



First Revision No. 14-NFPA 110-2022 [Detail]

Revise 8.3.6.1 as shown in the attachment.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FR_14_Section_8..3.6.1.docx	FR 14 attachment	
110_Detail_FR_14_8.3.6.1_For_Ballot.docx		

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 14:45:28 EDT 2022

Committee Statement

Committee Statement: The changes provide clarity around the differences between maintenance-free and non-maintenance-free batteries. Additionally, it gives greater options and guidance to the testing procedures that are available.

Response Message: FR-14-NFPA 110-2022

[Public Input No. 30-NFPA 110-2022 \[Section No. 8.3.6.1\]](#)

[Public Input No. 19-NFPA 110-2022 \[Section No. 8.3.6.1\]](#)

8.3.6.1

~~Maintenance of lead-acid batteries shall include the monthly testing and recording of electrolyte specific gravity. Battery conductance testing shall be permitted in lieu of the testing of specific gravity when applicable or warranted.~~

8.3.6.1.1

~~Maintenance of lead-acid~~Non-maintenance-free batteries shall include the be tested monthly testing and recording of electrolyte specific gravity or other maintenance practices as required for the battery type.

8.3.6.1.2*

Maintenance-free batteries shall be tested monthly using one of the following methods:

- (1) ~~Battery conductance testing shall be permitted in lieu of the testing of specific gravity when applicable or warranted.~~
- (2) Ohmic testing
- (3) Carbon pile load testing
- (4) *Cranking voltage drop testing

A.8.3.6.1.2

Priority should be given to the education and training of individuals regarding potential safety hazards when choosing the appropriate battery test.

A.8.3.6.1.2(4)

Examples of cranking voltage drops are shown in Table A.8.3.6.1.2(4).

Table A.8.3.6.1.2(4) Initial Cranking Voltage Drop for Starter Viability

Temp. [°C (°F)]	<u>21.1</u> <u>(70)</u>	<u>15.6</u> <u>(60)</u>	<u>10</u> <u>(50)</u>	<u>4.4</u> <u>(40)</u>	<u>-1.1</u> <u>(30)</u>	<u>-6.7</u> <u>(20)</u>	<u>-12.2</u> <u>(10)</u>	<u>-17.8</u> <u>(0)</u>
<u>Min. Volts (12 VDC)</u>	<u>9.6</u>	<u>9.5</u>	<u>9.4</u>	<u>9.3</u>	<u>9.1</u>	<u>8.9</u>	<u>8.7</u>	<u>8.5</u>
<u>Min. Volts (24 VDC)</u>	<u>19.2</u>	<u>19</u>	<u>18.8</u>	<u>18.6</u>	<u>18.2</u>	<u>17.8</u>	<u>17.4</u>	<u>17</u>



First Revision No. 17-NFPA 110-2022 [Detail]

8.3.6 *

~~Storage batteries, including electrolyte levels or battery voltage, used in connection with starting and control systems shall be inspected weekly and maintained in full compliance with manufacturers' recommendations.~~

8.3.6.1

~~Level 1 EPS storage batteries, including electrolyte levels or battery voltage, used in connection with starting and control systems shall be inspected weekly and maintained in full compliance with manufacturers' recommendations, including electrolyte levels and battery voltage.~~

8.3.6.2

~~Level 2 EPS storage batteries used in connection with starting and control systems shall be inspected monthly and maintained in full compliance with manufacturers' recommendations, including electrolyte levels and battery voltage.~~

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Thu Sep 01 09:41:06 EDT 2022

Committee Statement

Committee Statement: The minimum maintenance schedule for storage batteries is differentiated as weekly inspection for Level 1 EPS and monthly for Level 2 EPS based on the reduced criticality of a Level 2 system.

