Welcome to the WHEA's

Lunch & Learn

Jan 2020

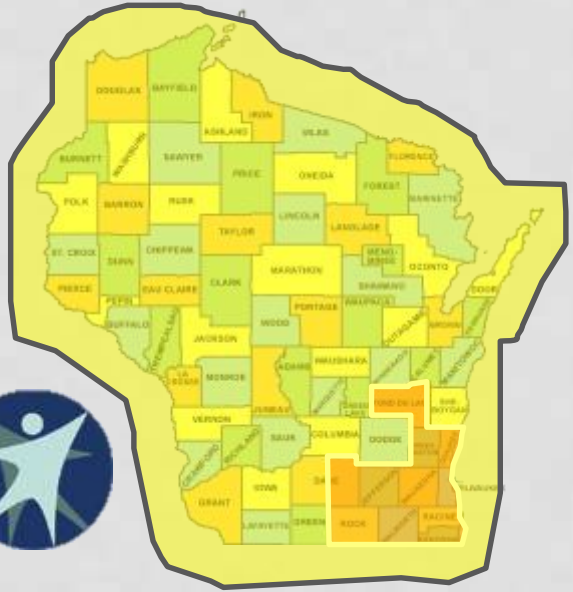
Electrical Sys Inspections

Presented by Bill Lauzon

LAUZON
LIFE SAFETY CONSULTING

Presenter:

Bill Lauzon (professional engineer)



1973-2006 (33 yrs)
"Facility Engineer"
Tomah – Fargo- Madison
Kenosha - Racine

2011-present
Lauzon Life
Safety Consulting

2006-2011
DHS-DQA
"Surveyor &
Plan Reviewer"

Wis Liaison

WHEA
Code & Education Committees

2020 Lunch & Learn Schedule (tentative)

Date	Program
Jan	Electrical Generator Design & Maintenance Testing Part 2 (Intermediate)
Feb	USP 797 -800
Mar	Water Treatment - Oerview
Apr	Sprinkler System Requirements
May	Healthcare Design Trents
Jun	Water Managenment Trends

Date	Program
July	Electrical Panel Requirements
Aug	Air Filtration
Sept	Steam Maintenance
Oct	Single Line Drawings
Nov	Humidification
Dec	Infection Control - Maintenance and EVS

Electrical Sys Inspections

Agenda

1. Electrical Codes
2. Install & Inspect Overview
3. Generator & ATS
4. Panelboards
5. Receptacles
6. Isolated Power
7. Lighting
8. Exit Sign
9. Battery Sys

Electrical Sys Inspections

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Will answer in writing by email after the L&L

Part 1 – Electrical Codes

Different AHJs have different codes

Concerned with
Design & Installation

Concerned with
Installation & Inspection

Most restrictive code applies

Different AHJs have different codes

Your job is tougher than the designers

because you are responsible for both **install <u>AND</u> inspection**

oncerned with
esign & Installation

The Joint Commission

Concerned with
Installation & Inspection

Most restrictive code applies

Different AHJs have different codes

Beware ← of → Inspection Dates

Very Restrictive

Annual	=12 mo+ 0 d
Semi-annual	= 6 mo + 0 d
Quarterly	= 3 mo + 0 d
Monthly	= < 31 d

Very Tolerant

Annual	=12 mo ± month
Semi-annual	= 6 mo ± 20 d
Quarterly	= 3 mo ± 10 d
Monthly	= 1/mo

ELECTRICAL SYSTEMS DESIGN FOR HEALTHCARE

MIKE McGANN, PE, LEED AP

- 18 Years MEPT Engineering Consulting
- 10 Years Electrical Contracting

- 5 Years MSOE - AE Adjunct Professor
- Engineering
- Architecture

Let's clarify codes described in the Dec L&L slides

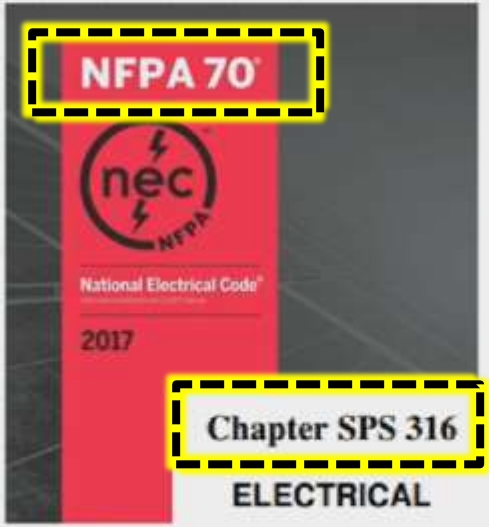
- Healthcare
- Power Distribution

RJ RING & DUCHATEAU
CONSULTING ENGINEERS

GOVERNING CODES

For INSTALLATION

NEC, What We Use For Buildings



Published under s. 35.93, Wis. Stats., by the Legislative Reference Bureau.

SAFETY AND PROFESSIONAL SERVICES

Utilities Have Their Own Rules

WISCONSIN STATE LEGISLATURE

HOME SENATE ASSEMBLY COMMITTEES SERVICE AGENCI

Menu » Administrative Rules Related » Administrative Code » Public Service Com

Chapter PSC 113

SERVIC TILITIES

Subchapter I — General

PSC 113.01 Application of rules.
PSC 113.012 Definitions.

Subchapter II — Miscellaneous Service Requirements

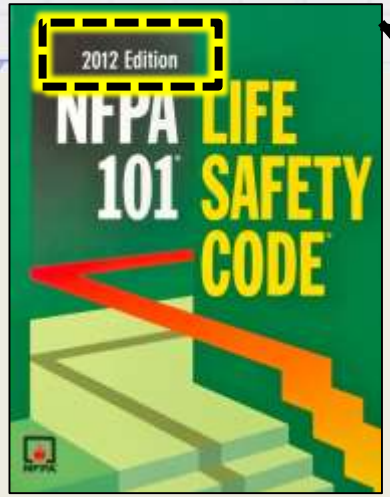
PSC 113.0201 General requirement.
PSC 113.0202 Relocation of poles.

GOVERNING CODES

For INSTALLATION, & INSPECTION

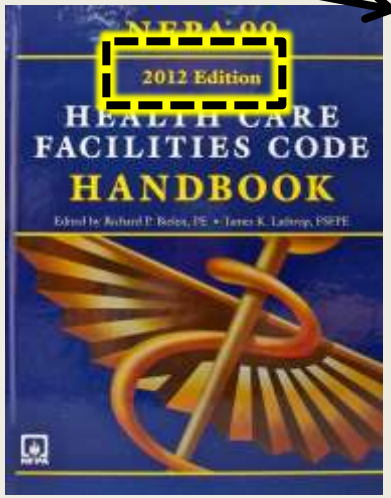
CMS CENTERS for MEDICARE & MEDICAID SERVICES

The Joint Commission

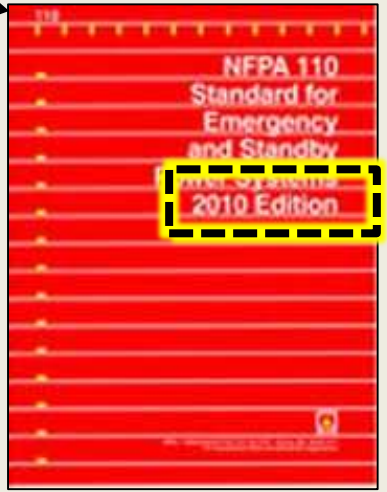


Points to
NFPA 70, 99 & 110

Design
(usually defer to 2017)



Design & Inspection



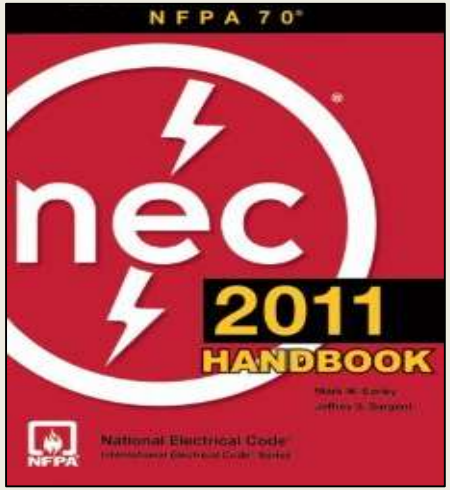
Generator Design & Inspection

GOVERNING CODES

CMS
CENTERS for MEDICARE & MEDICAID SERVICES

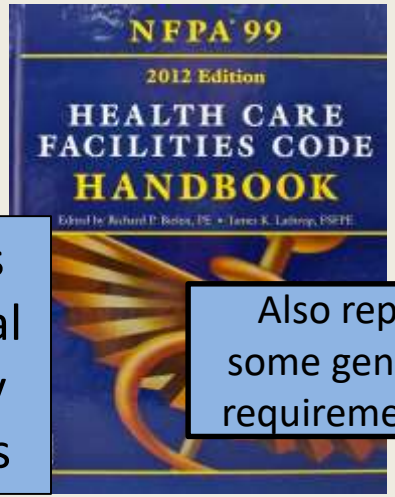
The Joint Commission

Art. 517 repeated in → Chap 6



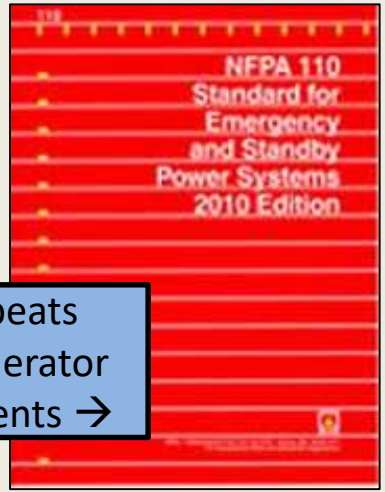
Design
(usually defer to 2017)

Also contains added normal & emergency requirements



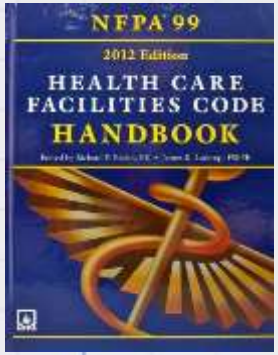
Also repeats some generator requirements →

Design & Inspection



Generator Design & Inspection

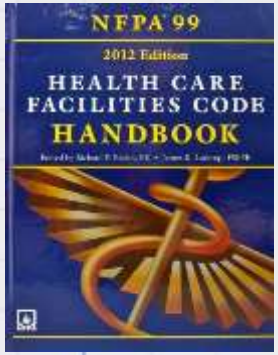
TYPICAL NFPA 99 ELECTRICAL DISTRIBUTION SYSTEM



Normal Sys 6.3

Emergency Sys (EES) 6.4 – 6.6

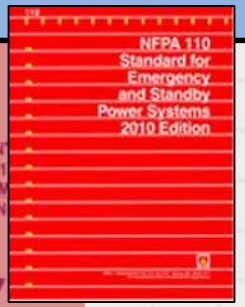
TYPICAL NFPA 99 ELECTRICAL DISTRIBUTION SYSTEM

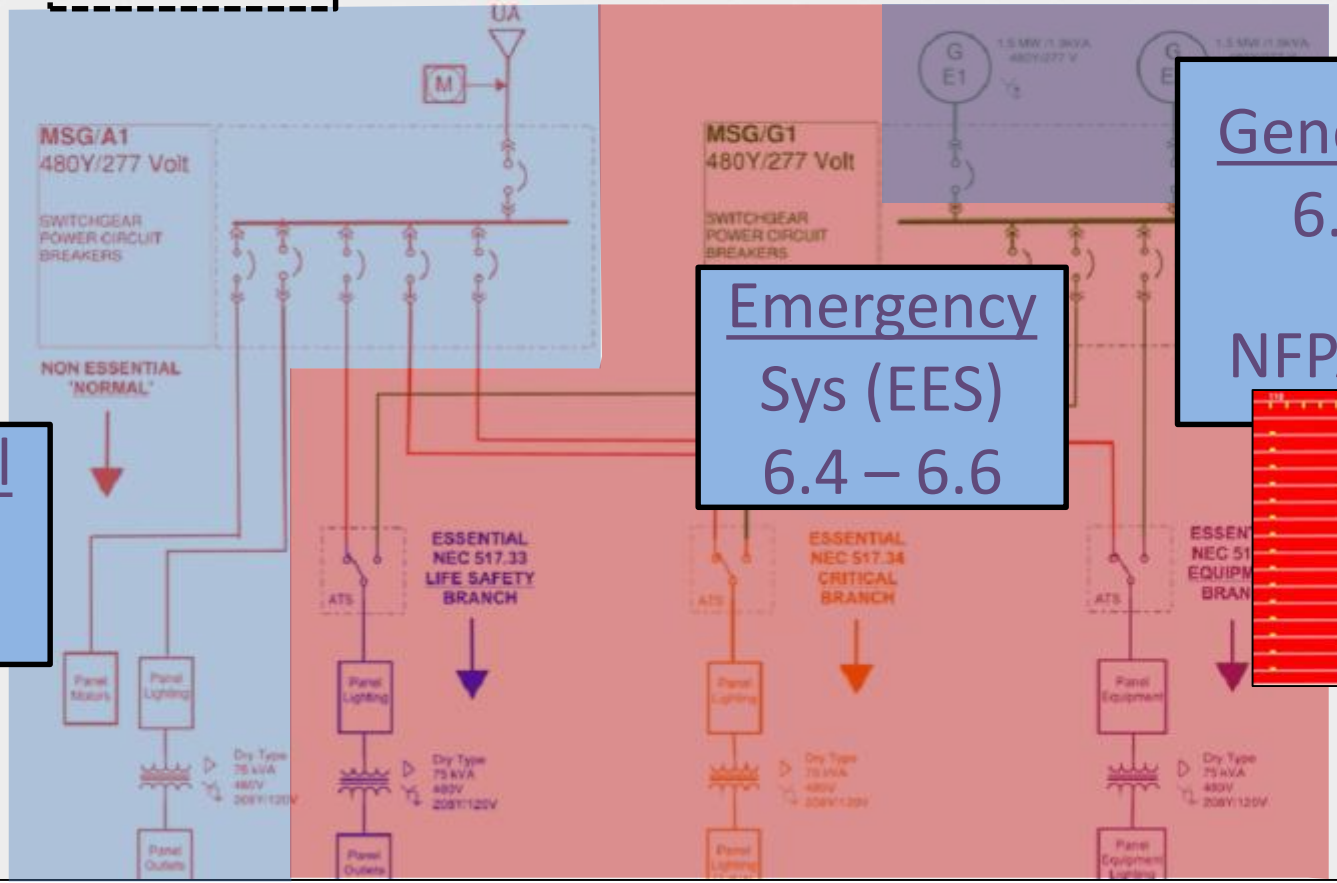


Normal
Sys
6.3

Emergency
Sys (EES)
6.4 – 6.6

Generator
6.4.1
&
NFPA 110





Part 2 – Overview of Checkpts

Overview of items most surveyors look for in the electrical system

ELECTRICAL SYSTEMS DESIGN FOR HEALTHCARE

MIKE McGANN, PE, LEED AP

RING & DUCHATEAU
CONSULTING ENGINEERS

Review the Dec 2019 L&L slides & Comment on:

- **<u>Installation</u> checkpoints looked at by CMS, DQA, TJC**
- **Inspection checkpoints looked at by CMS, DQA, TJC**

METERING

Rarely looked at by AHJs.

