Lightning Protection Receptors - Inspection, Testing, and Replace Criteria

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Intended audience: Blade inspection technicians, electrical maintenance technicians, O&M; engineers
Scope: Routine inspection and field service decisions for blade lightning receptors, receptor leads, and local surface damage around receptor sites. Includes documentation requirements and escalation criteria. Excludes internal conductor repairs that require blade opening unless explicitly authorized.

Revision table

Version (date)	Change
1.0 (2025-08-21)	Initial issue
1.4 (2025-12-10)	Added continuity checks and acceptance limits
1.6 (2026-01-17)	Added troubleshooting flow and photo/measurement checklist

1.0 TERMS AND DEFINITIONS

1.1 Receptor: External strike attachment point on blade surface, usually flush or slightly proud.

1.2 Receptor tip: Exposed conductive surface where attachment occurs.

1.3 Pitting: Small crater-like marks on the receptor tip caused by strikes.

1.4 Continuity: Electrical connection quality from receptor to down conductor.

1.5 Bonding lead: Internal or local conductor connecting receptor to main path.

2.0 SAFETY

2.1 General

Apply electrical LOTO where required by site procedures.

Treat all conductive parts as potentially energized until verified.

Use insulated tools for continuity checks where applicable.

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

Receptor is missing, loose, or visibly detached from blade surface.

Surrounding laminate shows burn-through, softening, or charred area larger than 25 cm2.

Continuity test fails (open circuit) on any receptor in the inspected set.

A strike path shows signs of internal heating (persistent burnt odor, melted sealant, or bubbling coating around receptor).

3.0 INSPECTION

3.1 Inspection Objective

Verify receptor condition, detect strike damage, confirm local integrity, and ensure electrical continuity within acceptance limits.

3.2 Inspection Frequency Guidance

Routine visual: at least annually

After storms or known lightning events: perform targeted receptor inspection within 7-14 days

High-exposure sites: consider semi-annual checks

3.3 Receptor Condition Table

TABLE 3.3 (ASCII)

Condition	Visual Signs	Action
R1	Light pitting, no looseness	Clean, record, continue
R2	Moderate pitting or edge chipping	Measure, monitor, recheck sooner
R3	Deep pitting, deformation, or melt marks	Replace receptor or escalate
R4	Missing/loose or surrounding burn damage	Stop, escalate immediately

3.4 Documentation Requirements

Receptor ID/location and span position (e.g., 60-100% span zone near tip)

Photo set: overview, close-up, close-up with scale, oblique angle showing protrusion/flush

Pit depth estimate (mm) and pit diameter (mm) for largest pit

Any surrounding discoloration, blistering, or crack patterns

Continuity measurement result (ohms) and instrument model

4.0 PROCEDURE

4.1 Tools and Materials

Non-metallic brush and cleaner for receptor surface

Caliper or pit gauge, flexible ruler

Multimeter (low resistance capability) or approved continuity tester

Replacement receptor kit (if authorized), sealant, torque tool as required

Marker, wipes, abrasion pads for surface prep

4.2 Step-by-Step Procedure: Visual and Mechanical Check

Confirm turbine state and access authorization. Apply LOTO as required.

Identify receptor(s) to inspect. Record span position group: 0-20%, 20-60%, 60-100%.

Clean receptor surface gently. Do not gouge the metal surface.

Photograph receptor before measurement (close-up with scale).

Inspect for pitting, melting, cracks around receptor edge, and any lift at the perimeter.

Check for looseness by applying gentle hand pressure and lateral wiggle (do not pry).

Measure largest pit diameter and estimate pit depth. Record results.

Inspect surrounding coating within 50 mm radius for blistering, soot, or heat effects.

Classify condition using Table 3.3. If R4, proceed to Section 4.5 immediately.

4.3 Step-by-Step Procedure: Continuity Check

- 10) Verify tester calibration/zero per instrument instructions.
- 11) Connect tester leads to receptor test point and approved reference point (per site practice).
- 12) Measure and record resistance. Repeat once to confirm stability.
- 13) Decision rule:
- IF resistance <= 2.0 ohms and stable THEN pass.
- IF resistance is intermittent or >2.0 ohms THEN treat as fail and proceed to Section 4.5.
- 14) For pass results, continue inspection for remaining receptors.

4.4 Step-by-Step Procedure: Local Replace (Authorized Cases Only)

- 15) Confirm you are authorized to replace the receptor type in use. If not authorized, escalate.
- 16) Mark orientation and remove old receptor per kit instructions. Avoid enlarging the opening.
- 17) Inspect seat area for burn marks or laminate cracking. If found, stop and escalate.
- 18) Prepare seat area: clean, lightly abrade, remove debris. Ensure surface is dry.
- 19) Install new receptor and torque to specified value if applicable.
- 20) Apply sealant around perimeter to prevent water ingress. Smooth bead and remove excess.
- 21) Allow sealant cure per product spec. Protect from rain during cure.
- 22) Re-test continuity. Record final resistance.
- 23) Photograph completed installation (overview and close-up).

4.5 Escalation Procedure (Fail or Severe Damage)

- 24) Stop work and notify supervisor if any of the following occur:
- continuity fail
- missing/loose receptor
- burn/char area >25 cm2
- laminate cracking radiating from receptor
- 25) Mark the affected area boundary and capture full documentation (Section 3.4).
- 26) Recommend turbine remains stopped until engineering review if stop criteria are met.

5.0 CHECKLIST

5.1 Inspection Checklist

- Turbine state and LOTO confirmed
- Receptor location and span group recorded
- Photos taken before and after cleaning
- Pit size measured and recorded
- Surrounding area inspected within 50 mm
- Condition class assigned (R1-R4)

5.2 Continuity Checklist

- Tester zero verified
- Resistance measured twice
- Pass/fail decision recorded (<=2.0 ohms pass)
- Failed units escalated with stop recommendation

6.0 TROUBLESHOOTING

6.1 Symptom: Continuity reading fluctuates

Likely causes:

Poor lead contact on receptor surface

Corrosion at contact point

Loose internal connection Checks:

Re-clean contact point and re-seat probes

Repeat measurement at least 2 times Actions:

If stable and <=2.0 ohms after cleaning, record as pass with note

If unstable or >2.0 ohms, treat as fail and escalate (Section 4.5)

6.2 Symptom: Receptor appears intact but surrounding coating is blistered

Likely causes:

Heat damage from strike attachment nearby

Moisture trapped under coating Checks:

Inspect blister pattern, perform gentle tap test around blister zone Actions:

If blister zone >25 cm2 or soft sound on tap test, stop and escalate

6.3 Symptom: Receptor seat leaks (moisture around perimeter)

Likely causes:

Sealant gap or poor adhesion Checks:

Visual check for discontinuities, press test for sealant edge lift Actions:

Clean and re-seal if no burn/crack is present; otherwise escalate

7.0 CHANGE LOG

7.1 Summary of Changes

Added explicit resistance acceptance limit and retest requirement

Added replace workflow and escalation triggers

Expanded troubleshooting and documentation fields

END OF DOCUMENT