

Module Blade Repair

BR

BR (70 h)



GLOBAL WIND
ORGANISATION

Aim: The aim of the GWO Blade Repair Module is to enable the participants to support and care for themselves and others working in the wind industry by possessing the necessary knowledge, skills, and ability for blade repair.

PROGRAM: BR Blade Repair

1. Introduction to the training
2. Safety data sheets
 - 2.1 Safety data sheets
 - 2.2 Safety data sheets location
 - 2.3 Safety instructions
 - 2.4 Hazard labels and symbols
 - 2.5 Personal protective equipment
3. Work instruction
 - 3.1 The work instruction (WI)
 - 3.2 Locate work instruction
4. Risk assessment
 - 4.1 The risk assessment
 - 4.2 Updated risk assessment
5. Secure an area
 - 5.1 Locate procedures
 - 5.2 Securing the area
6. Contamination
 - 6.1 Characteristics
 - 6.2 Work instruction as mitigation
 - 6.3 Avoiding contamination
7. Waste segregation
 - 7.1 Why segregate waste?
 - 7.2 Correct waste segregation
 - 7.3 Waste segregation information
8. Ergonomics
 - 8.1 Classroom
 - 8.2 Workshop
 - 8.3 Bladework
9. Lock out tag out
 - 9.1 Lock out tag out (LOTO)
10. Personal protective equipment
 - 10.1 Purpose
 - 10.2 Application
 - 10.3 Limitations
 - 10.4 Task specific
 - 10.5 Disposal
11. Masks and filters
 - 11.1 Purpose
 - 11.2 Filter categories
 - 11.3 Categories and lifetime
 - 11.4 Masks
 - 11.5 Apply filters
12. Chemical safety
 - 12.1 Purpose
 - 12.2 Transfer procedures
 - 12.3 Information about chemicals
 - 12.4 Equipment check
 - 12.5 Prevention and mitigation
13. Composites and blade construction
 - 13.1 Aerodynamics
 - 13.2 Blade construction
 - 13.3 Sandwich panel
 - 13.4 Blade enhancements
 - 13.5 Faults, implications and mitigations
14. Materials
 - 14.1 Reinforcement materials
 - 14.2 Matrix materials
 - 14.3 Adhesives
 - 14.4 Surface coatings
 - 14.5 Chemical handling and application
 - 14.6 Curing
15. Tools and equipment
 - 15.1 Mechanical, electrical and pneumatic principles
 - 15.2 Utilisation of tools and materials
 - 15.3 Calibration
 - 15.4 Lamination tools
 - 15.5 Heating blankets
 - 15.6 Checking electrical tools and equipment
 - 15.7 Vibrating tools
 - 15.8 Electrical safety devices
 - 15.9 Documentation types
16. Phase test
 - 16.1 Phase test
17. Lamination skills
 - 17.1 Fibre orientation
 - 17.2 Kinked or bent fibres
 - 17.3 Overlaps
 - 17.4 Dry fibres and air voids
 - 17.5 Mixing ratio
 - 17.6 Calculation of matrix material
 - 17.7 Curing elevated temperatures
 - 17.8 Ascertaining correct curing
 - 17.9 Ambient temperature and humidity
 - 17.10 Recording ambient temperature and humidity
18. Basic lamination
 - 18.1 Minimise risks associated with fibre work
 - 18.2 Fibreglass mats
 - 18.3 Fibre orientation and moulding theory
19. Sandwich panel
 - 19.1 Minimise risks associated with composite fibre work
 - 19.2 Sandwich construction
 - 19.3 Curing of fibre reinforced composite laminate
 - 19.4 Producing a composite sandwich panel
 - 19.5 Trailing edge section
20. Painting
 - 20.1 Completion of blade
21. Blade inspection
 - 21.1 Typical failures
 - 21.2 Reactions to damage categories
 - 21.3 Focused and scaled photographs
 - 21.4 Tap test
 - 21.5 Lighting
 - 21.6 Inspection tools and methods
 - 21.7 Types of damage
22. Inspecting lightning protection system
 - 22.1 Surface components
 - 22.2 Visual and conductivity inspection
 - 22.3 Measure resistance

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- 23. Sanding skills
 - 23.1 Sanding
- 24. Grinding skills
 - 24.1 Grinding
- 25. Surface repairs
 - 25.1 Minimise risks associated with composite fibre work
 - 25.2 Filler adhesion
 - 25.3 Reproduce surface profile
 - 25.4 Paint adhesion
 - 25.5 Layer thickness
 - 25.6 Apply paint with a roller
 - 25.7 Layer thickness with wet film
 - 25.8 Record ambient temperature and humidity
 - 25.9 Inspection and documentation
- 26. Laminate repairs
 - 26.1 Minimise risks associated with composite fibre work
 - 26.2 Safe removal of damaged material
 - 26.3 Identifying fibre direction
 - 26.4 Reinforcement overlaps and matrix adhesion
 - 26.5 Mixing
 - 26.6 Repair layers
 - 26.7 Wetting out fibres using appropriate tools
 - 26.8 Wetting out fibres with matrix material
 - 26.9 Vacuum consolidation
 - 26.10 Curing the repair using heating blankets
 - 26.11 Verifying the curing
 - 26.12 Recording the ambient temperature and humidity
- 27. Filling and shaping
 - 27.1 Filler
- 28. Trailing edge repairs
 - 28.1 Minimise risks associated with composite fibre work
 - 28.2 Repair task
 - 28.3 Crack repairs
 - 28.4 Recreating blade profile
 - 28.5 Record ambient temperature and humidity
- 29. Leading edge repairs
 - 29.1 Minimise risks associated with composite fibre work
 - 29.2 Repair task
 - 29.3 Leading edge repair
 - 29.4 Relocate leading edge
- 30. Sandwich panel repair
 - 30.1 Minimise risks associated with composite fibre work
 - 30.2 Repair task
 - 30.3 Repair inner and outer laminate
 - 30.4 Replacement core
 - 30.5 Inspection and documentation
- 31. Bond line repairs
 - 31.1 Debonding
 - 31.2 Injection of adhesive
 - 31.3 Injecting material in the trailing edge
- 32. Summary and final test
 - 32.1 Summary
 - 32.2 Final test

- 33. Training review
 - 33.1 Training review
 - 33.2 Feedback session

BR Module (Blade Repair)

Duration: 70 hours (9 days)

BR Program : Sections 1 to 33

Maximum students: 12 people per Edition.

Certificate validity:

Permanent. This assumes that the participants are actively working with composite inspection and repair.

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