ELI FIELD CHECKLIST • L3 HAZARD

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High-Voltage Switchgear Maintenance: Mechanical Reliability for MV Disconnects and Load-Break Switches

A pre-operation and PM verification checklist for medium-voltage switchgear

A medium-voltage switch is a mechanical device first and an electrical one second. When the operating linkage is never exercised or lubricated, it can seize — and a switch that opens two poles but hangs the third draws a phase-to-phase arc the instant the handle moves. This checklist captures the verification steps that prevent the failure mode behind a documented 4160V substation arc flash.

Use it before operating or returning any MV disconnect or load-break switch to service, and as the basis for the periodic maintenance interval. Sign each line. File the completed checklist with the work order and the switching plan.

COMPANION RCA

Mechanical Betrayal: 4160V Substation Arc Flash

AUDIENCE

HV electricians, substation and reliability maintenance, E&I supervisors

STANDARDS

NFPA 70B, NFPA 70E, OSHA 1910.335, CSA Z462, NETA MTS

> **Use this checklist before operating, and as the basis for maintaining, any medium-voltage switchgear.** Each item must be verified by the qualified person on site and signed off on the work order. A switch is a mechanical asset — if you cannot verify an item, do not operate it live.

1. MECHANICAL LINKAGES & MECHANISM

- [ ] **Operating mechanism cleaned and lubricated per OEM.**
  Old hardened grease removed and the mechanism re-lubricated with the manufacturer-specified lubricant on the manufacturer's interval. A switch not serviced in years is presumed seized until proven otherwise.

- [ ] **Linkages inspected for fracture, wear, and corrosion.**
  Operating rods, pins, and toggle linkages visually inspected for stress cracks, elongation, and binding. Corroded or worn components replaced — not forced.

- [ ] **Mechanism age and service history reviewed.**
  Switchgear past OEM design life flagged for condition assessment and a documented replace/refurbish decision.

2. OPERATIONAL & FUNCTIONAL TESTING

- [ ] **Switch exercised no-load before being relied upon.**
  Mechanism cycled open and closed under no load during the outage so a bound linkage reveals itself before any live operation.

- [ ] **All three phases verified fully open AND fully closed.**
  Actual blade travel confirmed on every pole — visually or by contact-resistance — not inferred from handle position alone.

- [ ] **Handle-to-blade correspondence confirmed.**
  Indicated handle position proven to match true blade state on all three poles.

3. DIELECTRIC & CONTACT TESTING

- [ ] **Insulation resistance (Megger) test performed.**
  Phase-to-phase and phase-to-ground insulation measured and trended against baseline and prior results.

- [ ] **Contact resistance (micro-ohm / Ductor) test performed.**

Main contact resistance measured on each pole and compared to OEM limits and to the other phases.

- [ ] **Power-factor / Doble test performed where applicable.**
  Insulation power factor measured and trended on the assembly where the test basis calls for it.

PASS CRITERIA — CONTACT & INSULATION

Contact resistance: within the OEM limit and consistent across poles; investigate any reading `> 150%` of baseline or a phase-to-phase deviation `> 50%`. Insulation resistance: meets or exceeds the OEM / NETA MTS acceptance value and shows no downward trend. Record all values on the work order.

4. ARC FLASH & PPE CONTROLS

- [ ] **Arc flash risk assessment current and label verified.**
  Incident-energy study reflects the present system; the posted label matches the study and the task being performed.

- [ ] **Task-rated arc flash PPE staged and worn for switching.**
  Arc-rated suit, hood, and face protection rated for the labeled incident energy staged at the gear and donned before operation — not daily-wear FR.

- [ ] **Operated from outside the arc flash boundary where possible.**
  Remote switching / motor operator used where available; the boundary is barricaded against unqualified entry during operation.

PASS CRITERIA — PPE SELECTION

Arc-rated clothing and equipment selected for an arc rating `≥` the labeled incident energy at the working distance, per NFPA 70E 130.5 / CSA Z462. Daily-wear FR rated below the labeled hazard is not acceptable for switching.

5. DOCUMENTATION & RETURN TO SERVICE

- [ ] **Test results and work order filed.**
  Lubrication, functional, dielectric, and contact-resistance results recorded and retained for trending.

- [ ] **Post-maintenance functional verification recorded.**
  Final confirmation that all three poles open and close correctly logged before the switch is returned to operations.

REFERENCE STANDARDS

- **NFPA 70B** — Standard for Electrical Equipment Maintenance — switchgear assemblies and mechanisms
- **NFPA 70E 130.5** — Arc-flash risk assessment, incident energy, and arc-rated PPE selection
- **OSHA 29 CFR 1910.335** — Safeguards for personnel protection (PPE)
- **CSA Z462** — Workplace electrical safety (Canadian equivalent to NFPA 70E)
- **NETA MTS** — Maintenance Testing Specifications — insulation, contact-resistance, and PF acceptance
- **IEEE C37.20** — Metal-enclosed / metal-clad switchgear assemblies

GET THE FULL RCA AND THE NEXT CHECKLIST

This checklist accompanies the full incident analysis at **safetyblog.eli-intelligence.com**. New incident RCAs and field checklists publish every Friday. Subscribe at the site footer to get them in your inbox the morning they go live.