Response Message: FR-17-NFPA 110-2022

[Public Input No. 20-NFPA 110-2022 \[Section No. 8.3.6 \[Excluding any Sub-Sections\]\]](#)



First Revision No. 18-NFPA 110-2022 [Detail]

8.4.1 *

~~EPSSs, including all appurtenant components, shall be inspected weekly, and the EPSS shall be exercised under load at least monthly.~~

8.4.1.1 Level 1 EPS and EPSS.

8.4.1.1.1

~~EPSSs, including all appurtenant components, shall be inspected weekly.~~

8.4.1.1.2

~~and the EPSS shall be exercised under load at least monthly.~~

8.4.1.2 Level 2 EPS and EPSS.

8.4.1.2.1

~~EPSSs, including all appurtenant components, shall be visually inspected at least monthly.~~

8.4.1.2.2

~~EPSS shall be exercised under load at least monthly.~~

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Sep 27 10:25:51 EDT 2022

Committee Statement

Committee Statement: The frequency of inspection has been changed based on the reduced criticality of a Level 2 system.

Response Message: FR-18-NFPA 110-2022



First Revision No. 1-NFPA 110-2022 [Section No. 1.1.3]

1.1.3

This standard does not cover the following:

- (1) Application of the EPSS
- (2) Emergency lighting unit equipment
- (3) Distribution wiring
- (4) Utility service when such service is permitted as the EPSS
- (5) Parameters for stored energy devices
- (6) The equipment of systems that are not classed as Level 1 or Level 2 systems in accordance with Chapter 4 of this standard
- (7) Optional standby systems

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Aug 30 13:07:54 EDT 2022

Committee Statement

Committee Statement: Optional standby systems are not required to meet the requirements of this document.

Response Message: FR-1-NFPA 110-2022

[Public Input No. 23-NFPA 110-2022 \[Section No. 1.1.3\]](#)

[Public Input No. 22-NFPA 110-2022 \[Section No. 1.1.3\]](#)

[Public Input No. 24-NFPA 110-2022 \[New Section after A.1.1.4\]](#)



First Revision No. 2-NFPA 110-2022 [New Section after 3.3.11]

3.3.12 Nickel Cadmium Battery (NiCd)

A secondary cell in which the active material of the positive electrode is nickel oxyhydroxide, the active material of the negative electrode is cadmium, and the electrolyte is dilute potassium hydroxide.

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Aug 30 13:10:15 EDT 2022

Committee Statement

Committee Statement: A definition is added for the battery type used in standard.

Response Message: FR-2-NFPA 110-2022

Public Input No. 29-NFPA 110-2022 [New Section after 3.3.11.2]



First Revision No. 3-NFPA 110-2022 [New Section after 3.3.12]

3.3.14 Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually. [70, 2020]

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Aug 30 13:14:05 EDT 2022

Committee Statement

Committee Statement: The NEC definition has been added for the phrase used in this standard.

Response Message: FR-3-NFPA 110-2022

Public Input No. 28-NFPA 110-2022 [New Section after 3.3.13]



First Revision No. 4-NFPA 110-2022 [Section No. 3.3.14.2]

3.3.16.2 Bypass-Isolation Switch.

A manually-operated manual, non-automatic or automatic device used in conjunction with an automatic a transfer switch to provide a means of bypass that directly connecting connects the load conductors to a power source and disconnecting allows the automatic transfer switch to be isolated or disconnected .

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Aug 30 13:16:59 EDT 2022

Committee Statement

Committee Statement: This definition was modified for accuracy in relation to UL 1008 and options currently available on the market.

The first modification recognizes that the bypass-isolation switch is not only a manually operated device. It can be manual, non-automatic or automatic.

The next change occurred in two locations and removes the reference to an automatic transfer switch and simply refers to “transfer switch”. This change aligns with the fact that Section 6.4 is generic in nature as well using the generic term of “transfer switch” and not “automatic transfer switch”.

Clarity was added through introducing the word “bypass” which first aligns with the word bypass in the term being defined (bypass – isolation) and second accurately describes what is occurring when the switch operates connecting the load conductors directly to the power source.

