
Overview

This standard identifies the competences you need to install marine propulsion systems and equipment, such as alternating and direct current motors, steam turbines, gas turbines, two-stroke and four-stroke turbo blown, mechanically blown, naturally aspirated internal combustion engines, in accordance with approved procedures. 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 marine propulsion components to be installed will include turbo blowers, air intakes, combustion system, engine control units, fuel injectors, fuel pipes, fire detection systems, exhaust units, 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 the correct sealants are used.

Your responsibilities will require you to comply with organisational policy and procedures for the installation of the propulsion system 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 installation techniques and procedures for marine propulsion systems. You will understand the marine 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.

**Performance
criteria**

You must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow all relevant drawings and specifications for the installation being carried out
- P3 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition
- P4 install, position and secure the equipment and components in accordance with the specification
- P5 ensure that all necessary connections to the equipment are complete
- P6 deal promptly and effectively with problems within your control and report those that cannot be solved
- P7 check that the installation is complete and that all components are free from damage

Knowledge and understanding

You need to know and understand:

- K1 the specific safety practices and procedures that you need to observe when working with marine propulsion systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
- K2 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)
- K3 the health and safety requirements of the work area where you are carrying out the activities and the responsibility they place on you
- K4 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)
- K5 the hazards associated with installing marine propulsion systems and with the tools and equipment used and how these can be minimised
- K6 the personal protective equipment (PPE) that you need to use for both personal protection and protection of the system
- K7 the interpretation of drawings, standards, quality control procedures and specifications used for the installation (including BS and ISO mechanical and electrical schematics, symbols and terminology)
- K8 how to carry out currency/issue checks/configuration state of the specifications you are working with
- K9 the basic operating principles of the marine propulsion system being installed
- K10 the components to be installed and their function within the particular marine propulsion system
- K11 the various mechanical fasteners that will be used and their method of installation (including threaded fasteners, special securing and locking devices)
- K12 the importance of using the specified fasteners and locking devices for the particular installation and why you must not substitute others
- K13 why securing devices need to be locked and labelled and the different methods that are used
- K14 the torque loading requirements on the fasteners and what to do if these loadings are exceeded or not achieved
- K15 the quality control procedures to be followed during the installation operations
- K16 procedures for ensuring that you have the correct tools, equipment, components and fasteners for the activities
- K17 the techniques used to position, align, adjust and secure the components without damage

- K18 methods of lifting, handling and supporting the components/equipment during the installation activities
- K19 the use of seals, sealant and adhesives and the precautions to be taken
- K20 why electrical bonding is critical and why it must be both mechanically and electrically secure
- K21 the organisational procedure to be adopted for the safe disposal of waste and all other materials
- K22 how to conduct any necessary checks to ensure the system integrity, functionality, accuracy and quality of the installation
- K23 how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, damage or contamination)
- K24 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
- K25 the tools and equipment used in the installation activities and their calibration/care and control procedures
- K26 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
- K27 the problems that can occur with the installation operations and how these can be overcome
- K28 the recording documentation to be completed for the activities undertaken and where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation
- K29 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Additional Information

Scope/range related to performance criteria

You must be able to:

1. Carry out **all** of the following during the installation of the marine propulsion system:
 - 1.1. use the correct issue of the vessel or craft installation drawings and planning documentation
 - 1.2. use copies of relevant COSHH sheets, risk assessment and marine or hovercraft standards
 - 1.3. check the calibration dates of tools to be used
 - 1.4. obtain clearance to work on the equipment and observe the power isolation procedures
 - 1.5. ensure that correct part numbers are used (including port or starboard items)
 - 1.6. return all tools and equipment to the correct location on completion of the installation
 - 1.7. leave the work area in a safe condition and to the prescribed category of cleanliness

2. Install **one** of the following types of marine propulsion system main engines:
 - 2.1. direct current electric motor
 - 2.2. alternating current electric motor
 - 2.3. gas turbine
 - 2.4. steam turbine
 - 2.5. two-stroke turbo blown/mechanically blown/naturally aspirated diesel/petrol engine
 - 2.6. four-stroke turbo blown/mechanically blown/naturally aspirated diesel/petrol engine

3. Assemble and install main engine components, to include **six** of the following:
 - 3.1. air Intake
 - 3.2. air/turbo/super charger
 - 3.3. combustion system
 - 3.4. bearings
 - 3.5. engine control unit
 - 3.6. fuel system
 - 3.7. turbine
 - 3.8. exhaust system
 - 3.9. air start system

- 3.10. shafts
 - 3.11. fire extinguishing system
 - 3.12. electrical start system
4. Use **twelve** of the following installation methods and techniques:
- 4.1. marking/setting out of locating and securing positions
 - 4.2. preparing holes (such as drilling, cleaning out threads)
 - 4.3. positioning equipment/components
 - 4.4. levelling equipment
 - 4.5. aligning equipment
 - 4.6. assembly/connection of components or sub-assemblies
 - 4.7. setting timing
 - 4.8. setting and adjusting equipment
 - 4.9. torque setting of mechanical fasteners
 - 4.10. lifting and handling
 - 4.11. lubricating
 - 4.12. making pipe connections
 - 4.13. connecting wires and cables
 - 4.14. securing using mechanical fixings
 - 4.15. securing using adhesives
 - 4.16. sealing
 - 4.17. applying screw fastener locking devices
 - 4.18. earth bonding
 - 4.19. ensuring the system cleanliness (such as covering exposed pipe ends or components)
5. Use **six** of the following types of fasteners and securing devices:
- 5.1. swing bolts
 - 5.2. screws
 - 5.3. dowels
 - 5.4. quick-release fasteners
 - 5.5. studs with nuts
 - 5.6. wing nuts
 - 5.7. bolts
 - 5.8. flexible bellows
 - 5.9. locking devices (such as split, parallel, clevis or taper pin)
 - 5.10. keys/keyways (such as slotted, semi-circular, woodruff, taper)
6. Produce installations which comply with **one** of the following standards:
- 6.1. BS or ISO standards and procedures
 - 6.2. customer (contractual) standards and requirements
 - 6.3. company standards and procedures
 - 6.4. specific system requirements
 - 6.5. recognised compliance agency/body's standards
 - 6.6. other accepted international standards

7. Complete the relevant paperwork, to include **one** of the following and pass it to the appropriate people:
 - 7.1. installation record
 - 7.2. acceptance documentation
 - 7.3. work authorisation documents
 - 7.4. job cards
 - 7.5. time sheets
 - 7.6. system log
 - 7.7. other specific recording method

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Installing marine propulsion systems and equipment

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