



SERVICES

THE POWER OF CERTAINTY

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NFPA-110
Standards
for
Emergency & Stand-by
Generators
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NFPA Disclaimer

- The views and opinions expressed in this seminar are purely those of the author and shall not be considered the official position of NFPA and shall not be considered to be, nor be relied upon as, a Formal Interpretation. Readers are encouraged to refer to the entire text of all referenced documents at NFPA.org.

Scope of NFPA 110

- NFPA 110 covers construction, installation, maintenance and operational testing requirements for Emergency Power Supply Systems (EPSS)

Terms

- EPSS---Emergency Power Supply Systems
- AHJ---Authority Having Jurisdiction
- Shall---Mandatory Requirement
- Should---Advised, but not required

CLASSIFICATION OF EMERGENCY

POWER SUPPLY SYSTEMS

Level 1 - System shall be installed when failure of the equipment to perform could result in loss of human life or serious injuries. (4.4.1)

Level 2 - Systems shall be installed when failure of the EPSS to perform is less critical to human life and safety and where the AHJ shall permit a higher degree of flexibility that provided by a Level I system. (4.4.2)

Example

- Class 72 (Hours of Run Time)
- Type 10 (Transfer Time)
- Level 1 (Life Safety)

Control Function

- A control panel shall be provided and shall contain the following. (5.6.5.1)
 - 1) Automatic remote start capability.
 - 2) Run-off-automatic switch.
 - 3) Shutdowns.
 - 4) Alarms.
 - 5) Controls.

Safety Indications – Control Panel Visual Requirements

- Over Crank
- Low water temp
- High engine temp per-alarm
- Low lube oil pressure pre-alarm
- Low coolant level
- EPS supplying load
- Control switch not in auto
- High battery voltage
- Low cranking voltage
- Low battery voltage
- Battery charger AC failure
- Lamp test
- Contacts for local & remote common alarm
- Low starting air pressure
- Low starting hydraulic pressure
- Air shutdown damper when used

Safety Indications – Control Panel

Shutdown of EPS Indication

- Overcrank
- High engine temperature
- Low lube oil pressure
- Overspeed
- Air shutdown damper when used
- Remote emergency stop

Safety Indications – Control Panel

Remote Audible Requirements

• Requirements - 1

- Overcrank
- Low coolant temp
- High engine temp pre-alarm
- Low lube oil pressure pre-alarm
- Overspeed
- Low coolant level

• Requirements - 2

- Control switch not in automatic position
- Low cranking voltage
- Contact for local & remote common alarm
- Audible alarm silencing switch
- Air shutdown damper when in used

Control Panel - Location

- A remote, common audible alarm shall be provided as specified in 5.6.5.2(4) that is power by storage battery & located outside of the EPS service room at a work site observable by personnel (5.6.6)
- In Hi-Rise buildings this must be in the Fire Control Room or Command Center.

Remote Stop

- All installation shall have a remote manual stop station of a type to prevent inadvertent or unintentional operation located outside the room housing the prime mover, where so installed, or elsewhere on the premises where the prime move is located outside the building (5.6.5.6)
- A.5.6.5.6 – For systems located outdoors, the manual shutdown should be located external to the weatherproof enclosure and should be appropriately identified.

Remote Start

- In HIRISE buildings. Section 403.10.1 or the 2006 International Building Code and Section 604.2.15.1 or the 2006 International Fire Code require:

System supervision with manual start and transfer feature shall be provided at the fire command center.

Location

- The EPS shall be located in a separate room for Level I installation (7.2.1).
- The room shall have a minimum 2-hour rating. Outside enclosures (should) must protect from snow, rain, and wind (7.2.1.1).
- The EPS shall have a minimum clearance of 3 feet on all sides of inspection, maintenance, repairs, etc. (7.2.5)

Battery Lighting

- The Level I & Level II EPS equipment location(s) shall be provided with battery-powered emergency lighting. – Does not apply units outdoors.
- This includes the area housing the transfer switch (7.3.1).