The last change is at the end of the definition providing an accurate description of what the bypass/isolation switch does. This switch acts to isolate or disconnect the transfer switch. This change also aligns with 6.4.4, “Operation”, where it notes that the transfer switch is isolated or disconnected.

Response Message: FR-4-NFPA 110-2022 The proposed change from “bypass-isolation switch” to “bypass-isolation transfer switch” was not made because the phrase “bypass-isolation transfer switch” is not used in the document.

Public Input No. 12-NFPA 110-2022 [Section No. 3.3.14.2]

**First Revision No. 6-NFPA 110-2022 [Section No. 4.1]****4.1* General.**

The EPSS shall provide a source of electrical power of the required capacity, reliability, and quality to loads for a length of time as specified in Table 4.1(a) and within a specified time following loss or failure of the normal power supply as specified in Table 4.1(b).

Table 4.1(a) Classification of EPSSs

<u>Class</u>	<u>Minimum Time</u>
Class 0.083	0.083 hr (5 min)
Class 0.25	0.25 hr (15 min)
Class 2	2 hr
Class 6	6 hr
Class 48	48 hr
Class X	Other time, in hours, as required by the application, code, or user

Table 4.1(b) Types of EPSSs

<u>Designation</u>	<u>Power Restoration</u>
Type U	Basically uninterruptible (UPS systems)
Type 10	10 sec
Type 60	60 sec
Type 120	120 sec
Type M	Manual stationary or nonautomatic — no time limit
Type X	Other time, in seconds, as required by the application, code, or user

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FR_6_Section_4.1.docx	attachment for FR 6	

Submitter Information Verification**Committee:** EPS-AAA**Submittal Date:** Wed Aug 31 09:06:43 EDT 2022**Committee Statement**

Committee Statement: A “Type X” designation has been added to Table 4.1(b) to represent “other time...” to give specifiers greater flexibility and transparency of the performance of EPSS.

Response Message: FR-6-NFPA 110-2022

Public Input No. 17-NFPA 110-2022 [Section No. 4.1]



First Revision No. 5-NFPA 110-2022 [Section No. 5.2.3]

5.2.3 Energy Converter Design and Testing.

The energy converter for Level 1 systems shall be specifically designed, assembled, and tested to ensure intended system operation under the following conditions:

- (1) Short circuits, including phase-to-ground or phase-to-neutral (as applicable) , phase-to-phase, and 3-phase bolted faults
- (2) Load surges due to motor starting
- (3) Elevator operations
- (4) Silicon-controlled rectifier (SCR) controllers
- (5) X-ray equipment
- (6) Overspeed, overtemperature, or overload
- (7) Adverse environmental conditions

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Tue Aug 30 14:52:57 EDT 2022

Committee Statement

Committee Statement: Some generate sets will not have the neutral bonded to ground. In addition, the product standard for generator sets (UL 2200) uses L-N mode for the AC short circuit test requirement.

Response Message: FR-5-NFPA 110-2022

[Public Input No. 14-NFPA 110-2022 \[Section No. 5.2.3\]](#)



First Revision No. 7-NFPA 110-2022 [Section No. 5.5.3]

5.5.3* Fuel Tank Capacity.

~~The main fuel tank shall have a minimum capacity of at least 133 percent of either the low-fuel sensor quantity specified in 5.5.2 or the quantity required to support the duration of run specified in Table 4.1(a) .~~

5.5.3.1

~~For classifications of 24 hours or less, as specified in Table 4.1(a) , the main fuel tank shall have a minimum capacity of at least 133 percent of either the low-fuel sensor quantity specified in 5.5.2 or the quantity required to support the duration of run specified in Table 4.1(a) .~~

5.5.3.2

~~For classifications greater than 24 hours, the main fuel tank shall have a minimum capacity of at least 100 percent of the low-fuel sensor quantity specified in 5.5.2 .~~

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 09:29:43 EDT 2022

Committee Statement

Committee Statement: For EPS's with a larger class rating (per Table 4.1(a)), the fuel tank capacity requirements are revised to be conditional. For shorter run time classes, it makes sense to have the extra 33% capacity. For longer run times classes, the volume of spoiled fuel will be significantly higher due to the requirement for oversizing an already large fuel tank. Fuel preservation and stabilization are issues that need to be addressed.