MAIN SWITCH GEAR MSG – LOW VOLTAGE SWITCH GEAR

Switch Gear

- 2,000 Amp through 6,000 Amp
- High quality product
- Circuit breakers in front
- Circuit Breakers removable for service
- Bussing in the middle
- Cable access in the rear
- Clearance front and back

Masterpact NW Circuit Breaker on its Rails

Typ AHJ Installation Checkpoints

- Clearances
- Cleanliness
- Breaker Labels
- Room Rating
- Exit Hardware:

Typ AHJ Inspection Checkpoints

- None

MAIN SWITCH BOARD MSB – Low Voltage Switch Board

Typ AHJ Installation Checkpoints

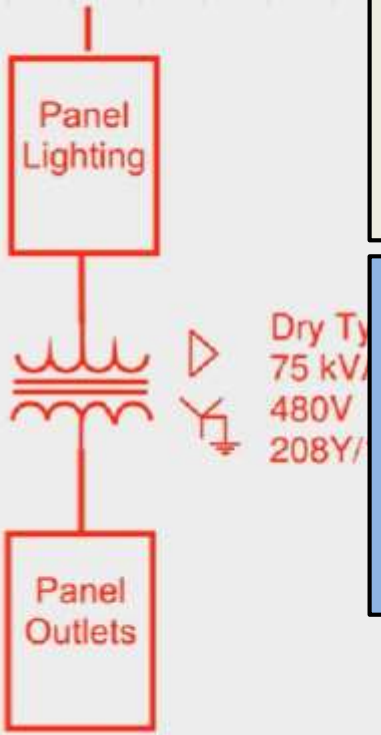
- Clearances
- Cleanliness
- Breaker Labels
- Room Rating
- Exit Hardware

Typ AHJ Inspection Checkpoints

- None

- Bussing in the back
- Cable access top/bottom
- Clearance front only

BRANCH PANELBOARD AND SMALL TRANSFORMER



Typ AHJ Installation Checkpoints

- Clearances
- Panel Directory

Typ AHJ Inspection Checkpoints

- Clearances
- Cleanliness
- Panel Directory

(more later)

- A branch Panelboard is for
to 50% of the main bus size
- Majority of the breakers will be 20A/1PA branch Panelboard is for distribution of small sized loads

LOAD CENTER

Not in Healthcare

Load Center

- Typically 60amp, 100Amp
- Residential Grade
- Available at
  - Home Depot
  - Lowe's
  - Fleet Farm

POWER PANELBOARD

Typ AHJ Installation Checkpoints

- Clearances
- Panel Directory

Typ AHJ Inspection Checkpoints

- Clearances
- Cleanliness
- Panel Directory

(more later)

- Circuit breakers are typically up to 50% of the main bus size

DIESEL GENERATORS

Indoor

Typ AHJ Installation Checkpoints

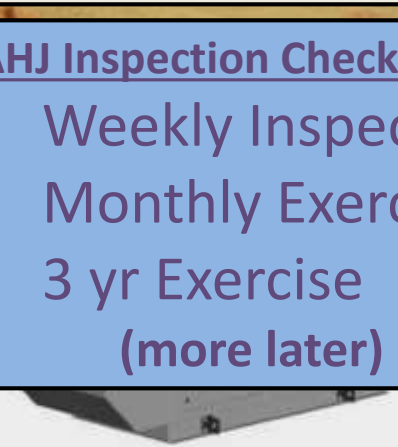
- Remote Panel
- Emerg Stop
- Emerg Lighting

(more later)

Typ AHJ Inspection Checkpoints

- Weekly Inspection
- Monthly Exercise
- 3 yr Exercise

(more later)



Outdoor, Level 3
Sound Enclosure

AUTOMATIC TRANSFER SWITCHES OPEN TRANSITION

- A 'break-before-make' tra
- When the normal source
  will be interrupted while t
  transferred
- When the normal source i
  restored, the power will b
  the loads will be transferr
  normal source

Typ AHJ Installation Checkpoints

- Rarely looked at

Typ AHJ Inspection Checkpoints

- Monthly Exercise
- Cool-down setting
- Annual Inspection

(more later)

LIFE SAFETY NFPA 99, 6.4.2.2.3

(A) Illumination means of egress

(B) Exit Signs

(C) Alarm & Alerting Systems
- Smoke control
- Kitchen hood supply/exhaust
- Supply Exhaust for important loads listed in NEC

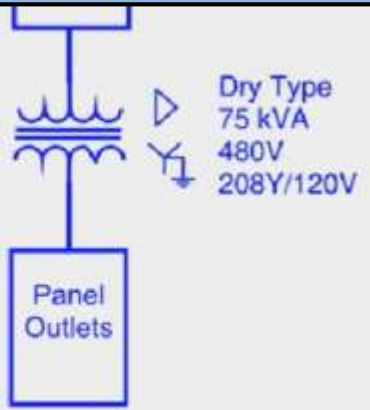
(D) Communication Systems
- Where used for issuing instructions during emergency situations.

(E) Generator Set Locations
- Task Illumination, Batt Packs, outlets at Generator and ATS

(F) Generator Set Accessories
- Fuel Pumps, Fans, louvers, controls.....

Typ AHJ Installation Checkpoints
- Rarely Looked at

Typ AHJ Inspection Checkpoints
- No Critical Loads
- 10 sec start up



CRITICAL

NFPA 99, 6.4.2.2.4

(A) Task illumination, fixed equipment, selected receptacles, and special power circuits serving fo

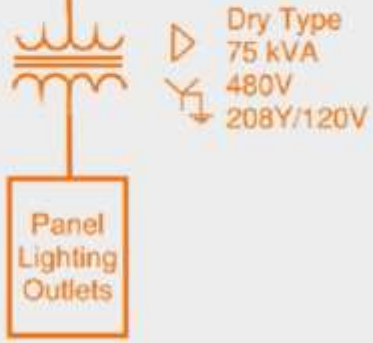
1. Critical Care (Category 1) spaces that utilize anesthetizing g
2. Isolated power systems in special environments
3. Patient care spaces:
   a. Infant Nurseries
   b. Medication preparation areas
   c. Pharmacy Dispensing areas
   d. Selected acute nursing areas
   e. Psychiatric bed areas (omit receptacles)
   f. Ward treatment rooms
   g. Nurse stations
4. Additional specialized task illumination and receptacles.....
5. Nurse Call systems
6. Blood, bone, and tissue banks
7. Telephone and data equipment rooms and closets
8. Task Illumination and receptacles for ....Many Departments.....
9. Additional task illumination, receptacles, and selected power circuits

Typ AHJ Installation Checkpoints

- Rarely Looked at

Typ AHJ Inspection Checkpoints

- No Life S. Loads



ISOLATED POWER SYSTEMS

NFPA 99, 6.3.2.6

- NFPA 99 operating rooms = wet procedure rooms
- Isolated power systems
- Ungrounded system
- Alarms to notify medical staff of fault >0.005 amps or
- Line isolation monitor 'LIM'
- Grounding
- Monthly and annual testing
- Xhhw insulation on wires
- DON'T FORGET THE LASER/X-ray !

Typ AHJ Installation Checkpoints

- Rarely Looked at

Typ AHJ Inspection Checkpoints

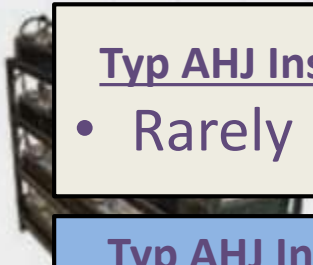
- Monthly Test
- Annual Inspections

UPS

NFPA 111-2010

A unit consisting of the following components:

- AC to DC Converter (rectifier)
- DC bus with backup battery system
- DC to AC Converter (inverter)
- Solid-state bypass switch
- Maintenance bypass switch



Typ AHJ Installation Checkpoints

- Rarely Looked at

storage devices

Typ AHJ Inspection Checkpoints

- Monthly Test
- Annual Inspections

Flywheel:

- A mass rotating around an axis (the motor generator rotor) by the use of magnets in a vacuum
- Designed to provide back up power when the normal source is lost

EQUIPMENT NFPA 99, 6.4.2.5

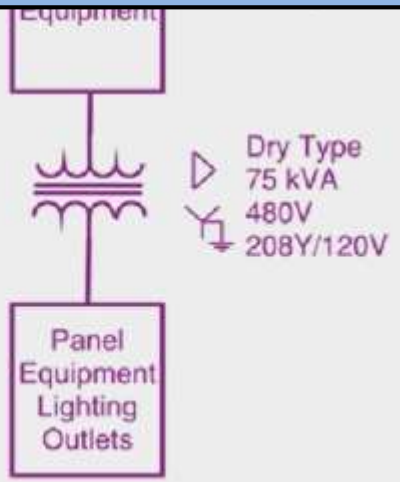
(A) Equipment for Delayed Automatic Connection
- Central Suction
- Sump Pumps
- Medical Air
- Smoke control
- Kitchen hood supply/exhaust
- Supply Exhaust for important loads listed in NEC

(B) Equipment for Delayed Automatic or Manual Connection
- Heating equipment for OR, labor, recover, ICU, coronary care
- Important loads listed in NEC

