HEALTHCARE FACILITY HUB • QUICK REFERENCE

Hospital Emergency Generators: Wet Stacking Prevention, NFPA 110 Testing & Load Bank Protocols

FREE FIELD SHEET
Current version — Oct 31, 2026
Update history: healthcarefacilityhub.org/hospital-generator-wet-stacking-load-bank-testing/

CORE OPERATING RULE: STARTING VS. LOADED EMERGENCY ENDURANCE

A successful start proves only that the generator can crank and run at that moment; it does not prove the diesel engine can burn fuel cleanly and sustain emergency clinical load. Standby sets in hospitals are sized for peak emergency demand that regular testing rarely presents. Chronic operation below 30% of standby nameplate kW leaves combustion temperatures too low, causing unburned fuel, carbon, and lube oil to accumulate (wet stacking) while check-the-box logs remain deceptively reassuring.

Caterpillar 30% Nameplate Threshold

- **Operating Threshold:** Loads below 30% of standby nameplate kW rating, sustained for extended periods, create the classic wet-stacking pattern.
- **Warning vs. Cliff Edge:** A single run at 28% does not foul the engine, nor does 31% guarantee perfect combustion. Risk stems from chronic monthly underloading.
- **Internal Damage:** Deposit formation behind piston rings, injector carbon fouling, and severe cylinder-liner polishing leading to permanent power loss.

Wet-Stacking / Exhaust Slobber Signs

- **Visual Slobber:** Thick, black oily liquid leaking at exhaust manifold joints, turbocharger clamps, or exhaust stack couplings.
- **Slobber Composition:** Carbon soot suspended in unburned diesel fuel and condensed crankcase oil—not a simple external oil leak.
- **Documentary Flags:** Monthly exercise loads repeatedly under 30% kW, sub-minimum exhaust gas temperatures, and rising smoke opacity.

NFPA 110 LEVEL 1 / TYPE 10 EPSS TESTING CADENCE

Cadence	NFPA 110 Standard	Mandatory Operational Parameters	Surveyor Audit Expectation
Weekly Inspection	NFPA 110 § 8.4.1	Battery float voltage (≥13.5V for 12V, ≥27.0V for 24V), electrolyte level. Jacket water temp maintained at 90°F–100°F (32°C–38°C). Day tank fuel ≥100%, lube oil, coolant, unblocked louvers.	Documented quantitative voltage, water temperature, and fluid inspection log.
Monthly Loaded Exercise (30 mins continuous)	NFPA 110 § 8.4.2 NFPA 99 § 6.4.4.1	Run minimum 30 continuous minutes under load via: • **Criterion A:** ≥30% of standby nameplate kW rating. • **Criterion B:** Manufacturer minimum exhaust gas temp (EGT). • **10-Second Transfer:** ATS must initiate crank and transfer emergency power within 10 seconds (Type 10).	Continuous log: kW, % nameplate, volts, Hz, oil psi, water temp, and 10s ATS stopwatch time.
Annual Supplemental Load Bank	NFPA 110 § 8.4.2.3	**Mandated if monthly runs fail Criterion A or B.** Stepped profile (min 2 continuous hours): • 30 min at 25% of nameplate kW • 30 min at 50% of nameplate kW • 60 min at 75% of nameplate kW	Certified contractor report showing stepped kW progression, ambient temps, and recovery.
Triennial 4-Hour Test (Every 36 months)	NFPA 110 § 8.4.9	Continuous 4-hour run under facility load or load bank at ≥30% nameplate capacity. Validates radiator cooling equilibrium, fuel replenishment rates, and long-term electrical stability.	Signed 4-hour performance certificate by Chief Plant Engineer in Life Safety e-SOC.