Response Message: FR-7-NFPA 110-2022

[Public Input No. 15-NFPA 110-2022 \[Section No. 5.5.3\]](#)



First Revision No. 8-NFPA 110-2022 [Section No. 5.6.5.4]

5.6.5.4

An automatic control and safety panel shall be a part of the EPS containing the following equipment or possess the following characteristics, or both:

- (1) Cranking control equipment to provide the complete cranking cycle described in 5.6.4.2 and required by Table 5.6.4.2
- (2) Panel-mounted control switch(es) marked Run/Off/Automatic to perform the following functions:
 - (a) *Run*: Manually initiate, start, and run prime mover
 - (b) *Off*: Stop prime mover, or reset safeties, or both
 - (c) *Automatic*: Allow prime mover to start or stop by operating a remote contact.
- (3) Controls to shut down and lock out the prime mover under any of the following conditions:
 - (a) ~~Failing~~ Failure to start after specified cranking time
 - (b) Overspeed
 - (c) Low lubricating-oil pressure
 - (d) High engine temperature ~~unless as indicated by high engine coolant temperature, high lube oil temperature, or both is due to high lubricating-oil temperature~~
 - (e) Operation of remote manual stop station
 - (f) Other conditions as required by the manufacturer of the prime mover
- (4) Individual alarm indication to annunciate any of the conditions listed in Table 5.6.5.4 and with the following characteristics:
 - (a) Battery powered
 - (b) Visually indicated
 - (c) ~~Have~~ Having additional contacts or circuits for a common audible alarm that signals locally and remotely when any of the itemized conditions occurs
 - (d) ~~Have a~~ Having lamp test switch(es) to test the operation of all alarm lamps
- (5) Controls to shut down the prime mover upon removal of the initiating signal or manual emergency shutdown
- (6) The ac instruments listed in 5.6.9.9
- (7) Controls to shed Level 2 loads and to initiate an overload alarm for an EPS that serves both Level 1 and Level 2 loads, per Table 5.6.5.4

Table 5.6.5.4 Safety Indications and Shutdowns

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>			<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>	<u>CV</u>	<u>S</u>	<u>RA</u>
(a) Overcrank	X	X	X	X	X	O
(b) Low water temperature	X	N/A	X	X	N/A	O
(c) High engine temperature prealarm	X	N/A	X	O	N/A	N/A
(d) High engine temperature	X	X	X	X	X	O
(e) Low lube-oil pressure	X	X	X	X	X	O
(f) Overspeed	X	X	X	X	X	O
(g) Low fuel main tank	X	N/A	X	O	N/A	O
(h) Low coolant level	X	O	X	X	O	X
(i) EPS supplying load	X	N/A	N/A	O	N/A	N/A

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>			<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>	<u>CV</u>	<u>S</u>	<u>RA</u>
(j) Control switch not in automatic position	X	N/A	X	X	N/A	X
(k) High battery voltage	X	N/A	N/A	O	N/A	N/A
(l) Low cranking voltage	X	N/A	X	O	N/A	O
(m) Low voltage in battery	X	N/A	N/A	O	N/A	N/A
(n) Battery charger ac failure	X	N/A	N/A	O	N/A	N/A
(o) Lamp test	X	N/A	N/A	X	N/A	N/A
(p) Contacts for local and remote common alarm	X	N/A	X	X	N/A	X
(q) Audible alarm silencing switch	N/A	N/A	X	N/A	N/A	O
(r) Low starting air pressure	X	N/A	N/A	O	N/A	N/A
(s) Low starting hydraulic pressure	X	N/A	N/A	O	N/A	N/A
(t) Air shutdown damper (when used)	X	X	X	X	X	O
(u) Remote emergency stop	N/A	X	N/A	N/A	X	N/A
(v) Overload alarm/load shed contact	X	N/A	X	N/A	N/A	N/A

CV: Control-panel-mounted visual. S: Shutdown of EPS. RA: Remote audible. X: Required. O: Optional. N/A: Not applicable.