Fuel Supply

- **Diesel Fuel**

- Most generators use diesel as a fuel supply.
- Fuel tanks must be sized according to the specific EPS class (7.9.1).
- Limited to 660 gallons if inside a building (7.9.1)
- In Cobb County the generator tank must be permitted separately from the generator itself. (AHJ)
- The tank must meet requirements of NFPA-30 and NFPA-37.

- **Natural Gas**

- Some generators use natural gas.
- Supply for the generator must be on the supply side of the main gas shut-off for the building (7.9.7) – This usually requires a separate meter.
- The shut off for the generator gas supply shall be marked as such and the main gas shut off need to indicate the existence of the separated shutoff for the EPS (7.9.8).

Acceptance Test

- An on-site acceptance test shall be conducted as a final approval test for all EPSS.
- The AHJ shall be given advance notice of the acceptance test in order to witness the test (7.13.3).

Maintenance Requirements & Operational Testing

- Maintenance Requirements come form Interpreting Chapter 8



Maintenance Requirements

Documentation



8.2.1* At least two sets of instruction manuals for all major components of the EPSS shall be supplied

Maintenance Requirements

ATS

- Transfer switches shall be subjected to a maintenance and testing program that includes the following:
 - Monthly testing and operation
 - Annually
 - Checking of connections
 - Inspection or testing for evidence of overheating and excessive contact erosion
 - Removal of dust and dirt.
 - Replacement of contacts when required (8.3.5)

Maintenance Requirements

Testing

- EPSS, Including all appurtenant components, shall be inspected WEEKLY and exercised under load MONTHLY (8.4.1).
- A log should be kept of the weekly and monthly checks / exercises.
- Sample maintenance logs are available in the contents of the NFPA-110 documents.
- Routine Maintenance program shall be over seen by a properly instructed individual (8.4.5).

Maintenance Requirements

Monthly Testing

- Section 8.4.2) Diesel generator sets in service shall be exercised at least once monthly, for a minimum of 30 minutes, using one of the following methods.
 - 1) Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer.
 - 2) Under operating temperature conditions and at not less than 30 percent of the EPS nameplate kW rating.
 - 3) If the engine cannot be operated until the water temperature and the oil pressure have stabilized and then the test shall be terminated before the 30 minute time period expires.

Maintenance Requirements

Annual Load Bank Testing

- Section 8.4.2.3 Diesel-powered EPS installation that do not meet the requirements of 8.4.2 shall be exercised monthly with the available EPSS load and exercised annually with supplemental loads at
- 25% of nameplate rating for 30 minutes, followed by 50% of nameplate for 30 minutes followed by
- 75% of nameplate for 60 minutes,
- for a total of **2** continuous hours.

Maintenance Requirement 36

Month Load Bank Testing

- Section 8.4.9 Level 1 EPSS shall be tested for the duration of its as-assigned class (see Section 4.2), for at least 4 hours, at least once within every 36 months.
- Section 8.4.9.1 The load shall be the EPSS system load running at the of the test. The test shall be initiated by opening all switches or breakers supplying normal power to the EPSS.

Maintenance Requirements

Time Delays

- Load tests of generator shall include complete cold start (8.4.4).
- Time Delays should be set as follows:
 - On start: 1 second minimum
 - Transfer to emergency: no minimum
 - Return to normal: 5 minutes minimum
 - Shutdown: 5 minutes minimum
- Transfer switches shall be operated monthly (8.4.6).

Maintenance Requirements

Section A-5.6.4.5.1 recommends that lead-acid starting batteries be replaced every 24 to 30 months.



Transfer Time

- For any generator serving emergency lighting, the load must be picked up by the generator within 10 seconds. See section 7.9.1.2 of the Life Safety Code.

Fire Extinguisher

- A fire Extinguisher should be kept in close proximity to the generator and should be a type for the hazard. Typically a minimum 3A, 40B, C extinguisher within 30 feet of the generator and in the path of egress.



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