Understanding NFPA 110

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INTRODUCTION

National Fire Protection Association (NFPA) Standard 110—the standard for emergency and standby power systems—outlines requirements for the installation and performance of backup power systems in emergency and legally required applications, where an outage would pose a life-safety risk.

In this white paper, we'll explore what NFPA 110 is and what should be considered when implementing and maintaining your facility's emergency power system.

NFPA 110 OVERVIEW

Split into eight chapters and three annexes, the 2025 edition of NFPA 110 is intended to codify the performance—in installation, maintenance, operation, and testing—of emergency and standby power systems.

Before launching into what NFPA 110 is and how it should—and shouldn't—be used by facility managers, installers, design engineers, and manufacturers, we need to address a few key definitions used throughout the standard.

DEFINITIONS

The emergency power supply (EPS) is the source of electrical power (i.e., generator) used in your backup power system. It is independent of your primary source of power, ready to operate in case of a power failure. Within the confines of this particular white paper, when we refer to an EPS, we are talking about a standby generator.

The emergency power supply system (EPSS) is the source of electrical power system (i.e., generator) used in your backup power system. It is independent of your primary source of power.

Authority having jurisdiction (AHJ) is a broad term referring to the agency or agencies responsible for enforcing code compliance in your particular city or region. This is typically a local inspector.

NFPA 110 APPROVAL

NFPA 110 defines something as approved when it's "acceptable to the AHJ". The only way to help ensure your installation, procedures, or equipment are compliant is working with the AHJ to ensure it aligns with all applicable standards, policies and codes. Be sure to also follow the EPSS manufacturer's recommendations.

These terms are at the core of NFPA 110. The standard provides requirements and best practices for the installation and maintenance of EPSSs to ensure they are able to provide prompt and reliable power in the event a failure of your primary power source (utility), minimizing the risk to human life.



LEVEL, CLASS, AND TYPE

The key to understanding the requirements outlined in NFPA 110 is understanding the way emergency power supply systems (EPSS) are classified:

LEVEL

Dictates performance standards your system needs to follow.

CLASS

Duration your system must be able to run without fuel.

TYPE

Time your generator has to be operational after a power failure.

These categories dictate decisions including, but not limited to, what equipment to use, where to store the system and how much fuel to keep on site as required by the facility's application, location, proximity to fuel and level of life-safety risk.

LEVEL

There are two EPSS levels defined in the standard: Level 1 and Level 2. They're distinguished by the types of loads they serve and have different equipment and installation standards.

Level 1 EPSS systems provide power where failure would result in "loss of human life or serious injuries". Level 2 EPSS systems serve loads "less critical to human life and safety". Level 1 EPSS systems are subject to stricter design guidelines. Most equipment is designed for Level 1 requirements and can be used for the less stringent Level 2 loads.

It's important to note that NFPA 110 does not state which applications, specifically, qualify as Level 1 or Level 2—that is up to the AHJ's interpretation. They do, however, provide some examples of situations where a Level 1 or 2 EPSS might be required. (*See Figure 1*)

Figure 1

Possible NFPA 110 Level 1 applications	Possible NFPA 110 Level 2 applications
Life safety illumination, public safety communication systems, fire pumps and ventilation equipment.	Heating and refrigeration systems, sewage disposal and some industrial processes.

Level 1 defines systems with a direct impact on life safety. However, even the failure of a Level 2 system may have significant ramifications for occupants during a failure. Due to the impact of Level 1 and 2 loads on life safety, an EPSS must be permanently installed to ensure it is available in case of your primary power source's failure.

There are applications that fall outside the scope of NFPA 110. These applications are defined as "Optional Standby" systems and are covered within the National Electrical Code. Facility managers looking for guidance on such applications should reference Article 702 as it contains the necessary information regarding design and installation criteria for these applications.

Note that the NEC does also briefly cover emergency and legally required systems within articles 700, and 701 respectively.