Notes:

(1) Item (p) shall be provided, but a separate remote audible signal shall not be required when the regular work site mentioned in 5.6.6 is staffed 24 hours a day.

(2) Item (b) is shall not be required for combustion turbines.

(3) Item (r) or (s) shall apply only where used as a starting method.

(4) ~~Item~~ For the function of item (i), an EPS ac ammeter shall be permitted for this function .

(5) All required CV functions shall be visually annunciated by a remote, common visual indicator.

(6) All required functions indicated in the RA column shall be annunciated by a remote, common audible alarm as required in 5.6.5.2(4).

(7) Item (g) on gaseous systems shall require a low gas pressure alarm.

(8) Item (b) shall be set at 11°C (20°F) below the regulated temperature determined by the EPS manufacturer as required in 5.3.1.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FR_8_Section_5.6.5.4_attachment.docx	attachment for FR 8	

Submitter Information Verification

Committee: EPS-AAA

Submission Date: Wed Aug 31 09:40:44 EDT 2022

Committee Statement

Committee Statement: Item (3)(d): High engine temperature may be independent of other factors.
New Item (3)(f) allows the prime mover manufacturer to specify necessary

protection, whether or not it is specifically required by this standard.

Response FR-8-NFPA 110-2022
Message:

[Public Input No. 3-NFPA 110-2022 \[Section No. 5.6.5.4\]](#)

[Public Input No. 4-NFPA 110-2022 \[New Section after 5.6.5.4\]](#)



First Revision No. 16-NFPA 110-2022 [New Section after 5.6.5.8]

5.6.5.9

Level 1 systems shall comply with both of the following:

- (1) The integrity of the EPS start signal circuit from a remote device such as an ATS or paralleling control shall be monitored for broken, disconnected, or shorted wires.
- (2) A broken, disconnected, or shorted start signal circuit shall start the EPS.

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 15:23:59 EDT 2022

Committee Statement

Committee Statement: An EPS start circuit wiring integrity requirement is added to ensure that the EPS will start and run when needed. This new requirement also harmonizes with the generator control wiring requirements in NFPA 70 (in Articles 695 and 700).

Response Message: FR-16-NFPA 110-2022

Public Input No. 16-NFPA 110-2022 [New Section after 5.6.5.7]



First Revision No. 15-NFPA 110-2022 [Section No. 8.4.1 [Excluding any Sub-Sections]]

~~EPSS, including all appurtenant components, shall be inspected weekly, and the EPSS shall be exercised under load at least monthly.~~

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 15:04:54 EDT 2022

Committee Statement

Committee Statement: The frequency of inspection has been changed based on the reduced criticality of a Level 2 system.

Response Message: FR-15-NFPA 110-2022

[Public Input No. 18-NFPA 110-2022 \[Section No. 8.4.1 \[Excluding any Sub-Sections\]\]](#)



First Revision No. 12-NFPA 110-2022 [Section No. A.4.1]

A.4.1

This standard ~~specifies~~ provides the performance requirements for the ~~an~~ EPSS as a complete functioning system in terms of types, classes, and levels. ~~It is not the intent of this standard to~~ This standard does not include recommendations ~~recommend for~~ the EPSS most suitable for any given application. The ~~terms~~ term *emergency power supply systems* ~~and standby power supply systems~~ as used in this standard include, but are not limited to, such terms as the following: is the focus of this standard and includes such systems as those found in *NFPA 70*, Article 700, Article 701, and Article 708, as well as the emergency systems found in *NFPA 99* and *NFPA 70*, Article 517.