(C) AC Equipment for Nondelayed Automatic Connection
- Generator Accessories

Typ AHJ Installation Checkpoints
- Rarely Looked at

Typ AHJ Inspection Checkpoints
- None



SECONDARY SELECTIVE– MAIN TIE MAIN

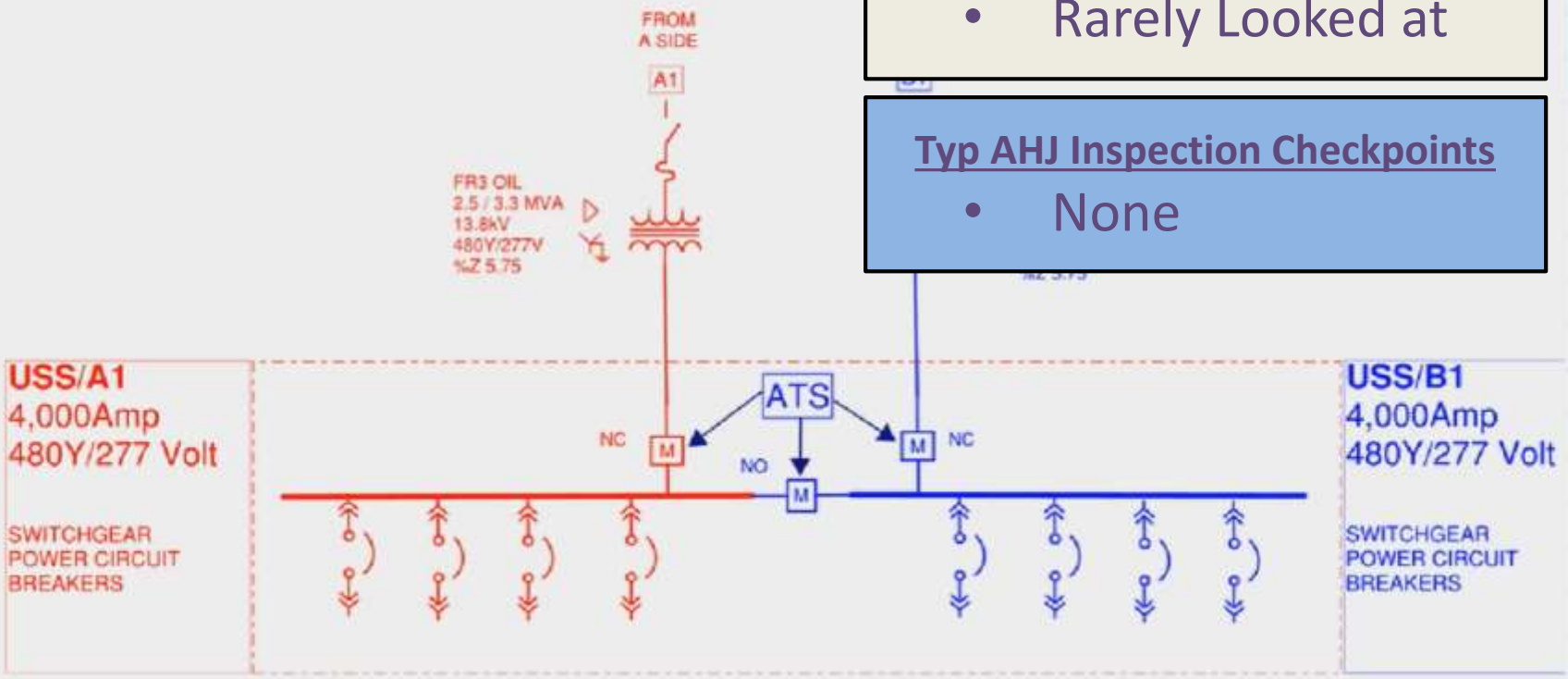
NFPA 99, 6.4.2.1.2

Typ AHJ Installation Checkpoints

- Rarely Looked at

Typ AHJ Inspection Checkpoints

- None



PRIMARY SELECTIVE

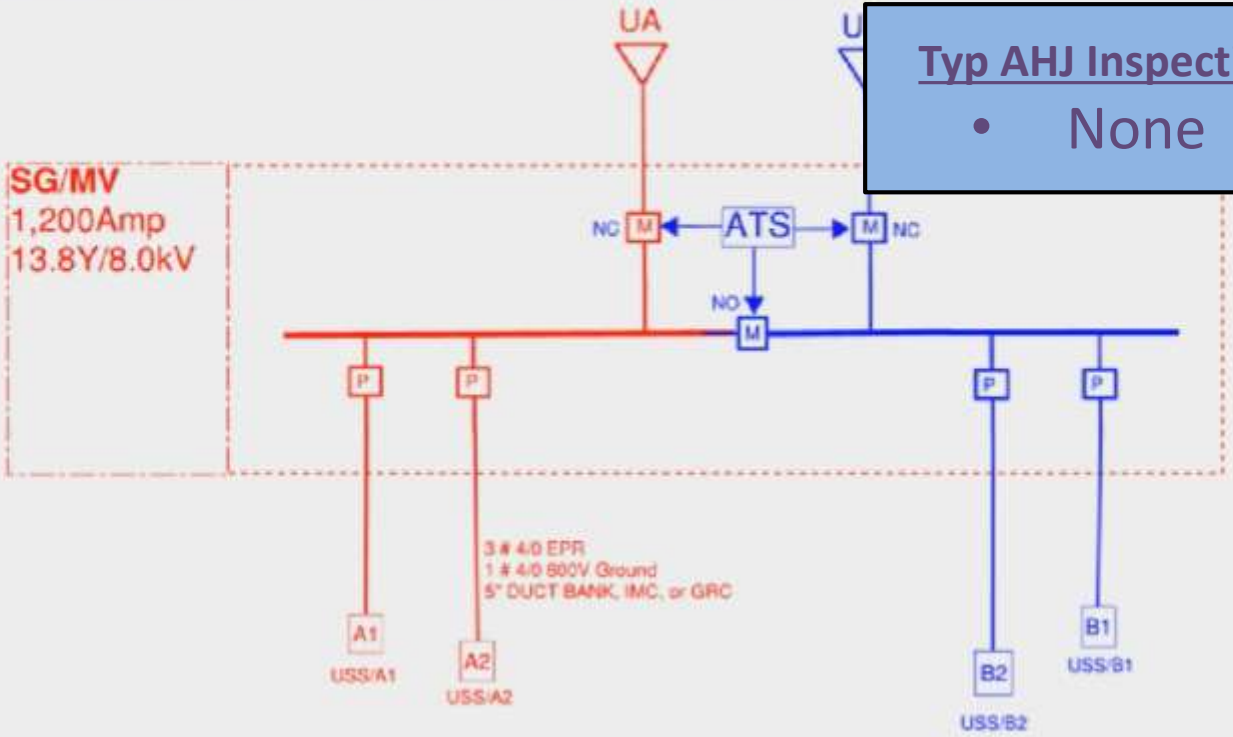
NFPA 99, 6.4.2.1.2

Typ AHJ Installation Checkpoints

- Rarely Looked at

Typ AHJ Inspection Checkpoints

- None



Electrical Sys Inspections

Agenda

1. Electrical Codes
2. Install & Inspect Overview
3. **Generator & ATS**
4. Panelboards
5. Receptacles
6. Isolated Power
7. Lighting
8. Exit Sign
9. Battery Sys

Will answer in writing by email after the L&L

Part 3 – Generators - Detailed

Installation & Inspection Checkpoints Used by AHJ Surveyors

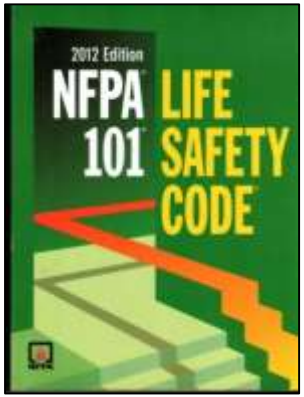
Regulations

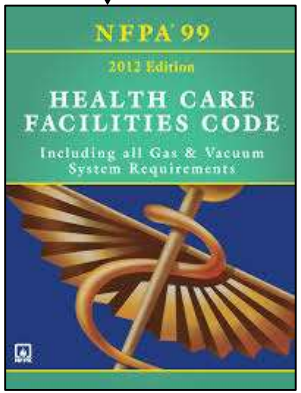
Wis Constr → Track

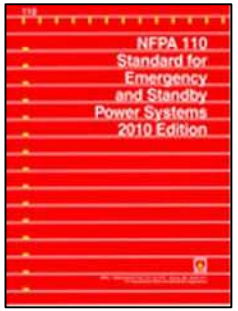
Art 517 (healthcare)

Borrowed language

License, → Funding & Accreditation Tracks

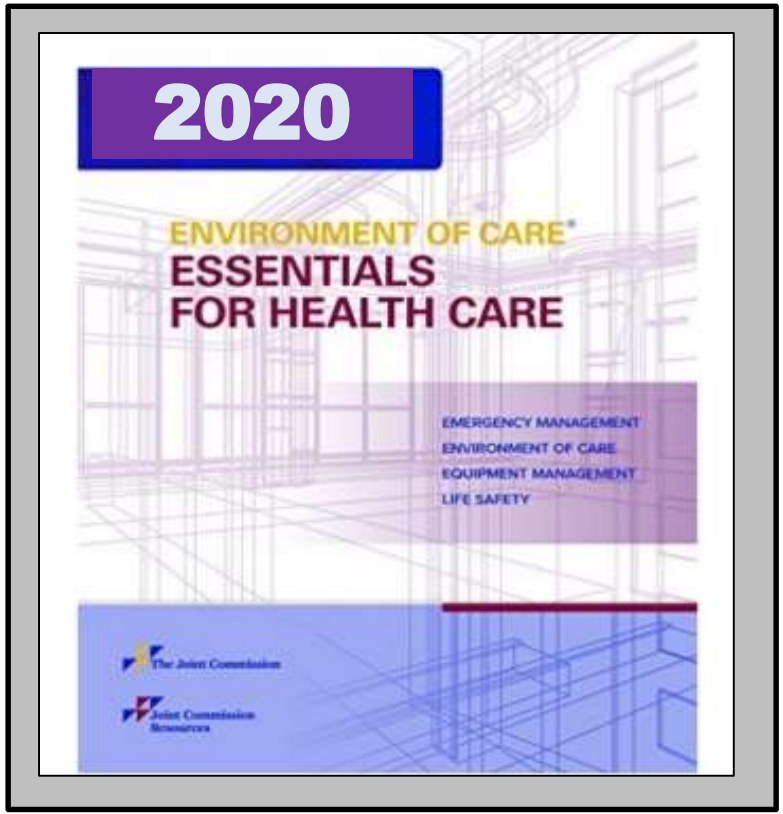






TJC Regulations

Environment of Care



The Joint Commission

Requirements are Primarily the

Same as NFPA

EC.02.05.01 – Risk Management

EC.02.05.03 – EMERGENCY SYS

EP.02.05.05 – SYS MAINTENANCE

EC.02.05.07 – ELECTRICAL MAINT.

EM.02.02.09 – EMERG OP PLAN

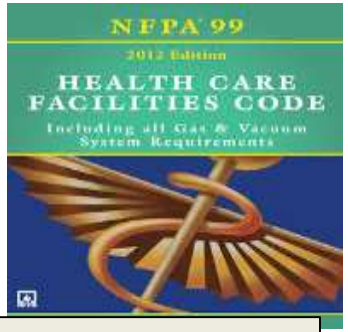
LS.02.01.20 – MEANS OF EGRESS

EMERGENCY GENERATOR rules

Found in At least 11 Locations

1. *LSC 18.2.9.2 – Emergency* Lighting per 99
2. *LSC 7.9.2.4 – Lighting Gen per 110*
3. *LSC 18.2.10.5* – Emerg Lite & Signs on LS branch
4. *LSC 18.5.1.2 – Alarm, Comm, Gen Lite per 99*
5. *LSC 18.5.1.3* – Life Support per 99
6. *LSC 7.2.3.12* – EPSS Gen Fuel, Rating, HVAC
7. *LSC 9.1.3.1- Gen Set per 110*
8. *LSC 9.1.3.2 – Gen monitor by FA*
9. *99, 6.4.1.1.6.1* – EPSS Gen Set classed per 110
10. *99, 6.4.4.1.1.3* – Gen Set Install & Maint per 110
11. *110 entire Standard* - Gen Set Install & Maint

NFPA 99, Chapter 6 – Electrical



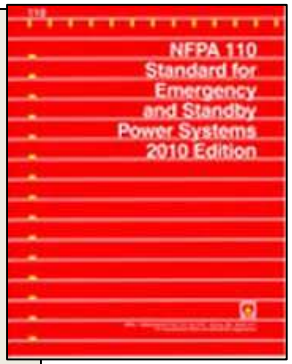
Section 6.4.3—Performance Criteria & Testing Covers EES Type 1 performance criteria to assure that the EES is safe and reliable.

Includes:

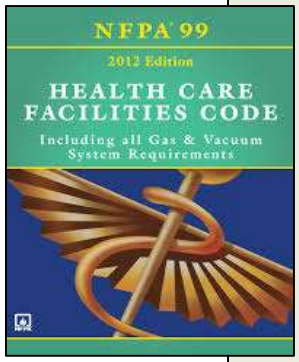
- Maintenance, inspection and testing of the EES alternate power source, including generator testing criteria, test conditions, and testing personnel qualifications
- Specific maintenance, inspection and testing requirements are also required through reference to NFPA 110, Standard for Emergency and Standby Power Systems
- Maintenance & testing of EES circuitry
- Record keeping requirements.

Often Confused

EPS, EES, EPSS



- **EPS** = Emergency Power Supply
  (generator/ancillary equip, NFPA 110)
- **EES** = Essential Electrical Sys
  (the Alternate source of power & all distribution equipment, NFPA 99)
- **EPSS** = Emerg Power Supply System
  (the Alternate source of power & all distribution equipment-NFPA 110)

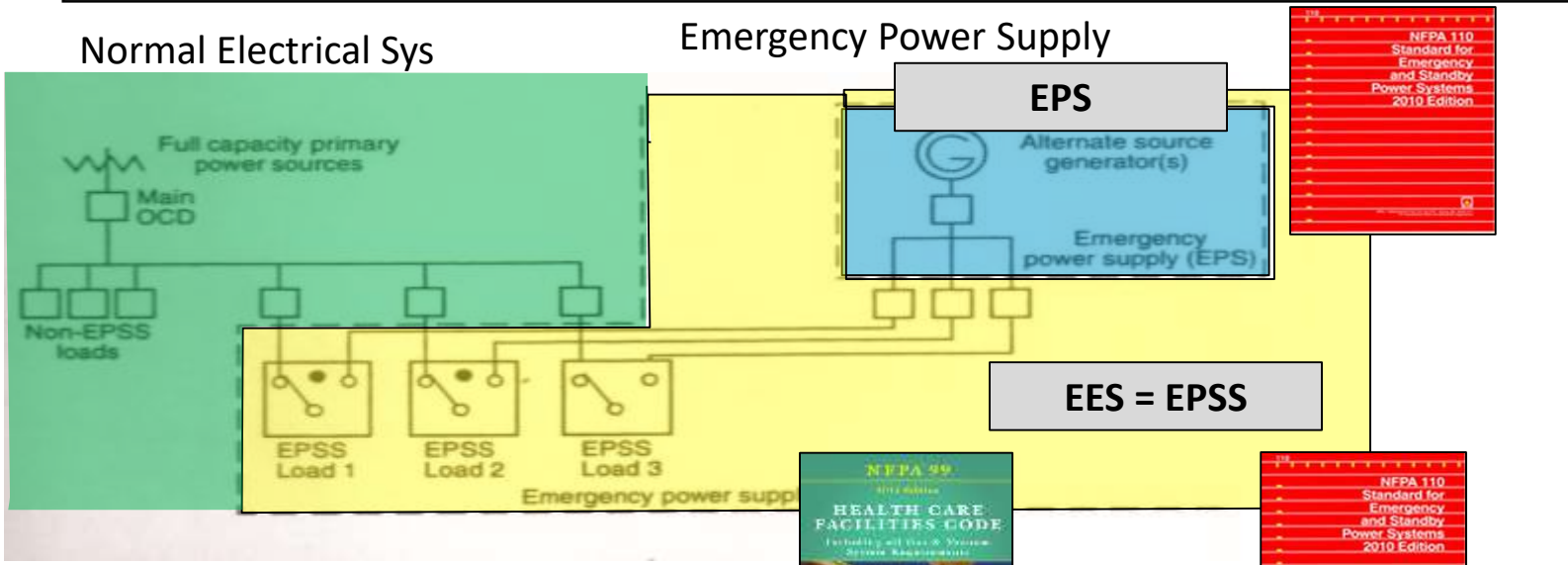


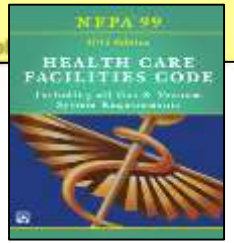
Different Terms

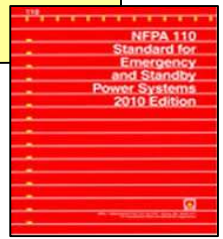
Often Confused

Normal Electrical Sys

Emergency Power Supply





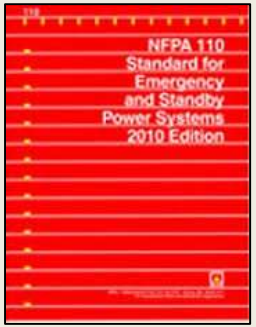


Essential Electrical Sys

Emerg Power Supply System

Generator Installation

110: Emergency & Standby Power Systems



Chapters:

- 4 – Classification of EPSS
- 5 - Generator Requirements
- 6 – Transfer Switching
- 7 – Installation
- 8 – Inspection-Test-Maintenance

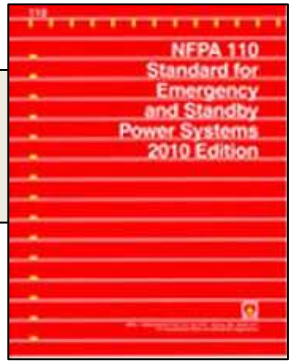
Applies to Existing HC via LSC 7.9.2.3

Batteries

1999:

" Starting batteries for Level 1 installations shall NOT be of the maintenance-free variety"

X



5.6.4.5 **- Type of Battery.** The battery shall be of the nickel-cadmium or lead-acid type.