CLASS

The EPSS Class is the duration (in hours) the system must be able to run at its full–rated output without refueling. (*See Figure 2*)

For example, Class 2 requires the generator to run for 2 hours without adding fuel, Class 48 requires 48 hours.

Figure 2

Classification of EPSSs

CLASS	MINIMUM TIME
Class 0.083	0.083 hr (5 minutes)
Class 0.25	0.25 hr (15 minutes)
Class 2	2 hr
Class 6	6 hr
Class 48	48 hr
Class X	Other time, in hours, as required, code or user

Source: NFPA 110

Higher classes pose a challenge for system designers—especially designers of larger systems as you must have enough fuel stored on site to satisfy the generator's fuel consumption for the duration as defined by the Class. Using a 96 hour class requirement as an example (Class 96), an initial 18,000 gallon fuel storage system would need to comply to a 133% minimum which would require 23,940 gallons of onsite fuel availability.

Careful sizing of the fuel tanks and regular fuel maintenance is necessary to ensure compliance. Make sure to consider fuel supplier delivery logistics – in a rural area it may take more time to get fuel delivered onsite. Consider oversizing the tank to accommodate extended outages due to delivery lead times.

Work closely with the local manufacturer's representative to determine a fuel storage and maintenance plan that assures consistent fuel quality and complies with this standard and all applicable codes, without driving up excessive costs.

TYPE

Type refers to the time in seconds that all Level 1 and Level 2 loads are supplied with alternate power. For emergency power–defined as NFPA 110 Level 1 Type 10, 10 seconds is the requirement. That means all Level Type 10 loads need to be transferred to your EPSS in 10 seconds, no matter how large or small the system is. (*See Figure 3*)

Figure 3

Types of EPSSs	
DESIGNATION	**POWER RESTORATION**
Type U	Basically uninterruptible (UPS system)
Type 10	10 sec
Type 60	60 sec
Type 120	120 sec
Type M	Manual stationary or non automatic–no time limit
Source: NFPA 110	

To prevent nuisance starts, there's usually a time delay of about 1 to 3 seconds for the transfer from utility to generator leaving even less time to pickup the load. With larger units, the time delay is sometimes reduced to have more time for the transfer and load pickup. For instance, a time delay of 3 seconds gives 7 seconds for the transfer and load pickup. Reducing the delay to 1 second gives 2 more seconds to transfer the load, which could be critical for applications that have a generator with a large inertia.

The EPSS must be available within the required time frame after power failure – and it must power all load requirements in full until the primary power source comes back on.

OTHER CONSIDERATIONS

While it provides guidance to design engineers, manufacturers and governing agencies, NFPA 110 is not an all–encompassing manual for the design and implementation of emergency power systems. NFPA 110 includes a chapter referencing publications and standards. The following publications listed below might be useful in your continued research regarding compliance for emergency power systems for a facility.

