

Static Bonding Verification: Solvent Transfer in Confined Spaces

A 14-point pre-job checklist for Class I Division 1 work

Moving fluids through hoses generates static electricity. In a flammable atmosphere, a single unbonded metal component can become an ignition source within seconds of starting work. This checklist captures the verification steps that prevent the failure mode behind a documented penstock recoating fire — the one that cost five lives.

Use it before any solvent transfer, spray application, or fluid handling in a Class I Division 1 location. Sign each line. File the completed checklist with the confined space entry permit.

COMPANION RCA

The Invisible Ignition: Static
Grounding Failure in a Penstock
Recoating

AUDIENCE

E&I crews, contractors, confined
space supervisors

STANDARDS

NFPA 77, API RP 2003, CEC §10/
§18, NEC 500/501

Use this checklist before every solvent transfer in a Class I Division 1 confined space. Each item must be verified by the qualified person on site and signed off on the permit. If you cannot verify an item, do not start work.

1. PRE-JOB HAZARD ASSESSMENT

Hazardous location classification documented.

Atmosphere formally classified per CEC Section 18 / NEC Article 500. Solvent flash point, vapor density, and LEL recorded on permit. Class I Division 1 status confirmed where flammable vapors are present in normal operations.

Solvent thinning ratio specified by engineer.

Maximum allowable VOC content per coating system documented. On-site verification by gravimetric or volumetric measurement before mixing. Logged on confined space permit.

Egress assessment complete.

If single-egress confined space: engineered secondary escape provided OR ignition risk eliminated through alternate method (cold-cure coating, alternative chemistry). Single-egress with flammable atmosphere is not acceptable as-is.

2. EQUIPMENT BONDING VERIFICATION

All conductive equipment bonded together.

Sprayer, pumps, hose couplings, nozzle, solvent containers, and worker tools electrically interconnected via bonding cable to form a single equipotential network.

Equipotential network bonded to verified earth ground.

Bonding network tied to the grounded structure (penstock wall, vessel shell, building steel). Earth ground integrity verified — not assumed from "metal touching metal."

Megger continuity reading taken before each shift.

End-to-end resistance measured across the bonding network. Reading recorded on permit. Hold-point: do not start work until verified.

PASS CRITERIA – BONDING CONTINUITY

Total resistance across the bonded equipotential network: $< 1 \Omega$ end-to-end, measured with a 4-wire megger. Hose end-to-end resistance: $< 1 M\Omega$ per NFPA 77 Section 12. Record both values on the confined space entry permit.

3. HOSE AND TRANSFER EQUIPMENT

Conductive hose specified and verified.

All solvent transfer hoses meet NFPA 77 Section 12: end-to-end resistance under 1 MΩ with internal bonding wire continuous from coupling to coupling. "Conductive" marketing claim alone is not acceptable.

Hose resistance measured before each shift.

Megger reading taken end-to-end on every hose in service. Non-compliant hoses tagged out immediately. Record on permit.

Equipment rated for hazardous location.

Sprayer, lighting, ventilation fans, and all other electrical equipment certified for Class I Division 1 service. Verify name plate and certification mark.

4. ATMOSPHERIC MONITORING

Continuous LEL monitoring in service.

LEL monitor calibrated, bump-tested, and running for the duration of the work — not just at entry. Sensor positioned in the work zone where vapors accumulate.

Alarm thresholds set and acknowledged.

Alarm at 10% LEL (warn). Forced evacuation at 20% LEL — non-discretionary. Crew briefed on action at each threshold.

Forced ventilation engineered for vapor generation rate.

Ventilation calculated per ACGIH IV with safety factor for the actual solvent application rate. Minimum 4x LEL dilution capacity verified before work starts. Confirm air movement direction and exhaust path.

5. CREW READINESS AND RESCUE

Crew trained on hazardous location work practices.

All workers in the space have completed Class I location and static control training. Competency verified — not just attendance recorded.

Failure-mode-specific rescue plan in place.

Rescue plan addresses the specific failure modes of the work — including flash fire and vapor ignition. Pre-positioned suppression and SCBA. Tabletop drill executed before entry.

REFERENCE STANDARDS

- **CEC Section 18** — Hazardous location classification and equipment
- **CEC Section 10** — Grounding and bonding (equipotential bonding)

- **CSA Z462** — Workplace electrical safety; hazloc work practices
- **NFPA 77** — Static electricity control for flammable liquid transfer
- **API RP 2003** — Static, lightning, and stray current protection in fluid handling
- **NFPA 70 (NEC) Article 500/501** — Class I Division 1 requirements
- **OSHA 29 CFR 1910.106** — Bonding for Class I flammable liquid dispensing

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