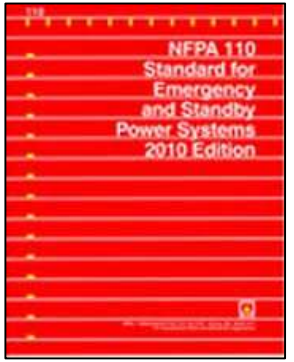
A 5.6.4.5

NFPA 110 requires that batteries for starting the prime mover be either lead-acid or nickel cadmium type but does not provide any other specific requirements on the battery construction. It does not prohibit the use of valve-regulated lead-acid or other type of "low maintenance" or "maintenance free" batteries for prime mover starting, provided all requirements in 5.6.4 are met.

Control Panel

5.6.5.1 - A control panel shall be provided and shall contain the following:

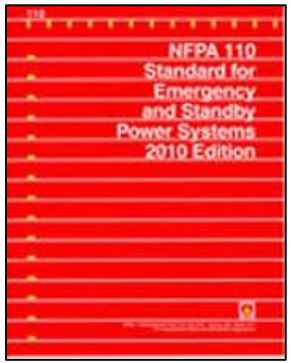
(1) Automatic remote start capability
(2) “Run-off-automatic” switch
(3) Shutdowns as required by 5.6.5.2(3)
(4) Alarms as required by 5.6.5.2(4)
(5) Controls as required by 5.6.5.2(5)



Remote Stop

REMOTE STOP BUTTON

- Located outside generator space
- “Tamper-resistant”



Often Cited

?

Gen Inspect-Weekly

8.4.1 –**Q:** Are there any **regular testing requirements** for Remote Shutdown Switches?

A: Yes… sort of. Section 8.4.1 of NFPA 110-2010 says generators, including all appurtenant components, shall be inspected weekly and exercised under load at least monthly. The term "appurtenant components" means accessory components, and the remote shutoff switch would be included in that. So, technically, you are required to inspect the remote shutoff switch weekly and exercise it when the generator is under load.

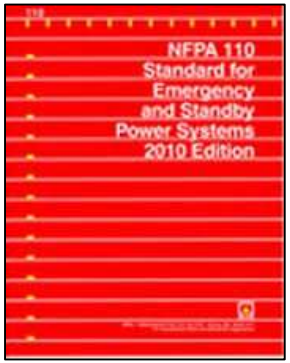
At least one state agency cited a facility for not testing the switch. It seems to be a 'ticky-tack' finding, but the surveyors are getting tougher because CMS is continuing to crack-down on Life Safety Code issues.

The bottom line … NFPA 110-2010 **requires** it to be inspected weekly and tested monthly

Remote Control Panel

5.6.3 – REMOTE CONTROL & ALARMS:

- Remote, common audible alarm
- Powered by storage battery
- Located outside the EPS service room at a site observable by staff
- 21 specified indicators/functions



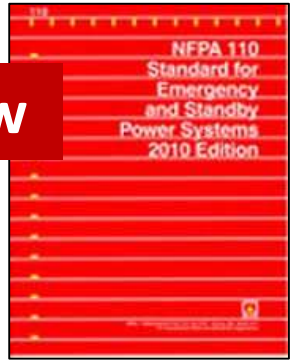
Rarely Cited

Location & Lighting

7.2 – EPS LOCATION:

- Separate room (level 1), 2-hr enclosure
- No other functions in the room
- EPSS not in room with normal power
- Minimize flood potential

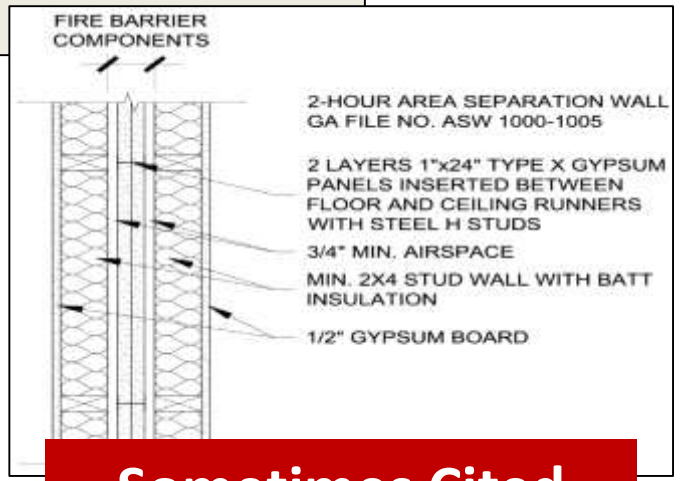
Citations may Grow



7.3.1 – EPS LIGHTING

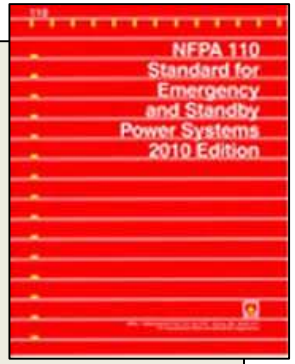
7.3.1 The Level 1 or Level 2 EPS equipment location(s) shall be provided with battery-powered emergency lighting.

This requirement shall not apply to units located outdoors in enclosures that do not include walk-in access.



Sometimes Cited

Final Testing

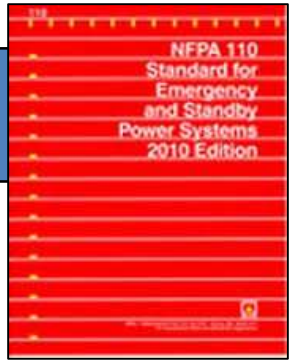


7.13 – ACCEPTANCE TEST

1. Building load test for 1-1/2 hrs
   - Cold start via normal power disconnect
   - All loads served
2. Full nameplate load test for 2 hrs
3. Cycle Crank test
4. Should invite AHJ
5. Documentation to AHJ

Rarely Cited

4. Generator Inspections



8.1.1 The routine maintenance and operational testing program shall be based on all of the following:

(1) Manufacturer's recommendations
(2) Instruction manuals
(3) Minimum requirements of chap 8, NFPA 110
(4) The authority having jurisdiction

Rarely Cited

8.2.2 – Manuals, Tools & Parts

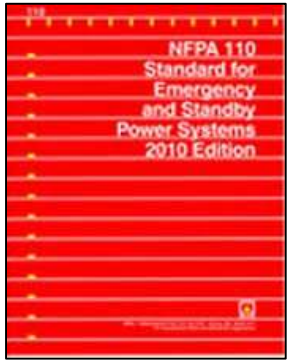
- Manuals near Level 1 sys
- High mortality Parts on-site

8.3.3 – EPSS Maintenance Program

- Written schedule
- Written record

Battery Inspections

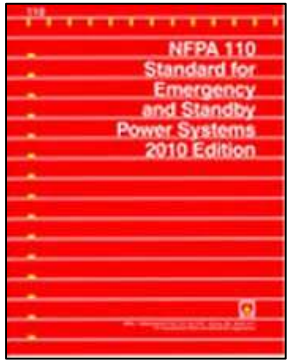
Frequently Cited



8.3.7 Storage batteries, including <u>electrolyte levels</u> or <u>battery voltage</u>, used in connection with systems shall be **<u>inspected weekly</u>** and maintained in full compliance with manufacturer's specifications.

8.3.7.1 Maintenance of lead-acid batteries shall include the **<u>monthly testing</u>** and recording of electrolyte <u>specific gravity</u>. Battery <u>conductance</u> testing shall be permitted in lieu

Gen Inspect-Weekly

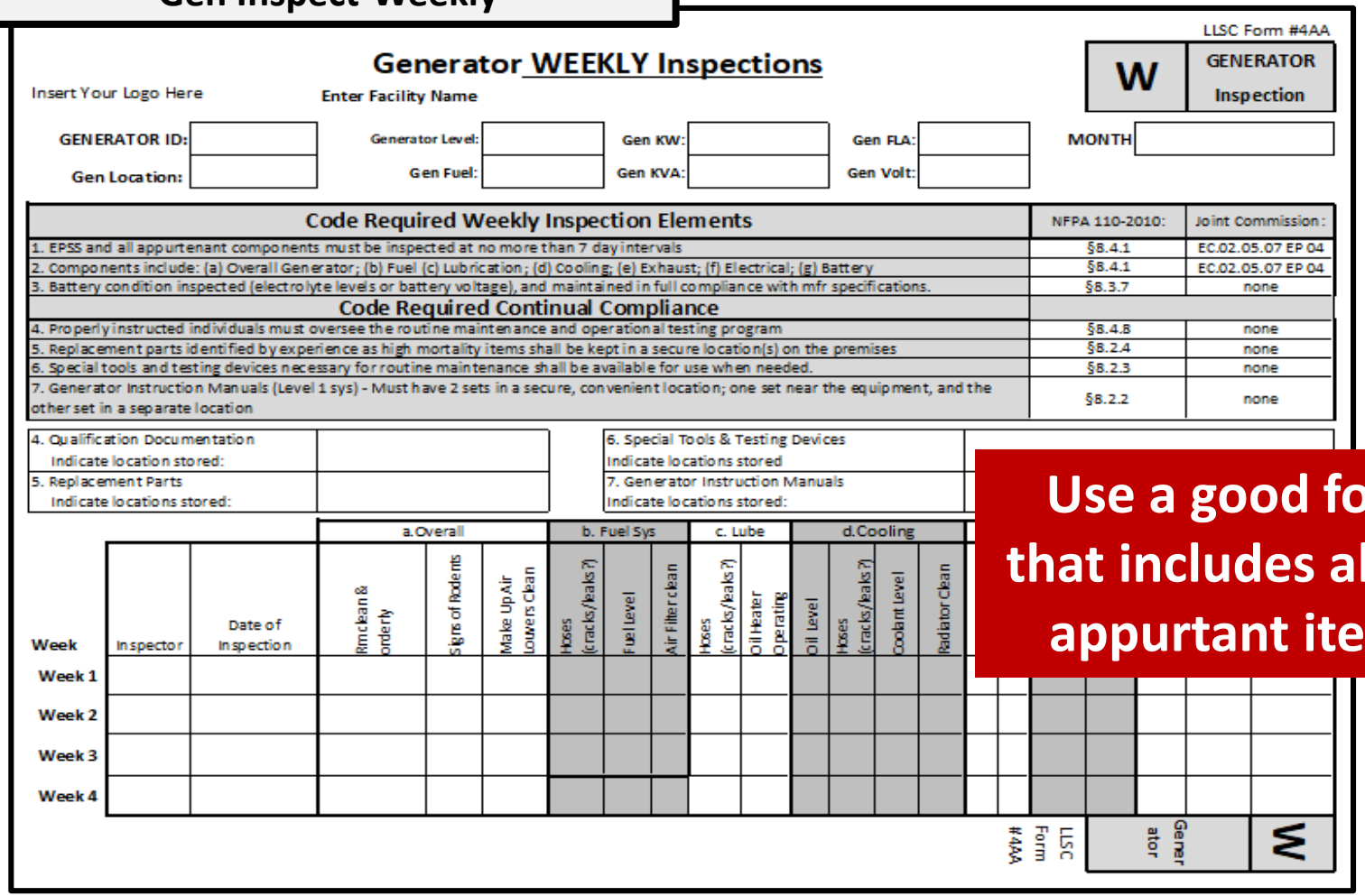


8.4.1 – Weekly Inspection

- Storage battery condition & electrolyte levels or battery voltage
- Includes all appurtenant components
- Follow manufacture's recommendations or those in Figure A.8.3.1(a)

Sometimes Cited

Gen Inspect-Weekly



LLSC Form #4AA

Generator WEEKLY Inspections

W | GENERATOR Inspection

Insert Your Logo Here

Enter Facility Name

GENERATOR ID:		Generator Level:		Gen KW:		Gen FLA:	
Gen Location:		Gen Fuel:		Gen KVA:		Gen Volt:	

MONTH

Code Required Weekly Inspection Elements	NFPA 110-2010:	Joint Commission:
1. EPSS and all appurtenant components must be inspected at no more than 7 day intervals	§8.4.1	EC.02.05.07 EP 04
2. Components include: (a) Overall Generator; (b) Fuel (c) Lubrication; (d) Cooling; (e) Exhaust; (f) Electrical; (g) Battery	§8.4.1	EC.02.05.07 EP 04
3. Battery condition inspected (electrolyte levels or battery voltage), and maintained in full compliance with mfr specifications.	§8.3.7	none
Code Required Continual Compliance		
4. Properly instructed individuals must oversee the routine maintenance and operational testing program	§8.4.8	none
5. Replacement parts identified by experience as high mortality items shall be kept in a secure location(s) on the premises	§8.2.4	none
6. Special tools and testing devices necessary for routine maintenance shall be available for use when needed.	§8.2.3	none
7. Generator Instruction Manuals (Level 1 sys) - Must have 2 sets in a secure, convenient location; one set near the equipment, and the other set in a separate location	§8.2.2	none

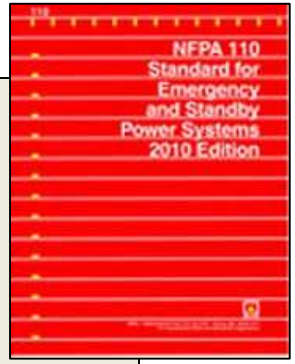
4. Qualification Documentation Indicate location stored:		6. Special Tools & Testing Devices Indicate locations stored	
5. Replacement Parts Indicate locations stored:		7. Generator Instruction Manuals Indicate locations stored:	

			a. Overall			b. Fuel Sys			c. Lube		d. Cooling									
Week	Inspector	Date of Inspection	Rm clean & orderly	Signs of Rodents	Make Up Air Louvers Clean	Hoses (cracks/leaks?)	Fuel Level	Air Filter clean	Hoses (cracks/leaks?)	Oil Heater Operating	Oil Level	Hoses (cracks/leaks?)	Coolant Level	Radiator Clean						
Week 1																				
Week 2																				
Week 3																				
Week 4																				

LLSC Form #4AA Generator W

Use a good form that includes all the appurtant items

Gen Exercise - Monthly



8.4.2 – Monthly Exercise – Diesel Powered

- 30 Minute, Under Load
- Load measured by:
  - 30% of Nameplate kW rating, or
  - Min exhaust gas temperature, or
  - Annual 90 min load bank (8.4.2.3)
    (50%-30 min, 75%-60 min)

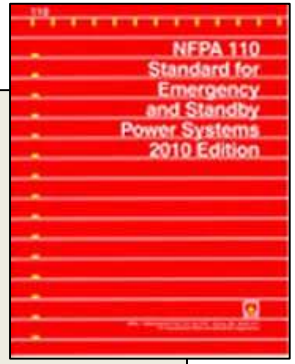
Sometimes Cited

8.4.2.4 – Monthly Exercise – Nat Gas Powered

- 30 Minute, Under available Load
- Or until water temperature & oil pressure have stabilized

8.4.3 The EPS test shall be initiated **by simulating a power outage** using the test switch(es) on the ATSs or by opening a normal breaker.