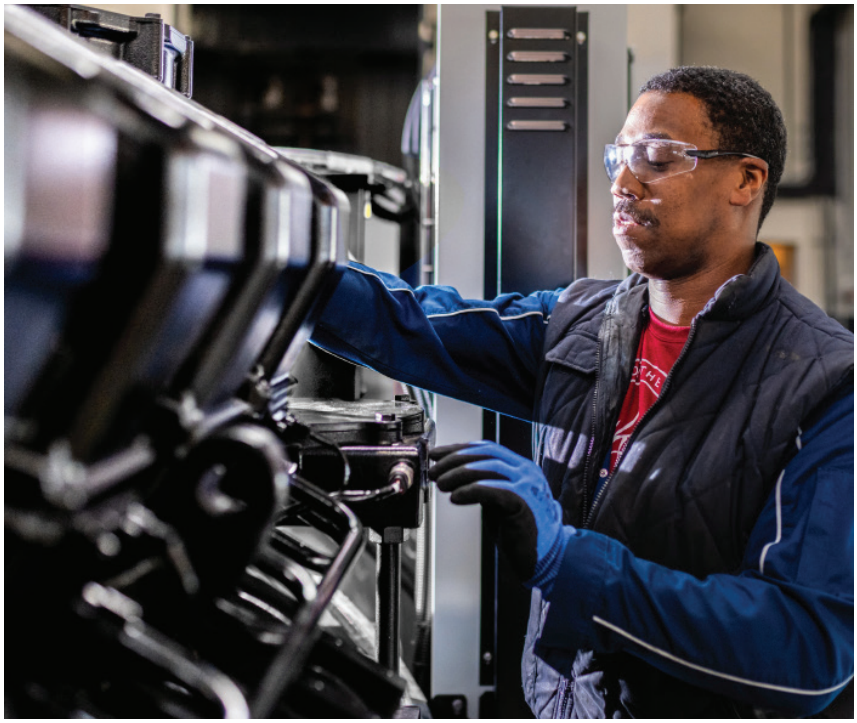
- NFPA 1 – Fire code
- NFPA 30 – Flammable and combustible liquids code
- NFPA 37 – Standard for the installation and use of stationary combustion engines and gas turbines
- NFPA 54 – National fuel gas code
- NFPA 58 – Liquefied petroleum gas code
- NFPA 70 – National electrical code
- NFPA 72 – National fire alarm and signaling code
- NFPA 99 (if applicable) – Health care facilities code
- NFPA 780 – Standard for the installation of lighting protection systems
- ASCE/SEI – Minimum design loads for buildings and other structures

To ensure the system is compliant, reference all applicable codes and standards in state and local area and work closely with AHJs. Being familiar with the necessary codes – and working with the appropriate state and federal authorities to certify the emergency power system assures backup emergency power will be available when it is needed most.

ACHIEVING NFPA COMPLIANCE

Emergency power systems aren't called upon in ideal situations. The EPSS needs to be designed to operate in flood, earthquake, fire and storm conditions.

NFPA 110 outlines ways to prevent the disruption of life-safety critical loads in case of emergency and outlines the tests required to prove compliance with the AHJ. But the EPSS will ultimately be installed, tested and maintained by the EPSS generator manufacturer's distributor and "approved" by the AHJ. Because the AHJ will vary depending on the site location, there's no single way to achieve compliance. Read NFPA 110 carefully and talk with the AHJ to make sure the EPSS installation is compliant with all applicable standards and codes.



INSTALLATION ACCEPTANCE TESTING

The EPSS is not considered compliant upon installation—its function and ability to accept full load must be proven through a series of on-site installation acceptance tests and two-hour load test.

Along with assistance from the generator representative, test the EPSS installation and ensure it both follows NFPA guidelines and is acceptable to the AHJ. After passing the tests, the equipment will be warranted and commissioned by the EPSS manufacturer for use as an emergency power system. (*See Figure 4*)

