

Installing engine/propulsion systems in yachts and boats

Overview

This standard identifies the competences you need to install propulsion systems and equipment in yachts or boats, in accordance with approved procedures. The engine/propulsion systems to be installed will include such items as inboard engines (petrol or diesel), outboard engines, direct current electric motors or steam engines. You will be required to use appropriate installation drawings, specifications and documentation to install the various items of equipment. You will be expected to select the appropriate equipment and installation techniques, based on the operations to be carried out and the components to be installed. The engine/propulsion components to be installed will include fuel, exhaust and cooling system components, shafts, engine control units, electrical cables, power supply, instrumentation and other associated equipment. The installation activities will include making all necessary checks and adjustments to ensure that components are correctly positioned, aligned, locked and fastened and that when appropriate, the correct sealants are used.

Your responsibilities will require you to comply with organisational policy and procedures for the installation of the engine/propulsion equipment and to report any problems with the installation activities, equipment or components used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to ensure that all tools, equipment and materials used in the installation are correctly accounted for on completion of the activities and to complete all necessary job/task documentation accurately and legibly. 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 appropriate installation techniques and procedures for yacht or boat engine/propulsion systems. You will understand the engine/propulsion system being installed, and its application, and will know about the installation techniques, tools and methods, 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 installation operations. 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. 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 equipment and components in accordance with the specification
5. ensure that all necessary connections to the equipment 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 free from damage
8. complete relevant documentation in line with organisational procedures

Installing engine/propulsion systems in yachts and boats

Knowledge and understanding

You need to know and understand:

1. the specific safety practices and procedures that you need to observe when installing engine/propulsion systems in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements)
3. the health and safety requirements of the work area where you are carrying out the activities and the responsibility they place on you
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 hazards associated with installing yacht or boat engine/propulsion systems and with the tools and equipment used and how these can be minimised
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the system and craft
7. the interpretation of drawings, standards, quality control procedures and specifications used for the installation (including BS and ISO mechanical schematics, symbols and terminology)
8. the basic operating principles of the engine and propulsion system being installed
9. the components to be installed and their function within the particular engine and propulsion system
10. the various mechanical fasteners that will be used and their method of installation (including threaded fasteners, special securing and locking devices)
11. the importance of using the specified fasteners and locking devices for the particular installation and why you must not substitute others
12. why securing devices need to be locked and labelled and the different methods that are used
13. the torque loading requirements on the fasteners and why this is important
14. the quality control procedures to be followed during the installation operations
15. the techniques used to position, align, adjust and secure the components without damage
16. methods of lifting, handling and supporting the components/equipment during the installation activities
17. the use of seals, sealant and adhesives and the precautions to be

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- taken
18. why electrical bonding is critical and why it must be both mechanically and electrically secure
 19. the procedure for the safe disposal of waste materials
 20. how to conduct any necessary checks to ensure the system integrity, functionality, accuracy and quality of the installation
 21. how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, damage or contamination)
 22. the importance of ensuring that the completed installation is free from foreign object debris and that any exposed components or pipe ends are correctly covered/protected
 23. the tools and equipment used in the installation activities and their calibration/care and control procedures
 24. the problems that can occur with the installation operations and how these can be overcome
 25. the recording documentation to be completed for the activities undertaken
 26. 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 installation of the yacht or boat engine/propulsion system:
 1. use the correct issue of the vessel/craft assembly/installation drawings and planning documentation
 2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations, lifting operations and lifting equipment regulations (LOLER)
 3. check the calibration dates of tools to be used
 4. obtain clearance to work on the equipment and observe the power isolation procedures
 5. ensure that correct part numbers are used (including port or starboard items)
 6. return all tools and equipment to the correct location on completion of the installation
 7. leave the work area in a safe condition and to the prescribed category of cleanliness

2. Install **one** of the following types of yacht or boat engine/propulsion systems:
 1. in-board engine (such as petrol or diesel)
 2. out-board engine
 3. direct current electric motor
 4. steam engine

3. Connect engine components, to include **four** of the following:
 1. electrical cables
 2. power supply
 3. engine control unit
 4. fuel system
 5. exhaust system
 6. cooling system
 7. shafts/couplings
 8. bearings/bearing block
 9. stern drives
 10. surface drives
 11. water jets
 12. sail drives

13. seals/gaskets instrumentation

4. Use **twelve** of the following installation methods and techniques:

1. marking/setting out of locating and securing positions
2. preparing holes (such as drilling, cleaning out threads)
3. positioning equipment/component
4. levelling equipment
5. aligning equipment
6. assembly/connection of components or sub-assemblies
7. setting timing
8. setting and adjusting equipment
9. torque setting of mechanical fasteners
10. lifting and handling
11. lubricating
12. making pipe connections
13. connecting wires and cable
14. securing using mechanical fixings
15. securing using adhesives
16. sealing
17. applying screw fastener locking devices
18. earth bonding
19. ensuring the system cleanliness (such as covering exposed pipe ends or components)

5. Use **two** of the following types of fasteners and securing devices:

1. studs with nuts
2. screws
3. dowels
4. locking devices (such as split, parallel, clevis or taper pin)

6. Install yacht or boat engine/propulsion systems 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/manufacturer's data
5. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
6. other accepted international standards

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

1. installation record
2. acceptance documentation
3. work authorisation documents
4. job cards
5. time sheets
6. system log
7. 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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