
Overview

This standard identifies the competences you need to repair composite components fitted to yachts or boats, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and repair documentation and to extract the relevant information in order to carry out the necessary repairs to the components or assemblies.

You will be expected to identify the method of repair to be used and to select suitable repair materials. You will repair a range of composite components such as craft/vessel structural components and ancillary components such as panels and covers. The components repaired will require the use of a range of resin and fibre materials and appropriate repair techniques.

Your responsibilities will require you to comply with organisational policy and procedures for the repair activities undertaken and to report any problems with the activities, equipment or materials 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 composite component repair procedures on yachts or boats. You will understand the repair techniques used and their application, 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 repair activities and when using the associated tools and equipment. 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:

- P1 work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
- P2 follow the relevant specifications for the component to be repaired
- P3 prepare the component for repair
- P4 carry out the repairs within agreed timescale using approved materials and components and methods and procedures
- P5 ensure that the repaired component meets the specified operating conditions
- P6 produce accurate and complete records of all repair work carried out

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Knowledge and understanding

You need to know and understand:

- K1 health and safety precautions to be taken and procedures to be used when working with composite materials, consumables, tools and equipment in the specific work area
- K2 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)
- K3 the hazards associated with using composite materials, consumables, tools and equipment and how to minimise these in the work area
- K4 the protective equipment (PPE) that is needed for personal protection and where required, the protection of others
- K5 the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables
- K6 the specific workshop environmental conditions that must be observed when repairing yacht or boat composite components (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)
- K7 how to use and extract information from repair drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
- K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K9 conventions and terminology used when repairing composite mouldings (such as disbonds, de-lamination, resin injection, resin voids, core potting, repair patches)
- K10 the different forms of damage or defect that can occur in the composite components and how this affects the type of repair selected
- K11 how to assess the damage or defect in the composite components and how to determine the most suitable type of repair
- K12 the importance of ensuring that the repair conforms to the repair specification
- K13 failure modes for various composite mouldings and what can contribute to these
- K14 different types of composite resin systems, fibres and reinforcements and the types of defect that might be present
- K15 different bonding agents, methods used and the sorts of defect that might be present in the bond
- K16 the various methods that can be used to help identify whether defects are present in the mouldings (to include visual inspection, touch, sound, measurement, mechanical and non-destructive tests)
- K17 correct methods of storage and handling of composite materials

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- K18 tools and equipment used for various activities associated with composite mouldings
- K19 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 repair of the yacht or boat composite components:
 - 1.1. use the correct issue of documentation (such as drawings, manuals, specifications, job cards)
 - 1.2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
 - 1.3. use the correct tools and equipment for the activity and ensure that they are safe to use and suitably stored
 - 1.4. keep the work area in a safe and tidy condition
2. Carry out **all** of the following when preparing for the repair activity:
 - 2.1. identify what needs to be repaired
 - 2.2. assess the extent of the damage to be repaired
 - 2.3. identify the method of repair to be used
 - 2.4. select the correct equipment for the activity
 - 2.5. check that the equipment is suitable for use
 - 2.6. check the availability of ancillary materials required
 - 2.7. identify and protect the repair materials in the work area
3. Carry out **three** of the following types of composite repair:
 - 3.1. cosmetic which can be filled
 - 3.2. surface damage where laminate needs replacing
 - 3.3. internal damage where laminate needs replacing
 - 3.4. hole damage with access from both sides
 - 3.5. hole damage with external access only
 - 3.6. requiring temporary mould manufacture
4. Carry out repairs to yacht or boat composite components, to include the following:
 - either **two** of the following:
 - 4.1. hull
 - 4.2. cabins or wheel houses
 - 4.3. superstructure
 - 4.4. bulkhead
 - 4.5. masts and spars
 - 4.6. other major components

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or **four** of the following:

- 4.7. rudders
 - 4.8. radar/navigational domes
 - 4.9. steering equipment (such as wheel, tiller)
 - 4.10. consoles (such as navigational or helm)
 - 4.11. casings and covers
 - 4.12. vanity units
 - 4.13. berths
 - 4.14. air intakes/vents
 - 4.15. fairings
 - 4.16. hatches
 - 4.17. shower units
 - 4.18. skegs
 - 4.19. tanks
 - 4.20. davits
 - 4.21. seats
 - 4.22. other specific components
5. Repair defects in composite mouldings, using **four** of the following methods:
- 5.1. localised curing
 - 5.2. fettling
 - 5.3. surface filling
 - 5.4. colour matching
 - 5.5. relieving distortion
 - 5.6. separation of bonds
 - 5.7. bonding
 - 5.8. polishing
 - 5.9. resin injection
 - 5.10. wet-lay patching
 - 5.11. pre-preg patching
 - 5.12. osmosis
 - 5.13. core-patching
 - 5.14. insert/core potting
 - 5.15. repair patches/kits
 - 5.16. laminating
6. Repair defects, using techniques/materials applicable to **two** of the following resins types:
- 6.1. polyester
 - 6.2. acrylic resin
 - 6.3. phenolic resin
 - 6.4. epoxy resin
 - 6.5. bismaleimide
 - 6.6. cyanate ester

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- 6.7. vinyl ester
7. Repair defects, using techniques/materials applicable to **two** of the following fibre types:
 - 7.1. polyethylene
 - 7.2. glass
 - 7.3. aramid
 - 7.4. carbon
 - 7.5. hybrid
8. Repair **eight** of the following types of defect in yacht or boat composite components:
 - 8.1. fractures
 - 8.2. gouges
 - 8.3. damaged surface finish
 - 8.4. distortion
 - 8.5. fire damage
 - 8.6. blisters
 - 8.7. de-lamination
 - 8.8. broken fibres
 - 8.9. water ingress
 - 8.10. voids
 - 8.11. disbands
 - 8.12. dents or 'dings'
 - 8.13. damaged cores
 - 8.14. wrong inserts
 - 8.15. insert positions
 - 8.16. impact damage
 - 8.17. abrasion/erosion
9. Repair a range of yacht or boat composite components which comply with **one** of the following:
 - 9.1. BS or ISO standards and procedures
 - 9.2. customer (contractual) standards and requirements
 - 9.3. company standards and procedures
 - 9.4. specific equipment requirements/manufacture's data
 - 9.5. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
 - 9.6. other accepted international standards
10. Complete the relevant paperwork, to include **one** from the following and pass it to the appropriate people:
 - 10.1. work authorisation documents
 - 10.2. acceptance documentation
 - 10.3. craft/vessel log

- 10.4. job cards
- 10.5. other specific recording method

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