Module BR
Blade Repair

BR (70 h)

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 t0
  emperature 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.

Headquarter:

Andosilla (Navarra) • Spain
Phone: +34 664 681 385 • navarra@totalhse.com

Other centers in Spain:

Las Palmas (Canary Islands) • Spain
SEPROM
Phone: +34 902 008 482 • canarias@totalhse.com

Redondela (Galicia) • Spain
Verticalia Formación
Phone: +34 986 401 472 • galicia@totalhse.com

Other centers:

Hatzor Haglilit • Israel
IWTC
Phone: +972 4 632 2095 • israel@totalhse.com

San José • Costa Rica
Desarrollos Floruma
Phone: +506 2282-7468 • sanjose@totalhse.com

Santiago de Chile • Chile
ENACTRAR
Phone: +56 9 5819 5060 • chile@totalhse.com

www.totalhse.com