Gen Exercise - Monthly



8.4.5 **Time delays** shall be set as follows:

(1) Time delay on start:

(a) 1 second minimum

(b) 0.5 second minimum for gas turbine units

(2) Time delay on transfer to emergency: no minimum required

(3) Time delay on restoration to normal: 5 minutes minimum

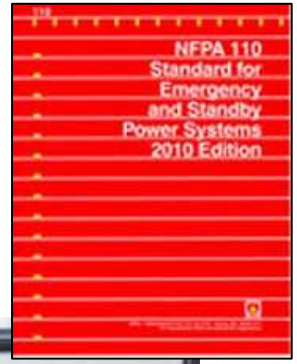
(4) Time delay on shutdown: 5 minutes minimum

Fewer Cites

ATS - Inspections

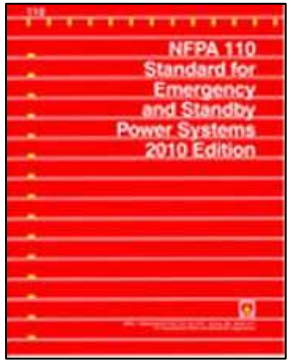
8.3.5 Transfer switches shall be subjected to a maintenance and testing program that includes all of the following operations:

(1) Checking of connections
(2) Inspection or testing for evidence of overheating and excessive contact erosion
(3) Removal of dust and dirt
(4) Replacement of contacts when required



Rarely Cited

ATS Exercise - Monthly



8.4.6.1 The monthly test of a transfer switch shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position.

Rarely Cited

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016
Not Running Checklist								
Radiator Restrictions	None	None	None	None	None	None	None	None
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1
Running Checklist								
Oil Pressure	59	60	60	60	59	59	59	59
Coolant Temperature	181	180	180	180	180	180	180	180
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9
Hour Meter Stop	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1
10 minute cool down	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oil Leaks	None	None	None	None	None	None	None	None
Coolant Leaks	None	None						None
Fuel Leaks	None	None						None
Unusual vibrations	None	None						
Unusual noises	None	None						
Unusual exhaust	None	None						
VOLTAGE								
L1	209	208						2
L2	208	208						208
L3	208	208						209
*AMPS								
L1	203	220						265
L2	228	248	225	240	213	258	228	270
L3	243	221	212	210	223	253	203	246
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333
Average Amps	225	230	211	219	218	262	223	260
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Use a good form that includes all the code checkpoints

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
	◊ Load tests of generator sets shall include complete cold starts
	♦ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016	9
Not Running Checklist									
Radiator Restrictions	None	None	None	None	None	None	None	None	
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok	
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4	
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok	
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok	
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok	
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt	
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1	
Running Checklist									
Oil Pressure	59	60	60	60	59	59	59	59	
Coolant Temperature	181	180	180	180	180	180	180	180	
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9	
Hour Meter Stop	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1	
Oil Leaks	None	None	None	None	None	None	None	None	
Coolant Leaks	None	None	None	None	None	None	None	None	
Fuel Leaks	None	None	None	None	None	None	None	None	
Unusual vibrations	None	None	None	None	None	None	None	None	
Unusual noises	None	None	None	None	None	None	None	None	
Unusual exhaust	None	None	None	None	None	None	None	None	
VOLTAGE									
L1	209	208	209	208	208	208	208	208	
L2	208	208	208	208	207	207	208	208	
L3	208	208	208	208	208	208	208	209	
*AMPS									
L1	203	220	195	208	219	275	238	265	
L2	228	248	225	240	213	258	228	270	
L3	243	221	212	210	223	253	203	246	
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333	
Average Amps	225	230	211	219	218	262	223	260	
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%	

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
	◊ Load tests of generator sets shall include complete cold starts
	♦ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016
Not Running Checklist								
Radiator Restrictions	None	None	None	None	None	None	None	None
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1
Running Checklist								
Oil Pressure	59	60	60	60	59	59	59	59
Coolant Temperature	181	180	180	180	180	180	180	180
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9
Hour Meter Stop	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1
10 minute cool down	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oil Leaks	None	None	None	None	None	None	None	None
Coolant Leaks	None	None	None	None	None	None	None	None
Fuel Leaks	None	None	None	None	None	None	None	None
Unusual vibrations	None	None	None	None	None	None	None	None
Unusual noises	None	None	None	None	None	None	None	None
Unusual exhaust	None	None	None	None	None	None	None	None
VOLTAGE								
L1	209	208	209	208	208	208	208	208
L2	208	208	208	208	207	207	208	208
L3	208	208	208	208	208	208	208	209
*AMPS								
L1	203	220	195	208	219	275	238	265
L2	228	248	225	240	213	258	228	270
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333
Average Amps	225	230	211	219	218	262	223	260
Running Capacity (%)								

Note: Generator must be runnir 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
	◊ Load tests of generator sets shall include complete cold starts
	♦ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016	9
Not Running Checklist									
Radiator Restrictions	None	None	None	None	None	None	None	None	
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok	
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4	
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok	
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok	
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok	
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt	
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1	
Running Checklist									
Oil Pressure	59	60	60	60	59	59	59	59	
Coolant Temperature	181	180	180	180	180	180	180	180	
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9	
Hour Meter Sto	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1	
10 minute cool do	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Oil Leaks	None	None	None	None	None	None	None	None	
Coolant Leaks	None	None	None	None	None	None	None	None	
Fuel Leaks	None	None	None	None	None	None	None	None	
Unusual vibrations	None	None	None	None	None	None	None	None	
Unusual noises	None	None	None	None	None	None	None	None	
Unusual exhaust	None	None	None	None	None	None	None	None	
VOLTAGE									
L1	209	208	209	208	208	208	208	208	
L2	208	208	208	208	207	207	208	208	
L3	208	208	208	208	208	208	208	209	
*AMPS									
L1	203	220	195	208	219	275	238	265	
L2	228	248	225	240	213	258	228	270	
L3	243	221	212	210	223	253	203	246	
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333	
Average Amps	225	230	211	219	218	262	223	260	
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%	

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
X	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
X	◊ Load tests of generator sets shall include complete cold starts
	♦ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016	9
Not Running Checklist									
Radiator Restrictions	None	None	None	None	None	None	None	None	
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok	
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4	
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok	
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok	
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok	
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt	
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1	
Running Checklist									
Oil Pressure	59	60	60	60	59	59	59	59	
Coolant Temperature	181	180	180	180	180	180	180	180	
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	
Hour Meter Sto	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1	
10 minute cool do	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Oil Leaks	None	None	None	None	None	None	None	None	
Coolant Leaks	None	None	None	None	None	None	None	None	
Fuel Leaks	None	None	None	None	None	None	None	None	
Unusual vibrations	None	None	None	None	None	None	None	None	
Unusual noises	None	None	None	None	None	None	None	None	
Unusual exhaust	None	None	None	None	None	None	None	None	
VOLTAGE									
L1	209	208	209	208	208	208	208	208	
L2	208	208	208	208	207	207	208	208	
L3	208	208	208	208	208	208	208	209	
*AMPS									
L1	203	220	195	208	219	275	238	265	
L2	228	248	225	240	213	258	228	270	
L3	243	221	212	210	223	253	203	246	
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333	
Average Amps	225	230	211	219	218	262	223	260	
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%	

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
X	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
X	◊ Load tests of generator sets shall include complete cold starts
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	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016	9
Not Running Checklist									
Radiator Restrictions	None	None	None	None	None	None	None	None	
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok	
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4	
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok	
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok	
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok	
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt	
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1	
Running Checklist									
Oil Pressure	59	60	60	60	59	59	59	59	
Coolant Temperature	181	180	180	180	180	180	180	180	
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9	
Hour Meter Sto	71.5	72.7	74.4	75.7	76.9	78	78.9	80.1	
10 minute cool do	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Oil Leaks	None	None	None	None	None	None	None	None	
Coolant Leaks	None	None	None	None	None	None	None	None	
Fuel Leaks	None	None	None	None	None	None	None	None	
Unusual vibrations	None	None	None	None	None	None	None	None	
Unusual noises	None	None	None	None	None	None	None	None	
Unusual exhaust	None	None	None	None	None	None	None	None	
VOLTAGE									
L1	209	208	209	208	208	208	208	208	
L2	208	208	208	208	207	207	208	208	
L3	208	208	208	208	208	208	208	209	
*AMPS									
L1	203	220	195	208	219	275	238	265	
L2	228	248	225	240	213	258	228	270	
L3	243	221	212	210	223	253	203	246	
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333	
Average Amps	225	230	211	219	218	262	223	260	
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%	

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
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C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
X	♦ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
X	◊ Load tests of generator sets shall include complete cold starts
X	♦ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
X	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

MONTHLY GENERATOR CHECKLIST

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	Jun 6/21/2016	Jul 7/25/2016	Aug 8/26/2016
Not Running Checklist								
Radiator Restrictions	None	None	None	None	None	None	None	None
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1
Running Checklist								
Oil Pressure	59	60	60	60	59	59	59	59
Coolant Temperature	181	180	180	180	180	180	180	180
Battery Charge	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Hour Meter Start	70.5	71.5	72.7	74.4	75.7	76.9	78	78.9
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 minute cool down	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Coolant Leaks	None	None	None	None	None	None	None	None
Fuel Leaks	None	None	None	None	None	None	None	None
Unusual vibrations	None	None	None	None	None	None	None	None
Unusual noises	None	None	None	None	None	None	None	None
Unusual exhaust	None	None	None	None	None	None	None	None
VOLTAGE								
L1	209	208	209	208	208	208	208	208
L2	208	208	208	208	207	207	208	208
L3	208	208	208	208	208	208	208	209
*AMPS								
L1	203	220	195	208	219	275	238	265
L2	228	248	225	240	213	258	228	270
L3	243	221	212	210	223	253	203	246
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333
Average Amps	225	230	211	219	218	262	223	260
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	◆ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	◆ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	◆ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
	◊ Available EPSS Load or ◊ Until the water temperature and the oil pressure have stabilized
X	◆ Operation Test shall be initiated by simulating a power outage by either: ◊ Using the test switch(es) on the ATSs, or ◊ By opening a normal breaker
X	◊ Load tests of generator sets shall include complete cold starts
X	◆ Battery Electrolyte Condition - Monthly, Must either a). measure & record spec gravity of each cell, or b). Perform battery conductance testing
X	◆ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
C	◆ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly

Monthly Checklist from Manufacturer

Date	Jan 1/28/2016	Feb 2/24/2016	Mar 3/24/2016	Apr 4/28/2016	May 5/26/2016	June 6/21/2016	July 7/25/2016
Additional checks							
Deteriorated Hoses	None	None	None	None	None	None	None
Exhaust Leaks	None	None	None	None	None	None	None
Meters ok	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indicator Lamps lite	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Batt Cable Conne	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Battery Fluid	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Ventilation Restrict	None	None	None	None	None	None	None
Tools and Part ava	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Emergency Lighting ok at both elevators	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operator doing test	jt	jt	jt	pw	dp	jt	jt

4 THINGS TO FIX ON FORM

Eval	4AB - GENERATOR EXERCISE - MONTHLY
C	♦ EPSSs, including all appurtenant components, shall be exercised under load at least monthly; Test Interval - minimum of 20 days; maximum of 40 days
C	♦ Diesel generator must be exercised for at least 30 min under any of the following load criteria:
C	◊ Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer, or ◊ Under operating temperature conditions and at not less than 30% of the EPS nameplate kW rating, or ◊ Annual Load Bank (see separate test document) and exercised monthly under the available load
	♦ Spark-ignited generator (ie. Natural gas/propane) must be exercised for at least 30 min under any of the following 2 load criteria:
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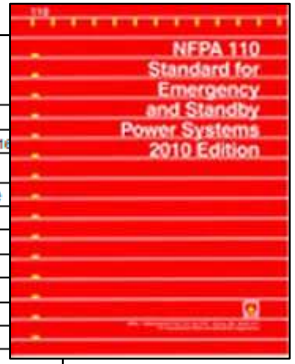
X	♦ Transfer Switch Test - Must operate every automatic and manual transfer switch each month. Transfer shall consist of electrically operating the transfer switch from the standard position to the alternate position and then a return to the standard position
C	♦ Must have a minium 5 minute Time delay on shut-down (Cool-Down)

Gen Exercise - Monthly



MONTHLY GENERATOR CHECKLIST

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1/28/2016	2/24/2016	3/24/2016	4/28/2016	5/26/2016	6/21/2016	7/25/2016	8/26/2016	9/19/2016	10/28/2016	11/30/2016	12/27/201
Not Running Checklist												
Radiator Restrictions	None	None	None	None	None	None	None	None	None	None	None	None
Air Cleaner	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Fuel Level	5/8	5/8	5/8	5/8	5/8	5/8	1/2	3/4	3/4	3/4	3/4	3/4
Coolant Level	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Oil Level	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Check fan belt	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Operator doing test	jt	jt	jt	pw	dp	jt	jt	jt	jt	jt	jt	jt
No pwr to pwr trfer (sec)	1	1	6	1	1	1	1	1	1	1	1	1
Running Checklist												
Oil Pressure												
Coolant Temperature												0
Battery Charge												1
Hour Meter Start												3
Hour Meter Stop												2
10 minute cool down	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oil Leaks	None	None	None	None	None	None	None	None	None	None	None	None
Coolant Leaks	None	None	None	None	None	None	None	None	None	None	None	None
Fuel Leaks	None	None	None	None	None	None	None	None	None	None	None	None
Unusual vibrations	None	None	None	None	None	None	None	None	None	None	None	None
Unusual noises	None	None	None	None	None	None	None	None	None	None	None	None
Unusual exhaust	None	None	None	None	None	None	None	None	None	None	None	None
VOLTAGE												
L1	209	208	209	208	208	208	208	208	208	208	208	208
L2	208	208	208	208	207	207	208	208	207	208	208	208
L3	208	208	208	208	208	208	208	209	209	208	208	209
*AMPS												
L1	203	220	195	208	219	275	238	265	212	233	204	210
L2	228	248	225	240	213	258	228	270	239	249	203	222
L3	243	221	212	210	223	253	203	246	188	208	215	202
Average Voltage	208.333	208	208.333	208	207.667	207.667	208	208.333	208	208	208	208.333
Average Amps	225	230	211	219	218	262	223	260	213	230	207	211
Running Capacity (%)	39%	40%	37%	38%	38%	45%	39%	45%	37%	40%	36%	37%