~~Alternate power systems~~

~~Standby power systems~~

~~Legally required standby systems~~

~~Alternate power sources~~

The term *standby power supply system* refers to the connection in some systems where a generator, for example, is used to supply both an emergency power system and an optional system. The requirements in this standard apply to these systems.

~~Since~~ Because this standard specifies the installation, performance, maintenance, and test requirements in terms of types, classes, and levels, any of these terms might be appropriate for describing ~~the~~ its application or use, depending on the ~~needs~~ and the preferences of the parties involved.

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 13:09:55 EDT 2022

Committee Statement

Committee Statement: The changes help clarify the distinction between the EPSS and standby systems as used in this document.

Response Message: FR-12-NFPA 110-2022

Public Input No. 37-NFPA 110-2022 [Section No. A.4.1]



First Revision No. 9-NFPA 110-2022 [Section No. A.4.4.1]

A.4.4.1

Typically, Level 1 systems are intended to automatically supply illumination ~~or~~, power, or both, to critical areas and equipment in the event of failure of the primary supply or ~~in the event of~~ danger to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. Other NFPA codes and standards, such as NFPA 20, NFPA 99, NFPA 101, and NFPA 1221, provide specific requirements on where Level 1 systems are required.

Essential electrical systems can provide power for the following essential functions:

- (1) Life safety illumination
- (2) Fire detection, alarm, and notification systems
- (3) Elevators
- (4) Fire pumps
- (5) Emergency services communications systems
- (6) Industrial processes where ~~current~~ interruption would produce serious life safety or health hazards
- (7) Essential ventilating and smoke removal systems
- (8) Medical life sustaining systems

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 12:05:56 EDT 2022

Committee Statement

Committee Statement: Medical life sustaining systems is added as yet another example of that which can be supplied by an essential electrical system.

Response Message: FR-9-NFPA 110-2022

Public Input No. 26-NFPA 110-2022 [Section No. A.4.4.1]



First Revision No. 10-NFPA 110-2022 [Section No. A.4.4.2]

A.4.4.2

Typically, Level 2 systems are intended to supply power automatically to selected loads (other than those classed as emergency systems) in the event of failure of the primary source.

Level 2 systems are typically ~~are~~ installed to serve loads, such as the following, that, when stopped due to any interruption of the primary electrical supply, could create hazards or hamper rescue or ~~fire-fighting~~ firefighting operations:

- (1) Heating and refrigeration systems
- (2) Communications systems
- (3) Ventilation and smoke removal systems
- (4) ~~Sewage disposal~~ Water and wastewater treatment systems
- (5) Lighting, including the unit equipment described in *NFPA 70 (NEC)*, 700.12(I)
- (6) Industrial processes

Standby generators used solely for telecommunications services that utilize battery backup in compliance with FCC guidelines are classified as other than Level 1 or Level 2 EPSs and are outside the scope of this standard.

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 12:07:10 EDT 2022

Committee Statement

Committee Statement: Sewage disposal is changed to a more broad and accurate term. Text was added to address that public telecommunications power is not Level 1 or level 2 to prevent misapplication of Item 2.

Response Message: FR-10-NFPA 110-2022

[Public Input No. 25-NFPA 110-2022 \[Section No. A.4.4.2\]](#)

[Public Input No. 27-NFPA 110-2022 \[Section No. A.4.4.2\]](#)



First Revision No. 11-NFPA 110-2022 [Section No. A.5.1.1]

A.5.1.1.1

Examples of probability of interruption could include the following: earthquake, wind damage, flood damage, cyberattack, or a demonstrated utility unreliability.

Submitter Information Verification

Committee: EPS-AAA

Submittal Date: Wed Aug 31 12:16:50 EDT 2022

Committee Statement

Committee Statement: The section is expanded to show more examples. The annex material is moved to the appropriate section.

Response Message: FR-11-NFPA 110-2022

[Public Input No. 34-NFPA 110-2022 \[Section No. A.5.1.1\]](#)