CMS SURVEYOR TAG A-0726 DEFICIENCY TRAP: CHECKMARKS VS. ENGINEERING NUMBERS

State health surveyors and The Joint Commission audit the past **36 consecutive months** of generator logs. Recording checkmarks, "OK", or "Pass" without quantitative readings (e.g., 482 kW, 480V, 59.9 Hz, 68 psi oil, 185°F water) triggers an immediate Condition-level citation and Form CMS-2567 deficiency notice.

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ASTM D975 Diesel Fuel Maintenance

Sudden clinical loading jumps fuel consumption 10x (5–8 gph idling to 60–90+ gph at 800 kW). Fuel starvation chokes filters before thermal equilibrium is reached.

- **"Diesel Bug" (Hormoconis resinae):** Bacterial and fungal biomass growing at water-fuel interfaces in UL 142/2085 bulk tanks blinds primary and secondary fuel filters.
- **Annual Testing (NFPA 110 § 8.3.8):** ASTM D975 testing for flash point, water/sediment via centrifuge, copper strip corrosion, and kinematic viscosity.
- **Fuel Polishing:** Automated semi-annual or continuous coalescing water separation with 2–5 micron particulate filtration.

What Load Banking Does & Cannot Do

- **What It Clears:** Artificially raises cylinder pressures and exhaust temperatures to safely burn off unburned diesel fuel and soft carbon deposits from rings and exhaust paths.
- **What It Cannot Repair:** Does not reverse cylinder liner polishing, piston ring wear, injector damage, or mechanical defects.
- **Danger of "Running It Harder":** Pushing a suspect engine with active severe slobber or unstable oil pressure without a structured test plan risks catastrophic seizure.

CMS TAG A-0726 & TJC EC.02.05.07 COMPLIANCE AUDIT WALKTHROUGH

1. Remote Annunciator Panel (NFPA 110 § 5.6.5.2)

• **Location:** Must be in a continuously staffed 24-hr location (Security Desk, Central Dispatch, or ED Triage).
• **Power:** Hardwired with verified battery backup power.
• **Operator Knowledge:** On-duty staff must demonstrate recognition of "EPS Supplying Load", "Low Fuel", and trouble alarms.

2. Remote Emergency Stop Switch (E-Stop)

• **Location:** Outside the generator room door or outside walk-in weather enclosure.
• **Protection:** Physical tamper cover or breakaway seal to prevent accidental activation.
• **Cadence:** Must be functionally tested annually to verify immediate drop of engine run signal.

FIELD ESCALATION PROTOCOL: WHEN TO ABORT LOADED TESTING

Observed Condition	Immediate Operational Action	Technical Escalation Path
Voltage / Frequency Instability (> ±2% Hz hunting, > ±5% V swing)	Drop load step immediately back to previous stable tier. Do not advance load.	Inspect governor linkage, electronic actuator, and automatic voltage regulator (AVR).
Lube Oil Pressure Drop (<30 psi or manufacturer low limit)	**EMERGENCY STOP.** Abort test immediately. Disengage load bank.	Escalate to authorized mechanical service. Check for oil dilution from unburned fuel.
Jacket Water Temperature Surge (>205°F / 96°C or high water alarm)	Shed supplemental load bank steps. Allow engine to idle for cool-down.	Inspect radiator core for air obstruction, water pump belt tension, and thermostat.
Heavy Continuous White/Black Smoke or active burning slobber at joints	Hold current load step; observe for 10 mins. If opacity worsens, disengage load.	Inspect fuel injectors, turbocharger boost pressure, and cylinder compression.

PRE-TEST PRACTICAL LOAD CHECKLIST (7 STEPS)

1. Verify 36 months of continuous prior records on site. 2. Calculate 30% nameplate kW baseline. 3. Record jacket water pre-heat (90°F–100°F). 4. Measure battery float voltage (≥13.5V/27.0V). 5. Verify automatic priority load shedding if utility fails during test. 6. Time 10-second ATS transfer with calibrated stopwatch. 7. Log all 6 parameters (kW, V, Hz, Oil psi, Temp °F, ATS sec).