Note: Generator must be running 30% capacity. (ave. volts x ave. amps x 1.73 = W / 1000 / 208) = % capacity

(Bad forms can get you into trouble)

LLSC Form 4B2

GENERATOR MONTHLY EXERCISE

M — GENERATOR EXERCISE (Kw calc)

Your Logo Here Facility:

Nameplate Information

Generator ID:		Generator KW:		FLA:		Ref: NFPA 110-12 §8.4 TJC EC.02.05.07 EP 4,5,6,7
Generator Loc:		Phase:		Volt:		
Fuel:		Power Factor:				
INSPECTOR Name:		EXERCISE DATE:				

PRIOR TO START	OBSERVATIONS	Result
Check Belt Condition & Tension (fan, pump, alt)		Pass☐ Fail☐
Check Battery Charger & Rate	(located at ATS)	Pass☐ Fail☐
Check Battery Equalize Charge		Pass☐ Fail☐
Oil Level Reading		Pass☐ Fail☐

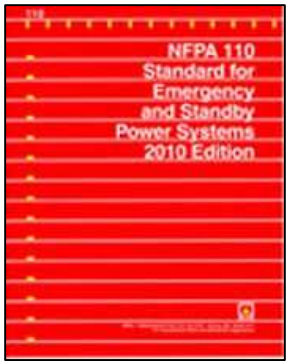
GENERATOR EXERCISE INFO	OBSERVATIONS		Difference	Pass If:	Result*
Prior Exercise:				at least 20, but < 40 days from prior	Pass☐ Fail☐
Time 1st ATS Test Button Pushed		AM/PM			
Time 1st ATS Transfered Back to Normal		AM/PM	Min	at least 30 min	Pass☐ Fail☐
Time the Generator Shut Down		AM/PM	Min	at least 5 min	
# Seconds between Pushing Test & 1st ATS Transfer (Use stopwatch)			Seconds	max 10 sec	Pass☐ Fail☐
Circle Name of ATS Used to Start Gen:	ATS1	ATS2	ATS3	ATS4	(rotate ATS used to start)
Name of any ATS NOT electrically transfermed			(ALL ATS must be transferred each month)		Pass☐ Fail☐

OPERATIONAL CHECKS	OBSERVATIONS	Result
Oil Pressure:	psi	Pass☐ Fail☐
Oil Temp:	°F	Pass☐ Fail☐
Water Temperature:	°F	Pass☐ Fail☐
Exhaust Temperature:	°F	Pass☐ Fail☐
Air Intake Louver Opened Properly?		Pass☐ Fail☐
Radiator Fan Cycled On/Off?		Pass☐ Fail☐
Remote Annunciator Indicates Operation?		Pass☐ Fail☐
Gererator Control in "Auto" Position After Run?		Pass☐ Fail☐

GENERATOR LOAD				OBSERVATIONS						Result*
Amp L1		Volt, L1-2			x	x	x 1.713	÷ 1000	=	A
Amp L2		Volt, L2-3		Avg Amps	x Avg Volts	x Power Factor (typ..8)	x sq root of 3	watt to kilo	= Kilo-watt LOAD	
Amp L3		Volt, L3-1						x .3	=	B
Avg (Sum/3)		Average					nameplate KW		If A>B = Pass Pass☐ Fail☐	

Describe any abnormal situations or failures:

Recommended MONTHLY Form



Use a good form that includes all the check-points

LLSC Form 4B2

GENERATOR MONTHLY EXERCISE

M — GENERATOR EXERCISE (Kw calc)

Your Logo Here Facility:

Nameplate Information

Generator ID:		Generator KW:		FLA:		Ref: NFPA 110-12 §8.4
Generator Loc:		Phase:		Volt:		TJC EC.02.05.07
Fuel:		Power Factor:				EP 4,5,6,7
INSPECTOR Name:		EXERCISE DATE:				

PRIOR TO START	OBSERVATIONS	Result
Check Belt Condition & Tension (fan, pump, alt)		Pass☐ Fail☐
Check Battery Charger & Rate	(located at ATS)	Pass☐ Fail☐
Check Battery Equalize Charge		Pass☐ Fail☐
Oil Level Reading		Pass☐ Fail☐

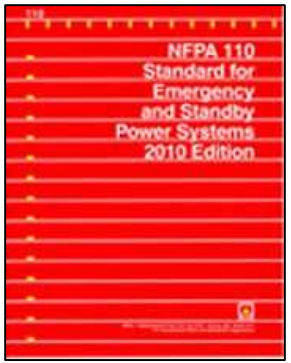
GENERATOR EXERCISE INFO	OBSERVATIONS		Difference	Pass If:	Result*
Prior Exercise:				at least 20, but < 40 days from prior	Pass☐ Fail☐
Time 1st ATS Test Button Pushed		AM/PM			
Time 1st ATS Transfered Back to Normal		AM/PM	Min	at least 30 min	Pass☐ Fail☐
Time the Generator Shut Down		AM/PM	Min	at least 5 min	
# Seconds between Pushing Test & 1st ATS Transfer (Use stopwatch)			Seconds	max 10 sec	Pass☐ Fail☐
Circle Name of ATS Used to Start Gen:	ATS1	ATS2	ATS3	ATS4 (circle ATS used to start)	
Name of any ATS NOT electrically transferred			(ALL ATS must be transferred each month)		Pass☐ Fail☐

OPERATIONAL CHECKS	OBSERVATIONS	Result
Oil Pressure:	psi	Pass☐ Fail☐
Oil Temp:	°F	Pass☐ Fail☐
Water Temperature:	°F	Pass☐ Fail☐
Exhaust Temperature:	°F	Pass☐ Fail☐
Air Intake Louver Opened Properly?		Pass☐ Fail☐
Radiator Fan Cycled On/Off?		Pass☐ Fail☐
Remote Annunciator Indicates Operation?		Pass☐ Fail☐
Gererator Control in "Auto" Position After Run?		Pass☐ Fail☐

GENERATOR LOAD				OBSERVATIONS						Result*
Amp L1		Volt, L1-2			x	x	x 1.713	÷ 1000	=	A
Amp L2		Volt, L2-3		Avg Amps	x Avg Volts	x Power Factor (typ..8)	x sq root of 3	watt to kilo	= Kilo-watt LOAD	
Amp L3		Volt, L3-1						x .3	=	B
Avg (Sum/3)		Average					nameplate KW		If A>B = Pass	Pass☐ Fail☐

Describe any abnormal situations or failures:

Recommended MONTHLY Form



Use a good form that includes all the check-points

Gen Exercise - Monthly

TOP PORTION

Does Your Form Include?

- Battery Measurements
- Criteria to Pass
- ATS Start & Checks

PRIOR TO START	OBSERV							
Check Belt Condition & Tension (fan, pump, alt)								Pass☐ Fail☐
Check Battery Charger & Rate	(located at ATS)							Pass☐ Fail☐
Measure Battery Electrolyte SG	1	2	3	4	5	6	Battery Conductance:	Pass☐ Fail☐
Oil Level Reading								Pass☐ Fail☐

GENERATOR EXERCISE INFO	OBSERVATIONS		Difference	Pass If:	Result*
Prior Exercise:				at least 20, but < 40 days from prior	Pass☐ Fail☐
Time 1st ATS Test Button Pushed	AM/PM		Min	at least 30 min	Pass☐ Fail☐
Time 1st ATS Transfered Back to Normal	AM/PM				
Time the Generator Shut Down	AM/PM		Min	at least 5 min	Pass☐ Fail☐
# Seconds between Pushing Test & 1st ATS Transfer (Use stopwatch)			Seconds	max 10 sec	
Circle Name of ATS Used to Start Gen	ATS1	ATS2	ATS3	ATS4	(rotate ATS used to start)
Name of any ATS NOT electrically transferred			(ALL ATS must be transferred each month)		Pass☐ Fail☐

Criteria for Pass

Gen Exercise - Monthly

Does Your Form Include?

- 30% Load Calc/Measure

BOTTOM PORTION

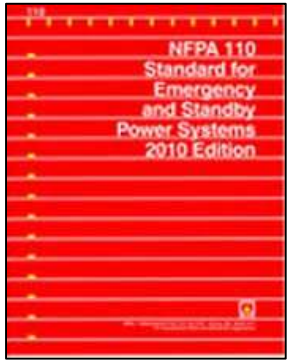
Form if don't have a Kw meter on panel:

GENERATOR LOAD				OBSERVATIONS						Result*
Amp L1		Volt, L1-2			x	x	x 1.713	÷ 1000	=	A
Amp L2		Volt, L2-3		Avg Amps	x Avg Volts	x Power Factor (typ .8)	x sq root of 3	watt to kilo	=	Kilo-watt LOAD
Amp L3		Volt, L3-1						x .3	=	B
Avg (Sum/3)		Average					nameplate KW			If A>B = Pass Pass☐ Fail☐

Form if have a Kw meter on panel:

GENERATOR LOAD	OBSERVATIONS			Result*
	Kw reading on Generator Meter =	⟷	.30 x Nameplate Kw= _____Kw	more than 30% of nameplate Kw? Pass☐ Fail☐

Generator - Annual



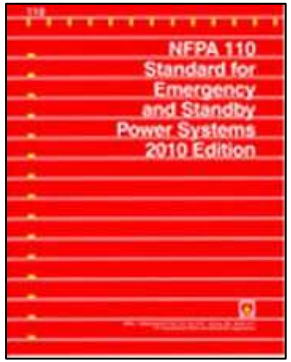
8.3.8 – Annual Fuel Quality Test

- Test method per ASTM standards

More Citations in Future

Load Bank duration reduced:

2-Hr → 1-1/2 Hr Run Time

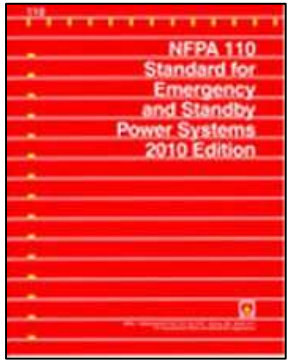


NFPA 110-2010 §8.4.2.3:

- Applies only if use load bank in lieu of the 30% monthly load
- Applies to diesel generators only
- Only need to load-bank for 1-1/2 hrs rather than 2 hrs
- 30 min at 50% load
- 60 min at 75% load
- Formerly a Categorical Waiver

Few Cites

Generator – 3-year Exercise



8.4.9* Level 1 EPSS shall be tested at least once within every 36 months.

3 Yr

Cites May Increase

8.4.9.1 Level 1 EPSS shall be tested continuously for the duration of its assigned class *(see Section 4.2)*.

8.4.9.2 Where the assigned class is greater than 4 hours, it shall be permitted to terminate the test after 4 continuous hours.

4 Hr

8.4.9.5.1 For a diesel-powered EPS, loading shall be not less than 30 percent of the nameplate kW rating of the EPS. A supplemental load bank shall be permitted to be used to meet or exceed the 30 percent requirement.

30%

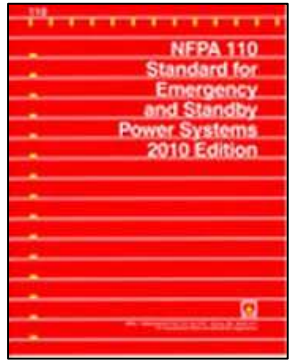
.6 The test required in 8.4.9 shall be permitted to be combined with one of the monthly tests required by 8.4.2 and one of the annual tests required by 8.4.2.3 as a single test.

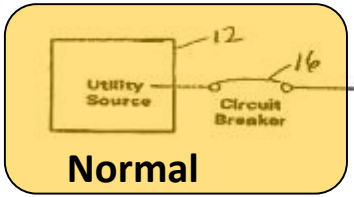
8.4.9.7 Where the test required in 8.4.9 is combined with the al load bank test, the first 3 hours shall be at not less than the minimum loading required by 8.4.9.5 and the remaining hour shall be at not less than 75 percent of the nameplate kW rating of the EPS.

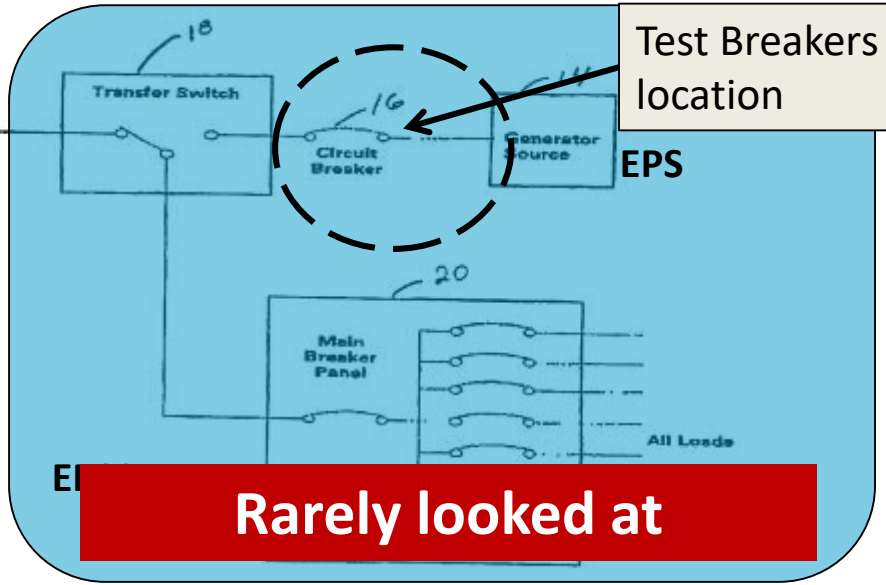
30%→ 75%

Generator Breakers - Annual

8.4.7 EPSS circuit breakers for Level 1 system usage, including main and feed breakers between the EPS and the transfer switch load terminals, shall be **exercised annually** with the EPS in the "off" position.



