

# Is Your Backup Power System Ready? Prove It.

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# Is Your Backup Power System Ready? Prove It.

Regardless of how carefully a backup power system is designed, it won't matter if the system doesn't provide power when its needed most. How can facilities know whether their backup power system will be ready and available? By implementing an adequate program of maintenance and testing.

## An Overview of NFPA 110

The National Fire Protection Agency publishes [NFPA 110 - Standard for Emergency and Standby Power Systems](#). It provides minimum guidance on the design, installation, maintenance, and testing of backup power systems, guidance that is referenced by other industry standards such as *NFPA 70 – National Electrical Code*, *NFPA 99 – The Healthcare Facilities Code*, and *The Joint Commission Hospital Accreditation Standards*. Furthermore, reliable backup power is not just an issue for healthcare ... [The Uptime Institute reports that 36% of data center outages are power-related](#).

## Key Provisions

NFPA 110 categorizes Emergency Power Supply Systems (EPSS), then prescribes requirements for installation, system maintenance, and periodic operational testing as follows.

### EPSS Categories

NFPA identifies backup power systems by Class, Type, and Level.

#### Class

The code classifies EPSS into classes according to the amount of time that they must be able to provide power without refueling or recharging. Five time classes range from 5 minutes to 48 hours, and a sixth class allows the runtime to be defined by application, code, or the user.

Classification of EPSSs	
Class	Minimum Time
Class 0.083	0.083 Hr. (5 Min.)
Class 0.25	0.25 Hr. (15 Min.)
Class 2	2 Hrs.
Class 6	6 Hrs.
Class 48	48 Hrs.
Class X	As required by code, application, or user

Types of EPSSs	
Type	Minimum Time
Type U	Basically Uninterruptible (UPS)
Type 10	10 Seconds
Type 60	60 Seconds
Type 120	120 Seconds
Type M	Manual Stationary or Nonautomatic – No Time Limit





**Type**

NFPA 110 classifies EPSS by how quickly backup power must become available. The maximum amount of time that the load terminals of a transfer switch can be without power are defined by four Types that range from “basically uninterruptible” to 120 seconds, plus a fifth type for manual switches, which has no time limit, as shown in the table above.

**Level**

NFPA Level 1 systems are required where a failure of backup power could result in loss of human life or serious injuries. Level 2 systems can be used where backup power is less critical to human life and safety.

**Common Application**

The Class, Type, and Level assigned to backup power systems vary by the missions of the facilities they serve. Many hospitals and healthcare facilities require Class 48, Type 10, Level 1 EPSS. In other applications such as data centers, the class and level may depend on the maximum time that an Uninterruptible Power Supply can keep the facility running as well as the nature of the operations or services supported by the facility.

**Environmental Requirements**

The standard requires facilities to protect EPSS from exposure to environmental conditions. For outdoor locations, an EPS must be installed in an enclosure that can resist rain and snow pursuant to local building codes and minimize damage from flooding. For indoor applications, Level 1 EPS equipment must be installed in a dedicated room that is constructed to a two-hour fire resistance rating.

NFPA 110 also addresses heating, ventilation, and air conditioning requirements for the EPSS spaces. Temperatures cannot exceed those specified by a system’s emergency power equipment manufacturers. Level 1 systems require heating to maintain ambient temperatures above 4.5°C (40°F).

**Installation Testing**

Once installed, EPSS must be tested to prove they can deliver backup power as required. The testing is completed without and with load for the durations shown in the following table.

Acceptance Test			
Test	Load Requirements	Duration	Reference
Initial Acceptance Test	EPSS loads, without minimum	1.5 Hours	NFPA 110Article 7.13.4.1
Two-Hour Full-Load Test	30% of nameplate or more	First 30 Minutes	NFPA 110 Article 7.13.4.3
	50% of nameplate or more	Next 30 Minutes	
	100% of nameplate	Next 60 Minutes	



## Maintenance Requirements

After an EPSS is installed, accepted, and placed in service, equipment maintenance and testing are necessary to demonstrate that backup systems can provide power when needed. NFPA 110 requires a written maintenance and testing program that complies with:

- manufacturers' recommendations
- instruction manuals
- minimum requirements of the Standard
- the requirements of the Authority Having Jurisdiction

The standard prescribes a scope of maintenance activities. For transfer switches and paralleling gear, the standard prescribes the following maintenance activities:

- Checking connections
- Inspecting or testing for overheating and corrosion
- Cleaning components
- Replacing contacts when required
- Verifying the proper function of controls for paralleling gear

Additional Maintenance for Paralleling Gear:

- Maintenance and testing of batteries and fuel performed by qualified personnel
- Testing after equipment repair

Some specific requirements can be found in the standard. The following table summarizes periodic requirements.

Operational Tests for EPSSs			
Test	Load Requirements	Minimum Duration	Reference
Weekly Inspection	--	--	NFPA 110 Article 8.4.1
Monthly Load Test	Min. Exhaust Gas Temp <b>OR</b> ≥30% of rating	30 Minutes	NFPA 110 Article 8.4.
Diesel Sets Not Meeting Above Criteria - Annually	≥50% of rating	30 Minutes	NFPA 110 Article 8.4.2.3
	≥75% of rating	60 Minutes	
	100% of rating	90 Minutes	
For Level 1 EPSSs			
Triennial Test (1 per 36 months)	EPSS load for spark-ignited gensets	Class Runtime <b>OR</b> 4 Hrs. Max	NFPA 110 Article 8.4.2.3
	≥30% of rating for diesel gensets		

Notably, NFPA 110 Article 8.1.2 states, "Consideration shall be given to temporarily providing a portable or alternate source whenever the emergency generator is out of service..." and cannot meet the performance requirements for supplying power to loads. A quick connect panel and a permanent switching means can meet this requirement.

## Closing

Omitting or delaying the maintenance and testing of Emergency Power Supply Systems leaves facilities and their customers and patients without assurance that vital backup power will be available when its needed most. A program that records and documents how maintenance and testing activities met or exceeded the minimum requirements of NFPA 110 is the first step to demonstrating readiness.

Readers should note that this article provides a cursory review of NFPA 110. For additional detail, consult the information sources below. Any evaluation of a compliance strategy should be made only after reviewing NFPA 110 directly and/or consulting a qualified professional.

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### For related reading, see:

#### **National Fire Protection Agency**

[NFPA 110 - Standard for Emergency and Standby Power Systems](#)

#### **ASCO Power Technologies, Inc.**

White Paper - [NFPA 110 – Standard for Emergency and Standby Power Systems, 2022 Edition](#)

White Paper - [NFPA 110 Overview Part 2: Installation, Environment, and Testing](#)

Infographic - [Understanding NFPA 110 Standards](#)

Technical Bulletin - [NEC Requirement for Permanent Manual Switching Means](#)

For additional information, contact [ASCO Customer Care](#).

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