

## Overview

This standard identifies the competences you need to carry out repairs to composite mouldings (such as cured panels, moulds, components and jigs), in accordance with approved procedures. You will be required to use appropriate specifications and documentation to bond composite materials, using the correct techniques.

You will be required to obtain all relevant and current documentation relating to the repair, to obtain the tools and equipment required for the repair operations, and to check that they are in a safe and usable condition. In carrying out the repair, you will be required to follow company procedures and specified repair techniques. You will repair a range of composite mouldings with various defects using a range of methods. Mouldings repaired will include a range of resin and fibre materials.

Your responsibilities will require you to comply with organisational policy and procedures for the repair activities undertaken, and to report any problems with the repair 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 to instructions, 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 be sufficient to provide a good understanding of your work, and will provide an informed approach to applying composite moulding repair procedures. 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 and other relevant regulations, directives and guidelines
- P2 follow the relevant specifications for the moulding to be repaired
- P3 prepare the moulding for repair
- P4 carry out the repairs within agreed timescale using approved materials and components and methods and procedures
- P5 ensure that the repaired moulding meets the specified operating conditions
- P6 deal with problems within your control and report those that cannot be solved
- P7 complete and store all relevant documentation in accordance with organisational requirements

## Knowledge and understanding

### *You need to know and understand:*

- K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- K2 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy
- K3 the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables
- K4 the specific environmental conditions that must be observed when repairing composite mouldings
- K5 how to extract and use information from engineering drawings and related specifications in relation to work undertaken
- K6 quality procedures used in the workplace to ensure that repairs are carried out satisfactorily
- K7 conventions and terminology used when repairing composite mouldings
- K8 the methods used to repair composite mouldings
- K9 the methods used to cure bonded repairs and their applications
- K10 the function resin systems, fibres, reinforcements play in the production of mouldings
- K11 the function bonding agents play in the production of mouldings
- K12 the importance of carrying out dimensional/tolerance checks on completion of the repair activity
- K13 why repairs may affect the structural integrity of the composite moulding
- K14 the procedure used to determine if additional testing is required following a repair
- K15 correct methods of storage and handling of composite materials
- K16 tools and equipment used for the various activities associated with repairing composite mouldings
- K17 the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

### Scope/range related to performance criteria

1. Carry out all of the following during the repair activities:
  - 1.1 obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation, material data sheets, repair procedures)
  - 1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
  - 1.3 check that all tools and equipment to be used are correct for the operation to be carried out and are in a safe and usable condition
  - 1.4 follow safe practice/approved composite repair techniques and procedures at all times
  - 1.5 return all tools and equipment to the correct location on completion of the composite repair activities
  - 1.6 segregate and dispose of waste materials using the correct procedure
  - 1.7 leave the work area in a safe and appropriate condition on completion of the activities
  
2. Carry out all of the following activities when preparing for the repair activity:
  - 2.1. confirm what has to be prepared
  - 2.2. confirm the method of repair to be used
  - 2.3. check availability of ancillary materials required
  - 2.4. confirm the tools, materials and equipment selected is suitable for the repair activity
  - 2.5. identify and protect the moulding and repair materials in the work area
  
3. Carry out two of the following types of repair:
  - 3.1. temporary
  - 3.2. cosmetic
  - 3.3. non structural
  - 3.4. structural
  - 3.5. temporary mould
  - 3.6. graft/pre-cured patch
  - 3.7. laminate only
  - 3.8. partial thickness laminate
  - 3.9. through laminate
  - 3.10. type A sandwich panel

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- 3.11. type B sandwich panel
  - 3.12. type C sandwich panel
  - 3.13. single sided access
  - 3.14. double sided access
4. Repair defects in three of the following types of composite moulding:
- 4.1. internal corners
  - 4.2. external corners
  - 4.3. horizontal surface
  - 4.4. vertical surface
  - 4.5. double curvature
  - 4.6. concave surface
  - 4.7. convex surfaces
  - 4.8. flat surfaces
  - 4.9. return surfaces
  - 4.10. joggle details
  - 4.11. nett edges
  - 4.12. webs/ribs
  - 4.13. inserts
  - 4.14. fixtures
  - 4.15. other (to be specified)
5. Repair defects in composite mouldings using two of the following methods:
- 5.1. localised curing
  - 5.2. fettling
  - 5.3. surface filling
  - 5.4. laminating
  - 5.5. relieving distortion
  - 5.6. bonding
  - 5.7. osmosis
  - 5.8. resin injection
  - 5.9. wet-lay patching
  - 5.10. pre-preg patching
  - 5.11. polishing
  - 5.12. core patching
  - 5.13. insert/core potting