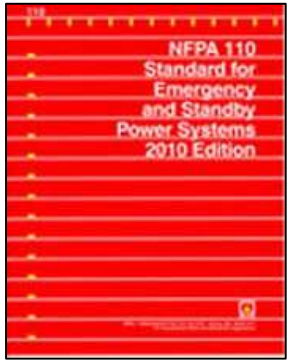




Test Breakers in this location

8.4.7.1 Circuit breakers over 600 volts for Level 1 system usage shall be **exercised every 6 months** and shall be tested under simulated overload conditions **every 2 years**.

Generator Breakers - Annual



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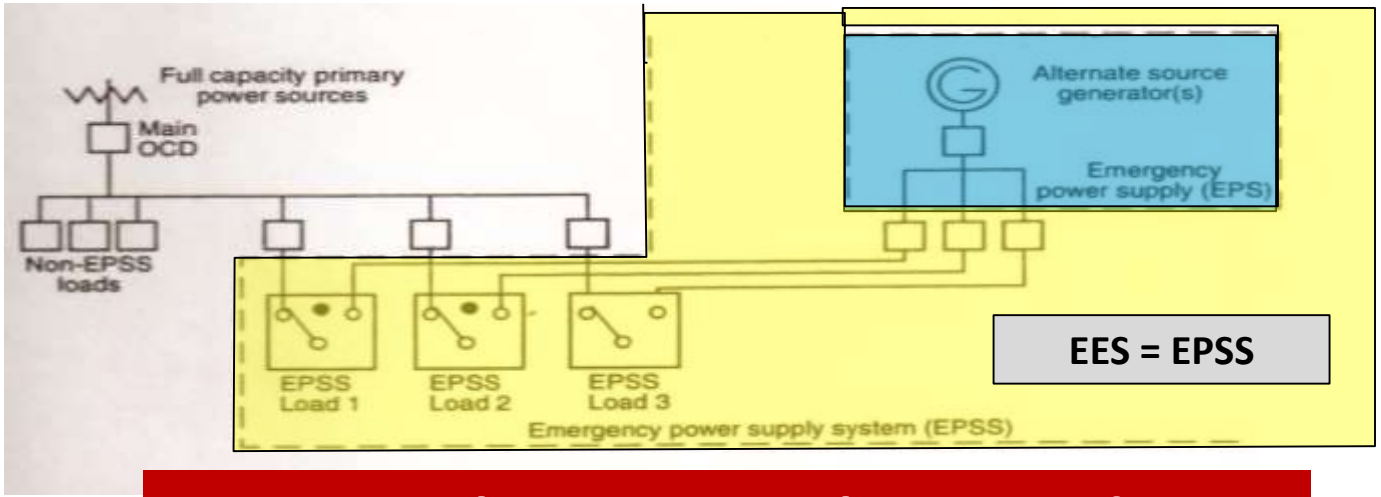

Many Breakers, Potential Increased Cites

Electrical Sys Inspections

Agenda

1. Electrical Codes
2. Install & Inspect Overview
3. Generator & ATS
4. **Panelboards**
5. Receptacles
6. Isolated Power
7. Lighting
8. Exit Sign
9. Battery Sys

Will answer in writing by email after the L&L

Part 4 – Panelboard Inspection

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BRANCH PANELBOARD AND SMALL TRANSFORMER

Panel Lighting

Routine Inspections are NOT mandatory

But, you must ALWAYS be compliant

Typ AHJ Installation Checkpoints

- Clearances
- Panel Directory

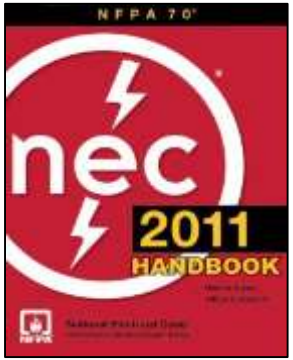
Typ AHJ Inspection Checkpoints

- Clearances
- Cleanliness
- Panel Directory

to 50% of the main bus size

- Majority of the breakers will be 20A/1PA branch Panelboard is for distribution of small sized loads

Panelboard Inspection

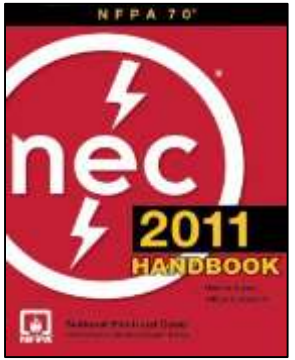


Clearances

- Min 36” if ≤ 600v; 48” if ≤ 9kv
- Surveyors usually use **Zero Tolerance**
- **NOTHING** in the clearance area !
  (hard to police; embarrassing to find)
- Work with staff; don’t just issue order

Often Cited

Panelboard Inspection

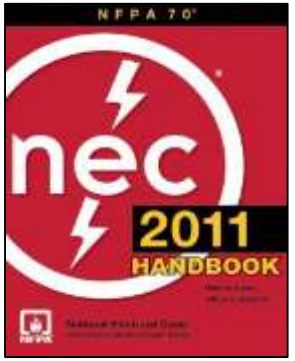


Clearances

- Rooms shared with other users are problematic
- Best to have panels in a separate space
- Do a staff pre-survey of panel locations when surveyor enters

Panelboard Inspection

Clearances



- Tape on floor is good, but only if followed

- If non-compliance is observed once …
  it will be repeated

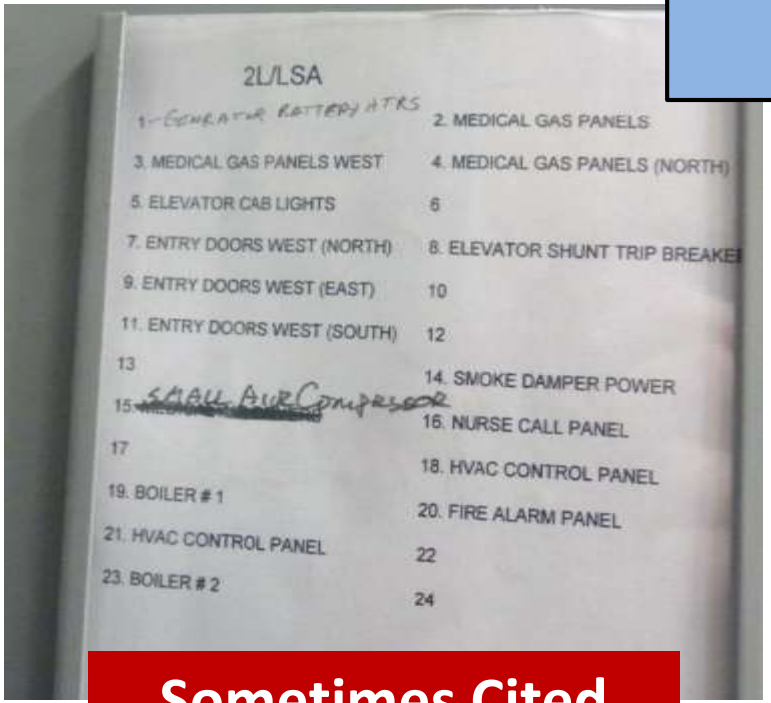
Panelboard Inspection

Disconnects

- Clearances also applies to all electrical disconnecting means

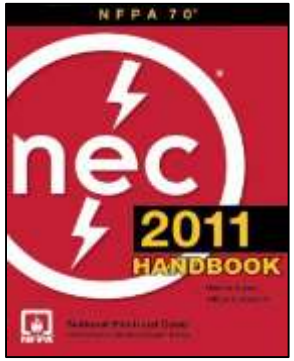
Rarely Cited

Panelboard Inspection



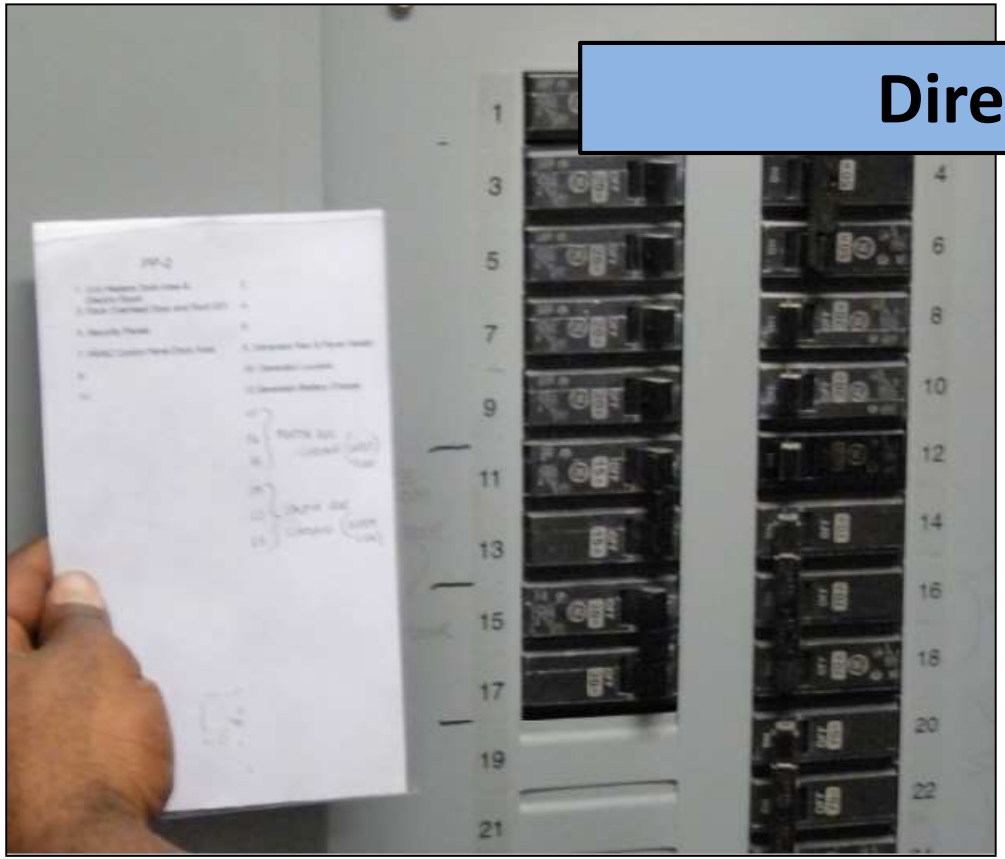
Sometimes Cited

Directory



- All Loads must be identified (Art. 110.22A)
- Must be accurate
- Should be neat & clear
- Caution w/ spares & blanks
- Multiple directories cause issues

Panelboard Inspection



Directory

- Every Breaker Labeled
- Every Space Labeled
- Spares are OFF

Panelboard Inspection

Openings

- No open energized component
- Use Manufactured Blanks
- No open panels in construction area

Rarely Cited

Part 5 – Receptacles

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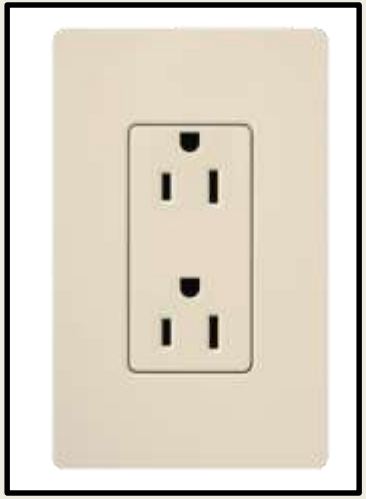
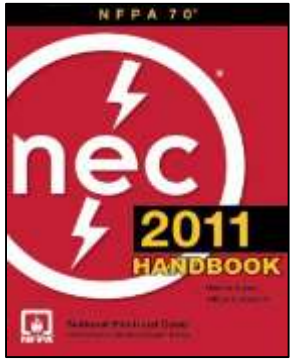


Receptacle Installation

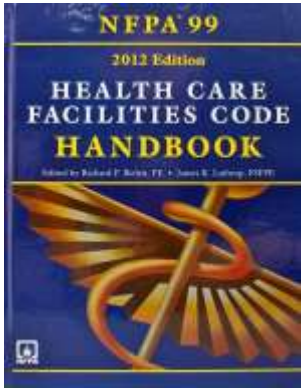


Hospital Grade

- Equipment with “green-dot” plugs must use H-G outlets
- Frequent issue in nursing homes
- Check all cords of devices used by residents

Rarely Cited

Receptacle Installation



6.3.2.2.6.2 Minimum Number of Receptacles. The number of receptacles shall be determined by the intended u patient care rooms in accordance with 6.3.2.2.6.2(A 6.3.2.2.6.2(E).

(A) Receptacles for Patient Bed Locations in General Care Ar- e (Category 2). ach patient bed location shall be provided wit minimum of eight receptacles.

(B) Receptacles for Patient Bed Locations in Critical Care Areas (Category 1). Each patient bed location shall be provided with a minimum of 14 receptacles.

(C) Receptacles for Operating Rooms (Category 1). Operating rooms shall be provided with a minimum of 36 receptacles.

(D) Receptacles for Bathrooms or Toilets. Receptacles shall not be required in bathrooms or toilet rooms.

(E) Receptacles for Special Rooms. Receptacles shall not be required in rooms where medical requirements mandate otherwise (e.g., certain psychiatric, pediatric, or hydrotherapy rooms).

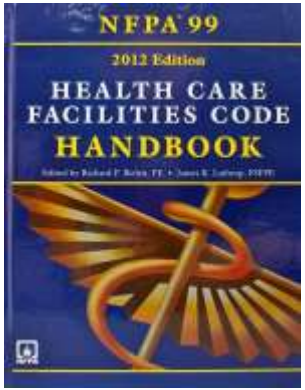
(F) Designated General Care Pediatric Locations. Receptacles that are located within the patient rooms, bathrooms, playrooms, and activity rooms of pediatric units, other than nurseries, shall be listed tamper-resistant or shall employ a listed tamper-resistant cover.