Figure 4



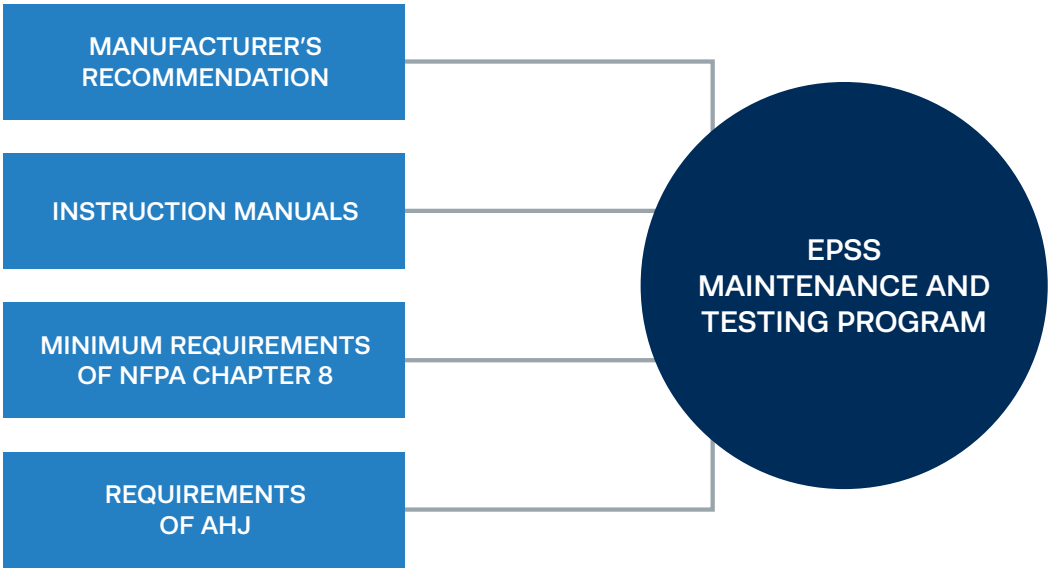
CHAPTER 8 MAINTENANCE

The EPSS must provide reliable power at a moment's notice. Since the timing of the need for the emergency power system is unpredictable, routine maintenance and testing is the only way to assure the system is functioning and readily available at all times.

NFPA 110 Chapter 8 suggests following the EPSS manufacturer–given guidelines when available.

NFPA's alternative recommendations are helpful in visualizing the weekly, quarterly, monthly and annual inspection / maintenance items to perform. Following them won't guarantee compliance – the NFPA only provides the sample plan for information purposes. Each system's maintenance program will depend largely on the EPSS manufacturer's recommendations and the AHJ's requirements. (*See Figure 5*)

Figure 5 **Core Elements of an EPSS Maintenance Program**

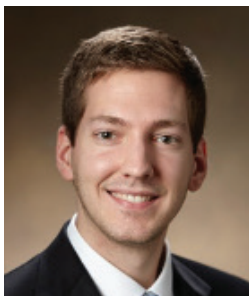


ON GOING EMERGENCY POWER SYSTEM TESTING

A weekly inspection and monthly load test are required for EPSSs. For Level 1 applications, an extended test is required every 36 months. This test duration is based on the EPSS class as determined by the AHJ and may require operation for up to four hours.

The purpose of these tests are to periodically verify the function of the system against the standard. To achieve compliance, however, consult the AHJ and EPSS manufacturer's service representative (distributor or dealer) to develop an acceptable testing program for the system.

Achieving NFPA 110 compliance requires in–depth knowledge and a relationship with the AHJ. Be sure to reach out to the local Rehlko distributor representative for assistance when there are questions about installation, maintenance, and operation testing of the EPSS. https://www.powersystems.rehlko.com/distributor–locator



ABOUT THE AUTHOR

Brady Eifrid is a Senior Project Engineer within the Rehlko Standards and Regulations team that ensures product compliance for all power system products, including safety certifications with UL, Canadian Standards Association (CSA), and structurally for the International Building Codes (IBC). Brady also drives certifications, as applicable, for the Commonwealth of Massachusetts Plumbers and Gas Fitters (Mass Gas) and California Department of Health Care Access and Information (HCAI).

Brady is a member of the Technical Committee (TC) for UL 2200, UL 2200A, and UL 6200. He is also a Technical Committee board member for NFPA 37. He consults with many driving authorities within the industry to understand and provide feedback on the ever-changing world of standards and regulations.

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Power Systems, Rehlko's largest division, delivers worldwide energy solutions designed to ensure resilience for mission-critical applications of all sizes. Building on more than a century of expertise and dedication, the company offers complete power systems, including industrial backup generators (HVO, diesel, gaseous), enclosures, hydrogen fuel cells systems, automatic transfer switches, switchgear, monitoring controls, genuine parts and end-to-end services. As a global company with service partners in every country, Power Systems provides reliable, cutting-edge technology to keep industries and businesses running.

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