

---

## Overview

This standard identifies the competences you need to carry out overhauling activities on marine navigational equipment and systems, in accordance with approved procedures. The equipment to be overhauled will include distance measuring equipment (DME), very high frequency omni directional range (VOR), instrument landing system (ILS), auto direction finder (ADF), global positioning system (GPS), Doppler, long range navigation (LORAN), homing, navigational and docking radar, electronic charting system, sounders and sonar inertial navigation system, retransmission systems, compass, speed log and gyro/rate gyro. This will involve dismantling, removing and replacing faulty equipment, at component or unit level, on different types of electrical assemblies and sub-assemblies. You will be expected to apply a range of dismantling and re-assembly methods and techniques, such as removing and replacing mechanical fasteners, soldering/de-soldering, crimping, harnessing and securing cables and components.

Your responsibilities will require you to comply with organisational policy and procedures for the overhaul of the marine navigational equipment and to report any problems with the overhauling activities 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 overhaul 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 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 overhauling procedures to marine navigational equipment. You will understand the dismantling/re-assembly methods and procedures used and their application. You will know about the marine navigational equipment being worked on, component properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities, correcting faults and ensuring that the overhauled equipment functions to the required specification.

You will understand the safety precautions required when carrying out the overhauling activities, 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.

---

## 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 specific safety practices and procedures that you need to observe when overhauling marine navigational equipment and systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the area in which the marine navigational overhaul activity is to take place and the responsibility these requirements place on you
3. the hazards associated with the overhauling of marine navigational equipment and with the tools and equipment used and how they can be minimised
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 isolation and lock-off procedure or permit-to-work procedure that applies to the overhauling activities (to include electrical isolation, locking off switchgear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the overhauled item/system
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, wiring regulations and other documents needed in the overhauling process
11. how to carry out currency/issue checks of the specifications you are working with
12. the items to be overhauled and their function within the associated

- 
- system
13. the importance of using the specified fasteners and terminations for the particular overhauling process and why you must not substitute others
  14. the different types of cabling used in marine navigational systems and their application (such as multicore cables, single core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables)
  15. the different types of systems and their various components
  16. the application and use of a range of electrical components (such as plugs, switches, sockets, indicators)
  17. the different types of wiring enclosures that are used (to include conduit, trunking and traywork systems)
  18. the care, handling and application of ohmmeters, multimeters and other electrical measuring instruments
  19. company policy on the repair/replacement of components and the procedure for obtaining replacement parts, materials and other consumables necessary for the overhauling process
  20. 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)
  21. the techniques used to remove, dismantle, dimensionally measure, inspect, reassemble, align, adjust and secure the components in the equipment/unit without damage
  22. methods of removing and replacing cables/wires in wiring enclosures, without causing damage to existing cables
  23. methods of lifting, handling and supporting the components/equipment during the overhauling activities
  24. why unit electrical bonding, earth prevention and continuity are critical, and why earth bonding must be both mechanically and electrically secure
  25. the use of regulations when selecting wires and cables and when carrying out tests on electrical equipment and systems
  26. methods of attaching identification marks/labels to removed components or cables to assist with re-assembly
  27. the tools and equipment used in the overhauling activities (including the use of cable stripping tools, crimping tools, soldering irons, gland connecting tools)
  28. methods of checking that components are fit for purpose and the need to replace 'lifer' items (such as motor brushes, seals and gaskets, overload protection devices)
  29. how to make adjustments to components/assemblies to ensure that they function correctly
  30. the factors to take into account when deciding if a component/module can be repaired or not
  31. the different types and methods of repair that can be used
  32. the importance of making 'off-load' checks before proving the

- 
- equipment with the electrical supply on
33. the generation of documentation and/or reports following the overhauling activity
  34. the problems that can occur during the marine navigational system overhauling activity and how they can be overcome
  35. 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 overhaul of the marine navigational equipment:

1. plan the overhauling activities to cause minimal disruption to normal working
2. use the correct issue of vessel/system drawings and overhauling documentation
3. adhere to risk assessment, COSHH and other relevant safety standards
4. obtain clearance to work on the equipment and observe the appropriate power isolation and safety procedures
5. provide safe access and working arrangements for the overhauling area
6. carry out the overhauling activities, using appropriate techniques and procedures
7. re-connect and return the system for setting to work on completion of the overhaul
8. leave the work area in the prescribed category of cleanliness

