldering and de-soldering
  8. heat shrinking (devices and boots)
  9. terminating screened cables
  10. crimping (tags and pins)
  11. terminating fibre-optic cables
  12. data cables
  13. allocating identification markings
  
5. Assist in modifying or rewiring yacht or boat electrical systems which comply with one of the following:
  1. BS, EN or ISO standards and procedures
  2. customer (contractual) standards and requirements
  3. company standards and procedures
  4. specific equipment requirements/manufacturer's data
  5. wiring Regulations (current edition)
  6. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
  7. other accepted international standards
  
6. Complete the relevant paperwork, to include one from the following

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and pass to the appropriate people:

1. job cards
2. installation records
3. system log
4. vessel/craft wiring documentation
5. other specific reporting method

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## 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

SEMME2135

Assisting in modifying and adding electrical circuits in yachts and boats



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