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5.14. repair patches/kits

5.15. colour matching

6. Repair defects using techniques/materials applicable to one of the following resin types:

6.1. bio resin

6.2. thermoplastic

6.3. polyester

6.4. vinyl ester

6.5. epoxy

6.6. phenolic

6.7. bismaleimide

6.8. cyanate ester

6.9. other (to be specified)

7. Repair defects using techniques/materials applicable to one of the following fibre types:

7.1. natural fibre

7.2. thermo plastic

7.3. glass

7.4. aramid

7.5. carbon

7.6. hybrid

7.7. other (to be specified)

8. Repair defects in one of the following core materials (where applicable to the Sector or process):

8.1. solid timber

8.2. end grain balsa

8.3. rigid foam

8.4. expanding foam

8.5. coremat

8.6. honeycomb

8.7. fibrous honeycomb

8.8. aluminium honeycomb

8.9. syntactic core

8.10. expanding core

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- 8.11. thermoplastic
- 8.12. other (to be specified)

## 9. Repair four of the following types of defect in composite mouldings:

- 9.1. dimensional
- 9.2. tolerances
- 9.3. surface finish
- 9.4. colour separation
- 9.5. distortion
- 9.6. blisters
- 9.7. dents or 'dings'
- 9.8. surface cracks
- 9.9. incorrect material
- 9.10. contamination
- 9.11. bridging
- 9.12. broken fibres
- 9.13. stray fibres
- 9.14. ply orientation
- 9.15. wrong join type
- 9.16. gaps at joins
- 9.17. incorrect overlap
- 9.18. wrinkles
- 9.19. splintering
- 9.20. voids
- 9.21. resin rich areas
- 9.22. fibre deviation
- 9.23. damaged cores
- 9.24. dis-bonds
- 9.25. excessive adhesive
- 9.26. wrong inserts
- 9.27. insert positions
- 9.28. porosity
- 9.29. local exotherm
- 9.30. fayed/burned area
- 9.31. incomplete curing
- 9.32. de-lamination

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- 9.33. impact damage
  - 9.34. puncture
  - 9.35. gouges
  - 9.36. holes
  - 9.37. abrasion/erosion
  - 9.38. fluid ingress
  - 9.39. fractures
  - 9.40. other (to be specified)
10. Where applicable cure bonded repairs using one of the following methods:
- 10.1. room temperature
  - 10.2. oven
  - 10.3. autoclave
  - 10.4. heated tools/moulds
  - 10.5. heat mats
  - 10.6. curing lamps
  - 10.7. infrared heating
  - 10.8. UV curing
  - 10.9. electro-magnetic inductance
  - 10.10. micro-wave
  - 10.11. hot bonder
  - 10.12. other (to be specified)
11. Repair a range of mouldings in compliance with one of the following standards:
- 11.1. BS, ISO or BSEN standards and procedures
  - 11.2. customer standards and requirements
  - 11.3. organisational standards and procedures
  - 11.4. recognised compliance agency/body standards

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<b>Developed by</b>	Enginuity
<b>Version Number</b>	3
<b>Date Approved</b>	31 Mar 2026
<b>Indicative Review Date</b>	01 Apr 2029
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating Organisation</b>	Enginuity
<b>Original URN</b>	SEMMME2-37
<b>Relevant Occupations</b>	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
<b>Suite</b>	Mechanical Manufacturing Engineering Suite 2
<b>Keywords</b>	engineering; manufacturing; mechanical; repairing; defects; composite moulds; resin moulds; fibre moulds; methods; techniques

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