

Surface Coating and Paint Loss - Preparation, Restoration, and Acceptance Checks

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Intended audience: Blade service technicians, coating technicians, O&M; supervisors

Scope: Field identification and repair of surface coating loss and paint damage on wind turbine blades. Includes surface preparation, coating restoration, curing, and acceptance checks. Excludes major laminate reconstruction; if fibers are exposed or laminate is damaged, escalate per Section 3.4.

Revision table

Version (date)	Change
1.0 (2025-10-12)	Initial issue
1.3 (2026-01-08)	Added humidity limits and cure verification
1.4 (2026-01-17)	Clarified prep grit sequence and QA checks

1.0 TERMS AND DEFINITIONS

- 1.1 Coating:** Paint, gelcoat, or protective top layer on blade surface.
- 1.2 Paint loss:** Missing or flaking paint exposing primer or substrate.
- 1.3 Feather edge:** Smooth transition from intact coating to bare area without a sharp step.
- 1.4 Cure:** Time and conditions required for coating to reach handling and service hardness.
- 1.5 Overspray:** Unwanted coating deposition beyond repair zone.

2.0 SAFETY

2.1 General

Apply LOTO and confirm turbine is safe to access.
Use respiratory protection when sanding or spraying coatings.
Control overspray and protect surrounding surfaces and environment.

2.2 Stop Criteria (Do not operate if...)

Fibers are exposed over area >25 cm² or any laminate is visibly damaged.
Coating loss is associated with blistering that indicates underlying delamination (soft tap sound).
Repair cannot be completed to minimum acceptance due to weather conditions (Section 4.3).

2.3 Environmental Limits

Do not apply coatings if surface is wet or if condensation is likely.
Avoid coating when relative humidity is high enough to cause blush or poor adhesion.
If using fast-cure systems, ensure wind does not carry overspray into sensitive areas.

3.0 INSPECTION

3.1 Inspection Objective

Identify coating loss extent, determine whether damage is cosmetic only, and select restoration method.

3.2 Coating Damage Severity Table

TABLE 3.2 (ASCII)

Class	Visual Signs	Typical Area	Action
P1	Light scuffs, minor discoloration	<25 cm ²	Clean and monitor
P2	Local paint loss, edges stable	25-200 cm ²	Spot repair and top coat
P3	Flaking edges, multiple patches, rough surface	200-1000 cm ²	Prep + primer + top coat
P4	Exposed fibers, blisters, or laminate damage	any	Stop and escalate

3.3 Required Measurements and Reporting Fields

Turbine ID, blade ID, date/time, ambient temperature (if available)
Span position range and side (pressure/suction)
Area estimate (cm²), max length/width
Photos: overview, close-up with scale, boundary shot, post-work finish
Notes: contamination, salt, insect buildup, prior repairs

3.4 Escalation Indicators

Any evidence of laminate involvement: fiber exposure, cracks, soft tap sound.
Blisters around paint loss that expand when pressed gently.
Repeated paint loss in same location within 6 months.

4.0 PROCEDURE

4.1 Tools and Materials

Cleaner, lint-free wipes, masking film
Abrasives: 120, 180, 240, 320 grit
Vacuum or dust removal method
Primer system compatible with blade coating
Top coat system (spray or brush/roller) as approved
Mixing supplies, wet film gauge (if available)
Edge blending pads, polishing compound (if specified)

4.2 Preparation Notes

For P2-P3, the goal is adhesion and smooth runoff. Do not leave sharp coating steps.
Mask a perimeter beyond repair zone to control overspray and create a clean edge.

4.3 Step-by-Step Procedure: Surface Coating Restoration (P2-P3)

Confirm LOTO and safe access. Record turbine state.
Mark repair boundary including at least 30 mm margin beyond visible paint loss.
Clean boundary and surrounding area. Remove insects and residue thoroughly.
Take pre-work photos including scale and span position reference.
Evaluate damage class using Table 3.2. If P4, stop and escalate (Section 3.4).
Remove loose paint at the edges by hand scraping with plastic tool (no metal gouging).
Sand the damaged area with 120-180 grit to remove unstable coating and rough substrate lightly.
Feather the boundary using 240 grit until transition is smooth (no hard edge).
Vacuum and wipe down. Ensure the surface is dry and free of dust.
If bare substrate is present, apply primer as specified. Keep primer within the prepared zone.
Verify primer flash time and dryness before top coat. Do not trap solvent under top coat.
Apply first top coat layer evenly. Use wet film gauge if available to confirm thickness.
Allow tack time then apply second layer if required to achieve coverage and durability.
Remove masking at the correct time to avoid tearing cured edges (follow product guidance).
Allow cure per product specification. Protect from rain and contamination during cure.
Perform finish sanding/blending if needed (320 grit) to match surrounding surface.
Conduct acceptance checks (Section 5.3) and take final photos.
Record materials, batch numbers, ambient conditions, and any deviations.

4.4 Step-by-Step Procedure: Small Spot Repair (P2 quick method)

- 19) Clean and lightly abrade (240-320 grit) the spot and 20 mm beyond.
- 20) Apply primer if substrate is exposed.
- 21) Apply top coat by brush/roller in thin layers; avoid runs.

- 22) Blend edges with a pad after cure if needed. Document and schedule follow-up check.

5.0 CHECKLIST

5.1 Pre-Work Checklist

- Permit-to-work approved and LOTO verified
- Weather suitable (dry surface, manageable wind)
- PPE for dust and coating application
- Correct primer/top coat system available
- Masking and overspray control prepared

5.2 In-Process Checklist

- Loose paint removed; edges stable
- Boundary feathered smooth
- Surface dust-free and dry
- Primer applied only where required
- Top coat applied evenly (no runs)

5.3 Post-Work Acceptance Checks

- No exposed substrate within repair zone
- No sharp edges; transition smooth to hand and visual check
- No pinholes, fisheyes, or uncured tackiness
- Adhesion quick check: light tape pull on fully cured area (if permitted), no flaking
- Repair finish does not create ridge that traps water
- Photos and report fields complete

6.0 TROUBLESHOOTING

6.1 Symptom: Coating craters or fisheyes during application

Likely causes:

Surface contamination (oil/silicone)

Cleaner residue not fully flashed Checks:

Wipe test on adjacent area, inspect for oily sheen Actions:

Stop application, allow flash-off, re-clean, and re-apply with proper prep

6.2 Symptom: Coating remains soft after expected cure time

Likely causes:

Low temperature, high humidity, incorrect mix ratio Checks:

Confirm ambient conditions and mixing records Actions:

Extend cure time if within allowable conditions; if still soft, remove and rework

6.3 Symptom: Repaired patch peels at feather edge after return to service

Likely causes:

Feather edge too abrupt or coating applied over unstable paint Checks:

Inspect peeling boundary and underlying layer integrity Actions:

Re-prep with wider taper, remove unstable layers, re-prime and re-coat

7.0 CHANGE LOG

7.1 Summary of Changes

Added environmental and cure verification guidance

Clarified grit sequence and acceptance checks

Expanded troubleshooting for adhesion failures

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