Quantity

- Know the Chap 4 RISK CATEGORY
- Need more now than in the past

Rarely Cited

Receptacle Inspection



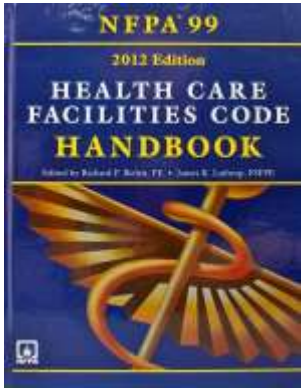
Annual

6.3.4.1.3 Receptacles not listed as hospital-grade, at patient bed locations and in locations where deep sedation or general anesthesia is administered, shall be tested at intervals not exceeding 12 months.

Sometimes Cited

6.3.4.2.1.2 At a minimum, the record shall contain the date, the rooms or areas tested, and an indication of which items have met, or have failed to meet, the performance requirements of this chapter.

Receptacle Inspection



Annual

6.3.3.2 Receptacle Testing in Patient Care Rooms.

6.3.3.2.1 The physical integrity of each receptacle shall be confirmed by visual inspection.

6.3.3.2.2 The continuity of the grounding circuit in each electrical receptacle shall be verified.

6.3.3.2.3 Correct polarity of the hot and neutral connections in each electrical receptacle shall be confirmed.

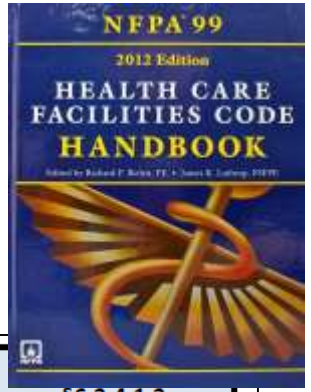
6.3.3.2.4 The retention force of the grounding blade of each electrical receptacle (except locking-type receptacles) shall be not less than 115 g (4 oz).

- Test sheet must document 4 points for each outlet

Receptacle Inspection

Use a quality inspection form:

- After construction
- Annually thereafter



Annual

A. All receptacles (normal & emergency powered) at patient bed locations & where deep sedation or general anesthesia is a[illegible] tested at intervals not exceeding 12 months.	§6.3.4.1.3
B. All other receptacles (normal & emergency powered) in patient care rooms must be tested at intervals defined by documented performance data. (Facility must have performance data to prove "other than annual" testing is warranted; otherwise test annually)	§6.3.4.1.2
TEST PROCEDURES: In each area, ID each outlet starting on the LH side of the main entry door and proceed counter-clockwise back to the entry door; test each individual outlet for the following 4 conditions. Record each on a separate line. Use added pages as needed.	
a. Visually inspect the device and cover that they are intact and in good condition (enter Pass/Fail evaluation in Col "E")	§6.3.3.2.1
b. Use a receptacle tester and verify continuity of the ground (enter Pass/Fail evaluation in Col "F")	§6.3.3.2.2
c. Use a receptacle tester and verify polarity (enter Pass/Fail evaluation in Col "G")	§6.3.3.2.3
d. Use a ground blade tension tester and verify tension is no less than 4 oz. (enter Pass/Fail evaluation in Col "H")	§6.3.3.2.4
IF ANY TEST FAILS, ENTER IN COL "I" A FULL DESCRIPTION OF ISSUE, METHOD & DATE OF CORRECTION & WHO CORRECTED	TJC EC: none

A	B	C	D	E	F	G	H	I
				"a"	"b"	"c"	"d"	
ROOM #	ROOM NAME	*TYPE OUTLET	DEVICE ID (start L of door & test all, ccw)	Physical Condition Pass/Fail	Ground Continuity Pass/Fail	Polarity Check Pass/Fail	Tension ≥ 4 oz. Pass/Fail	If Fail, Describe Corrective Action, Who & Date
1								
2								
3								

Part 6 – Isolated Power-Inspection

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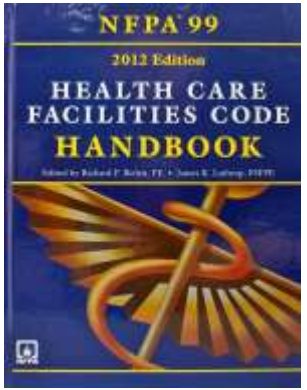
Concerned with <u>Inspection</u>

Wet Locations



Must have either:

- Isolated Power
- GFI

Risk Assessment

6.3.2.2.8.3 Patient beds, toilets, bidets, and wash basins shall not be required to be considered wet procedure locations.

6.3.2.2.8.4* Operating rooms shall be considered to be a wet procedure location, unless a risk assessment conducted by the health care governing body determines otherwise.

Eval forms available →

Rarely Cited

ASHE

NFPA 99: How to Conduct Operating Room Risk Assessments

The National Fire Protection Association recently made an important code change that classifies operating rooms as wet procedure locations unless a risk assessment determines otherwise. Because wet procedure locations must be provided with special protection against electric shock, operating rooms defined as wet locations must be protected by either isolated power or ground-fault interrupters.

Previously, operating rooms were not considered wet locations by default (read more about the history of this issue and the recent code change at the end of this article). ASHE does not agree with the concept that all operating rooms should automatically be classified as wet locations unless risk assessments determine otherwise. However, the key to achieving compliance with this new requirement, and protecting scarce resources of time and money, is to perform a risk assessment to determine whether your operating rooms are wet locations.

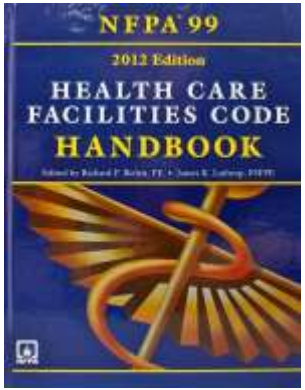
How to Conduct an Operating Room Risk Assessment

1. **Form a risk assessment group to develop a process for evaluating operating rooms.**
   The NFPA directs the health care governing body to consult with all relevant parties, including clinicians, biomedical engineering staff, and facility safety engineering staff.

2. **The risk assessment group should gather information to help determine which surgical procedures, if any, qualify as wet procedures.**
   Clinical staff should be able to identify typical surgical procedures performed at the hospital. Often they can state categorically that wet procedures are never c in certain operating rooms, such as those used for eye surgery, neurosurgery, or ENT surgery. In the case of rooms used for general surgery, it will be necessary to determine if any particular types of general surgery performed in the room are wet procedures. Any operating rooms in which wet procedures are never performed do not require either isolated power or ground-fault interrupters, and no further steps are necessary for these locations.

3. **When a more in-depth risk assessment is needed to determine if an operating room should be classified as a wet procedure location, evaluate the condition of the room during surgical**

Line Isolation - Inspection



Line Isolation Monitor

- Monthly – LIM
- Annual only (if self-test/calibr)

6.3.4.1.4 The LIM circuit shall be tested at intervals of not more than 1 month by actuating the LIM test switch *(see 6.3.2.6.3.6)*. For a LIM circuit with automated self-test and self-calibration capabilities, this test shall be performed at intervals of not more than 12 months. Actuation of the test switch shall activate both visual and audible alarm indicators.

Rarely Cited

6.3.4.2.2 Isolated Power System (Where Installed). A permanent record shall be kept of the results of each of the tests.

Part 7 – Batt Lighting - Inspection

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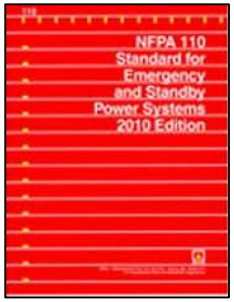
Batt Lighting - Locations



Anesthesia - Surgery

6.3.2.2.11 Battery-Powered Lighting Units.

6.3.2.2.11.1 One or more battery-powered lighting units shall be provided within locations where deep sedation and general anesthesia is administered.

6.3.2.2.11.2 The lighting level of each unit shall be sufficient to terminate procedures intended to be performed within the operating room.

6.3.2.2.11.3 The sensor for units shall be wired to the branch circuit(s) serving general lighting within the room.

6.3.2.2.11.4 Units shall be capable of providing lighting for 1½ hours.

6.3.2.2.11.5 Units shall be tested monthly for 30 seconds, and annually for 30 minutes.

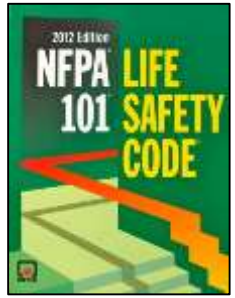
Generator

▲**7.3.1** The Level 1 or Level 2 EPS equipment location(s) shall be provided with battery-powered emergency lighting. This requirement shall not apply to units located outdoors in enclosures that do not include walk-in access.

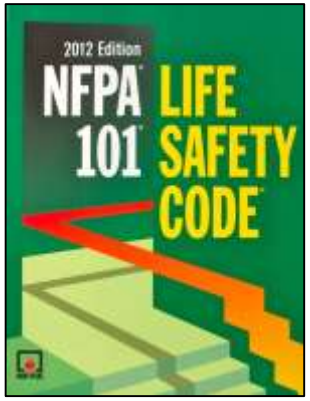
7.3.2 The emergency lighting charging system and the normal service room lighting shall be supplied from the load side of the transfer switch.

Egress Path (optional)

7.8.2.2 Battery-operated electric lights and other types of portable lamps or lanterns shall not be used for primary illumination of means of egress. Battery-operated electric lights shall be permitted to be used as an emergency source to the extent permitted under Section 7.9.



Batt Lighting - Inspections



Monthly + Annual

7.9.3.1.1 Testing of required emergency lighting systems shall be permitted to be conducted as follows:

(1) Functional testing shall be conducted monthly, with a minimum of 3 weeks and a maximum of 5 weeks between tests, for not less than 30 seconds, except as otherwise permitted by 7.9.3.1.1(2).

(2)*The test interval shall be permitted to be extended beyond 30 days with the approval of the authority having jurisdiction.

(3) Functional testing shall be conducted annually for a minimum of 1½ hours if the emergency lighting system is battery powered.

(4) The emergency lighting equipment shall be fully operational for the duration of the tests required by 7.9.3.1.1(1) and (3).

- Monthly (3-5 week interval)

Rarely Cited

Part 8 – Exit Signs - Inspection

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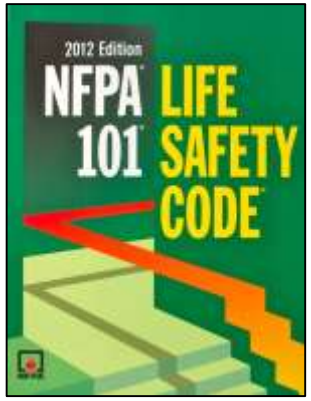
Exit Signs - Inspection



Monthly

7.10.9.1 Inspection. Exit signs shall be visually inspected for operation of the illumination sources at intervals not to exceed 30 days or shall be periodically monitored in accordance with 7.9.3.1.3.

7.9.3.1.3 Testing of required emergency lighting systems shall be permitted to be conducted as follows:

(1) Computer-based, self-testing/self-diagnostic battery-operated emergency lighting equipment shall be provided.
(2) Not less than once every 30 days, emergency lighting equipment shall automatically perform a test with a duration of a minimum of 30 seconds and a diagnostic routine.
(3) The emergency lighting equipment shall automatically perform annually a test for a minimum of 1½ hours.
(4) The emergency lighting equipment shall be fully operational for the duration of the tests required by 7.9.3.1.3(2) and (3).
(5) The computer-based system shall be capable of providing a report of the history of tests and failures at all times.

- Monthly (max 30 days)
- Obstructions & Operation

Rarely Cited

Part 9 – Battery Sys- Inspection

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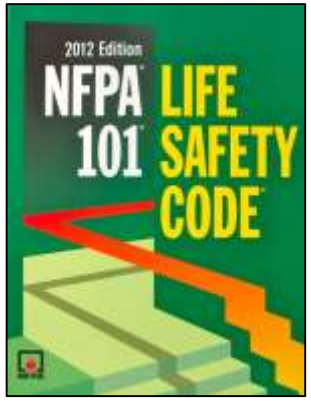
Concerned with Inspection

Referred to as: SEPSS
(Stored Energy Power Standby Supply)

Battery Sys- Inspection



Per NFPA 111-2010

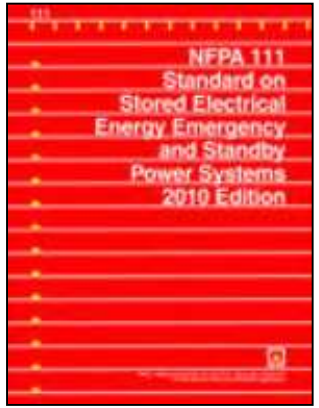
7.9.2.4 Emergency generators providing power to emergency lighting systems shall be installed, tested, and maintained in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems.* Stored electrical energy systems, where required in this *Code*, other than battery systems for emergency luminaires in accordance with 7.9.2.5, shall be installed and tested in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

9.1.4 Stored Electrical Energy Systems. Stored electrical energy systems shall be installed, tested, and maintained in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

- Referenced in two locations in LSC

Rarely Looked at

Battery Sys- Inspection



Rarely Looked at

Monthly, Qrtly, Annual

SYSTEM-INSPECTION/TEST	Ok	M	CODE REQUIRED INSPECTION/TEST
STORED EMERG POWER SUP Monthly SEPSS Test	❑	❑	Monthly test of Stored Emergency Power Supply System (SEPSS, i.e. battery system) for lighting or power to critical areas or equip
Quarterly SEPSS Test	❑	❑	Test for 5 min or as spec'd; Critical Non-SEPSS sys tested & maintained per mfgr spec. Class defines min time for SEPSS to operate [per NFPA 111-1996]; (per TJC-EC.02.05.07, EP 3)
Annual SEPSS Test	❑	❑	Annual test at full load for 60% of full duration of its class

Electrical Sys Inspections

We Covered:

1. Electrical Codes
2. Install & Inspect Overview
3. Generator & ATS
4. Panelboards
5. Receptacles
6. Isolated Power
7. Lighting
8. Exit Sign
9. Battery Sys

Will answer in writing by email after the L&L

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Thanks for joining us