
Overview

This standard identifies the competences you need to install and secure cable runs/circuits in yacht or boat structures, in accordance with approved procedures. You will be required to use appropriate installation drawings, specifications and documentation to install the various types of cabling/circuit. You will install the appropriate cable enclosures which could include conduit and trunking systems, and you will be expected to position, align and secure these in the correct locations, using the specified/appropriate techniques and bulkhead/screen penetration and fastening devices. The circuitry will include vessel power supply cables, internal and external lighting cables and system cable assemblies. You will be expected to terminate these cables to the relevant circuit breaker panels, distribution panels and relay panels.

Your responsibilities will require you to comply with organisational policy and procedures for the electrical installation activities undertaken and to report any problems with these activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. 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 will provide an informed approach to applying electrical cable installation techniques and procedures in yacht or boat structures. You will understand the circuits being installed, and their application, and will know about the installation methods, tools and techniques used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the completed installation is to the required specification.

You will understand the safety precautions required when carrying out the cable installations. 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 legislation, regulations, directives and other relevant guidelines
2. follow all relevant drawings and specifications for the installation being carried out
3. use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition
4. install, position and secure the cabling and components in accordance with the specification
5. ensure that all necessary connections and terminations are complete
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. check that the installation is complete and that all components are fit for purpose
8. complete relevant documentation in line with organisational procedures

Knowledge and understanding

You need to know and understand:

1. the specific safety practices and procedures that you need to observe when installing cable runs/circuits in yacht or boat structures (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the work area where you are carrying out the activities and the responsibility these requirements place on you
3. 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)
4. the hazards and risks associated with installing cable runs/circuits in yacht or boat structures and with the tools and equipment used, (such as using sharp instruments for stripping cable insulation) and how they can be minimised
5. the protective equipment that you need to use for both personal protection (PPE) and protection of the vessel/equipment
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. the interpretation of circuit diagrams, wiring diagrams and other relevant specifications (including BS and ISO schematics, wiring regulations, symbols and terminology)
10. currency/issue checks of the specifications you are working with
11. the cable runs/circuits to be installed and their function within the particular system
12. 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)
13. the application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units, relays, solenoids, transformers, sensors and actuators)
14. checking that the positions selected for mounting the components do not interfere with or damage existing services (such as pipework)

15. the techniques used to position, align, adjust, carry, support, secure and distribute the cabling through the vessel/craft
16. how to extract and insert cables in wiring enclosures (such as conduit, trunking and through-bulkhead penetration) without causing damage to cables or components
17. 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
18. the use of BS7671/IET wiring regulations when selecting wires and cables and when carrying out tests on systems
19. methods of attaching markers/labels to components or cables to assist with identification (such as colour coding conductors, using coded tabs)
20. the various mechanical fasteners/termination that will be used and their method of installation
21. the importance of ensuring that the completed installation is free from damage and of ensuring that any exposed components are protected and advisory notices are placed
22. the importance of conducting inspections and checks before connecting 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)
23. the procedures for ensuring that you have the correct tools, equipment, components and fasteners for the activities
24. why electrical bonding is critical and why it must be both mechanically and electrically secure
25. the procedure for the safe disposal of waste materials
26. the tools and equipment used in the installation activities and their calibration/care and control procedures
27. 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
28. the problems that can occur with the electrical wiring installation operations and how these can be overcome
29. the recording documentation to be completed for the activities undertaken
30. 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 electrical cable installation activities:

1. use the correct issue of electrical system installation drawings and technical documentation
2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
3. check the calibration dates of tools to be used
4. obtain clearance to work on the system and observe the power isolation and safety procedures
5. return all tools and equipment to the correct location on completion of the activities
6. leave the system in a recognised condition with any incomplete terminations clearly identified
7. leave the work area in a safe condition and to the prescribed category of cleanliness

2. Install **two** of the following types of wiring enclosures:

1. non-metallic conduit systems
2. metal conduit systems
3. non-metallic trunking systems
4. metal trunking system
5. traywork systems
6. bulkhead/screen/deck penetration

3. Install cable runs in support of **four** of the following types of yacht or boat electrical/electronic systems:

1. power supply circuits
2. services/domestic electrical systems
3. autopilot systems
4. sensor systems (such as RADAR)
5. pumping systems (such as freshwater systems, bilge pumping systems, sanitary systems)
6. motor/rotating equipment circuits (such bow/stern thrusters, anchor windlass, trim tabs winches and hoists)
7. lighting systems (such as internal, external navigational)
8. alarm systems (such as fire, flood/liquid level, gas, intruder)
9. emergency/temporary power supplies

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10. entertainment systems (such as sound systems, video entertainment systems)
 11. communications systems (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom)
 12. positioning systems (such as chart plotter, global positioning system (GPS), long range navigation, compass, gyro)
 13. instrument systems (such as speed, depth, wind, velocity made good)
 14. other specific electrical circuits
4. Install **four** of the following types of cable run:
1. single core cables
 2. multicore cables
 3. PVC twin and earth
 4. wiring looms
 5. coaxial
 6. screened cables
 7. steel wire armoured (SWA) cables
 8. mineral insulated (MI) cables
 9. data/communication/fibre-optic cables
5. Apply **four** of the following cable installation methods and techniques:
1. determining the position/path of the cable runs
 2. positioning and securing conduit/trunking using mechanical fixings
 3. carrying out through-bulkhead penetration
 4. determining size and lengths of cables required
 5. laying in cables without twisting or plaiting
 6. leaving sufficient slack for termination and movement
6. Carry out **eight** of the following cable termination activities:
1. stripping cable sheaths without damage to conductor insulation
 2. removing cable insulation
 3. connecting accessories (such as plugs, sockets multi-way connectors)
 4. making mechanical/screwed/clamped connections
 5. crimping (such as spade end, loops, tags and pins)
 6. secure wires and cables (such as clips, plastic strapping, lacing, harnessing)

7. soldering and de-soldering
8. terminating armoured cables
9. terminating mineral insulated cables
10. attaching suitable cable identification
11. heat shrinking (devices and boots)
12. screening
13. earth bonding

7. Install cable runs and circuits in yachts or boats which comply with **one** of the following:

1. BS or ISO standards and procedures
2. customer (contractual) standards and requirements
3. company standards and procedures
4. specific equipment requirements/manufacture's data
5. BS 7671/IET Wiring Regulations (current edition)
6. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
7. other accepted international standards

8. Complete the relevant documentation in line with organisational procedures, to include **one** from the following and pass it to the appropriate people:

1. installation records
2. system log
3. job cards
4. vessel/craft wiring documentation
5. system authorisation documentation
6. other specific recording 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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