2. Carry out overhauling activities on **two** of the following types of marine navigational equipment:

1. distance measuring equipment (DME)
2. very high frequency omni-directional range (VOR/ILS)
3. auto direction finder (ADF)
4. global positioning system (GPS)
5. long range navigation (LORAN)
6. navigational radar
7. electronic charting system
8. depth sounders and sonar
9. homing
10. Doppler
11. inertial navigation system
12. Decca
13. retransmission systems
14. compass
15. speed log
16. gyro/rate gyro
17. docking radar

3. Carry out overhauling activities on **five** of the following navigational system components:

1. aerials
2. transmitter units
3. receiver units
4. unit trays
5. indicator units
6. control units
7. interface network units

4. Carry out **all** of the following overhauling activities, as applicable to the equipment being overhauled:

1. isolating and locking off equipment
2. dismantling equipment to unit level
3. removing electrical units/components
4. disconnecting and re-connecting wires and cables
5. removing and replacing damaged wires and cables
6. visually checking components for serviceability
7. dimensional inspection of components
8. measurement of electrical values of components
9. replacing damaged/defective units/components
10. repair defective/damaged units/components
11. adjustment of variables to return to tolerance limits
12. replacing 'lified' or updated items or components
13. removing and replacing wiring enclosures
14. attaching suitable cable identification markers
15. harnessing and securing wires and cables
16. securing, screening and locking
17. earth bonding
18. setting and adjusting replaced components
19. making 'off-load' checks before powering up
20. functionally testing the completed system

5. Replace and or repair a range of electrical components, to include **ten** of the following groups of components:

1. cables and connectors
2. contactors
3. relay components
4. overload protection devices
5. electronic modules
6. circuit board components
7. circuit board tracks
8. display units

9. capacitors
10. rectifiers
11. encoders or resolvers
12. inverter and servo controllers
13. circuit boards
14. thermistors or thermocouples
15. lighting equipment
16. batteries
17. switches and sensors
18. solenoids
19. transformer
20. locking and retaining devices (such as cable ties, clips, fasteners)
21. other specific components

6. Make **three** of the following types of mechanical securing connections to the equipment:

1. threaded fasteners
2. locking devices
3. screws
4. quick release fasteners
5. torque loaded bolts

7. Make **three** of the following types of electrical connection to the equipment:

1. module blocks
2. terminal blocks
3. tray-mounted sockets
4. free plugs
5. crimping
6. soldering
7. earth bonding
8. fibre-optic connections

8. Carry out **five** of the following checks on the overhauled system:

1. earth bonding and shielding checks
2. insulation checks
3. continuity checks
4. resistance checks
5. frequency checks
6. phase balance checks
7. functional checks of safety devices
8. operational/assembly checks



9. over voltage and under voltage checks
10. speed/rotational checks
11. standing waveform reflection checks
12. data bus communication checks
13. networking data commissioning checks
14. power output
15. distortion
16. signal to noise
17. receiver sensitivity
18. alignment checks
19. clearance checks
20. flow rate checks
21. liquid level checks
22. other specific check

9. Ensure that the overhauled navigational equipment meets **all** of the following:

1. all components and sub-assemblies are fit for purpose
2. all connections are safe and sound
3. equipment static checks, after overhaul, meet specifications
4. all potential defects are identified, recorded and reported for future action

10. Overhaul marine navigational equipment which complies with **one** of the following standards:

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. recognised compliance agency/body's standards
6. other accepted international standards

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

1. job cards
2. system log
3. maintenance/overhaul logs or reports
4. work authorisation documents
5. vessel wiring documentation
6. 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

SEMME3036

Overhauling and repairing marine navigational equipment and systems



Developed by	Enginuity
Version Number	3
Date Approved	28 Feb 2019
Indicative Review Date	28 Feb 2021
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMME3036
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	engineering; marine; overhaul; navigation; equipment; system; DML; GPS; LORAN; VOR/ILS; doppler; ADF