

NFPA® 111

Standard on Stored Electrical Energy Emergency and Standby Power Systems

2016 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

NOTICE AND DISCLAIMER OF LIABILITY CONCERNING THE USE OF NFPA STANDARDS

NFPA® codes, standards, recommended practices, and guides (“NFPA Standards”), of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in NFPA Standards.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on NFPA Standards. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making NFPA Standards available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of NFPA Standards. Nor does the NFPA list, certify, test, or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

REMINDER: UPDATING OF NFPA STANDARDS

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that NFPA Standards may be amended from time to time through the issuance of Tentative Interim Amendments or corrected by Errata. An official NFPA Standard at any point in time consists of the current edition of the document together with any Tentative Interim Amendment and any Errata then in effect.

In order to determine whether an NFPA Standard has been amended through the issuance of Tentative Interim Amendments or corrected by Errata, visit the Document Information Pages on NFPA’s website. The Document Information Pages provide up-to-date, document specific information including any issued Tentative Interim Amendments and Errata.

To access the Document Information Page for a specific NFPA Standard, go to <http://www.nfpa.org/docinfo> to choose from the list of NFPA Standards or use the search feature on the right to select the NFPA Standard number (e.g., NFPA 101). In addition to posting all existing Tentative Interim Amendments and Errata, the Document Information Page also includes the option to sign-up for an “Alert” feature to receive an email notification when new updates and other information are posted regarding the document.

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

ADDITIONAL NOTICES AND DISCLAIMERS

Updating of NFPA Standards

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments or corrected by Errata. An official NFPA Standard at any point in time consists of the current edition of the document together with any Tentative Interim Amendments and any Errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments or corrected through the issuance of Errata, consult appropriate NFPA publications such as the National Fire Codes® Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed below.

Interpretations of NFPA Standards

A statement, written or oral, that is not processed in accordance with Section 6 of the Regulations Governing the Development of NFPA Standards shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Patents

The NFPA does not take any position with respect to the validity of any patent rights referenced in, related to, or asserted in connection with an NFPA Standard. The users of NFPA Standards bear the sole responsibility for determining the validity of any such patent rights, as well as the risk of infringement of such rights, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on NFPA Standards.

NFPA adheres to the policy of the American National Standards Institute (ANSI) regarding the inclusion of patents in American National Standards (“the ANSI Patent Policy”), and hereby gives the following notice pursuant to that policy:

NOTICE: The user’s attention is called to the possibility that compliance with an NFPA Standard may require use of an invention covered by patent rights. NFPA takes no position as to the validity of any such patent rights or as to whether such patent rights constitute or include essential patent claims under the ANSI Patent Policy. If, in connection with the ANSI Patent Policy, a patent holder has filed a statement of willingness to grant licenses under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, copies of such filed statements can be obtained, on request, from NFPA. For further information, contact the NFPA at the address listed below.

Law and Regulations

Users of NFPA Standards should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

NFPA Standards are copyrighted. They are made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of safe practices and methods. By making these documents available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to these documents.

Use of NFPA Standards for regulatory purposes should be accomplished through adoption by reference. The term “adoption by reference” means the citing of title, edition, and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA Standards, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA Standards and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA standards during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; email: stds_admin@nfpa.org

For more information about NFPA, visit the NFPA website at www.nfpa.org. All NFPA codes and standards can be viewed at no cost at www.nfpa.org/freeaccess.

Copyright © 2015 National Fire Protection Association®. All Rights Reserved.

NFPA® 111

Standard on

Stored Electrical Energy Emergency and Standby Power Systems

2016 Edition

This edition of NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, was prepared by the Technical Committee on Emergency Power Supplies and released by the Correlating Committee on National Electrical Code®. It was issued by the Standards Council on May 26, 2015, with an effective date of June 15, 2015, and supersedes all previous editions.

A Tentative Interim Amendment (TIA) to Table 4.2.2 was issued on August 18, 2015. For further information on tentative interim amendments, see Section 5 of the Regulations Governing the Development of NFPA Standards, available at: <http://www.nfpa.org/regs>.

This edition of NFPA 111 was approved as an American National Standard on June 15, 2015.

Origin and Development of NFPA 111

The Technical Committee on Emergency Power Supplies was organized in 1976 by NFPA in recognition of the demand for guidelines on the assembly, installation, and performance of electrical power systems to supply critical and essential needs during outages of the normal power source. During the development of a base standard (NFPA 110, *Standard for Emergency and Standby Power Systems*), it was determined that several power sources were available for emergency and standby power systems. The committee determined that sufficient differences existed between these sources to justify separate documents providing clearly defined specifics. Each document would follow the basic format of NFPA 110 to provide a consistent basis for comparison and usage and would remain under the jurisdiction of the Technical Committee on Emergency Power Supplies.

Because of the unique knowledge necessary to provide an authoritative document, the technical committee authorized a subcommittee in 1982 to prepare a draft document on systems using stored energy sources. In 1986, a document tentatively titled NFPA 110A, *Stored Energy Emergency and Standby Power Systems*, was submitted for adoption at the 1989 NFPA Annual Meeting.

Formally designated as NFPA 111, this document addressed the performance of stored energy systems with appropriate equipment detail. The requirements of the standard were considered necessary to obtain the minimum level of reliability and performance and to achieve an on-site stored energy auxiliary electrical power source suitable to the needs of the applicable requirements. If followed, its use would result in a system suitable for various situations as required by other codes and standards.

The second edition in 1993 contained only minor changes.

For the 1996 edition, a section was added to cover the acceptability of systems, methods, and devices other than those listed in the document.

The 2001 edition contained two changes: informational text was moved to the appendix and the operational testing requirements were expanded.

The 2005 edition underwent a complete rewrite in accordance with the *Manual of Style* for NFPA Technical Committee Documents. Along with the rewrite, some of the definitions were revised and located in Chapter 3. Other data in the document were transferred to the table format for better usability.

The 2010 edition revised the document scope to clarify that an uninterruptible power supply (UPS) supplied through an emergency power supply (EPS) is not a stored emergency power supply system (SEPSS). The definitions of automatic transfer switch and nonautomatic transfer switch were revised to correlate with NFPA 110. New definitions covered battery cell types, bridging systems, and electrochemical energy storage devices. Energy sources, convertors, inverters, and accessories were covered by Chapter 5 revisions that clarified existing requirements, recognized new battery types, and provided requirements covering stored energy sources other than batteries. Revisions to area ventilation requirements acknowledged that there might be flammable gases other than hydrogen associated with energy sources that are not batteries. Annex diagrams were added to illustrate flywheel and rotating EPS systems, different UPS systems, and basic switching points of an SEPSS.

A rectifier plant, which is often used in the telecommunications industry, was added in 2013 as a potential stored emergency power supply system (SEPSS). These rectifier plants were also included as a suitable bridging system. The location of SEPSS equipment serving Level 1 EPSS loads was revised to correlate with the requirements of NFPA 110.

Throughout the 2016 edition, references to a stored emergency power supply system have been revised to a stored-energy emergency power supply system to more appropriately describe the type of system. Requirements for baseline measurements have been revised to provide more accurate data. The load test has been revised to correlate with the IEEE 450 rate-adjusted and time-adjusted capacity tests.

Correlating Committee on National Electrical Code®

Michael J. Johnston, Chair
National Electrical Contractors Association, MD [IM]

Kimberly L. Shea, Recording Secretary
National Fire Protection Association, MA

Mark W. Earley, Administrative Secretary
National Fire Protection Association, MA

James E. Brunssen, Telcordia, NJ [UT]
Rep. Alliance for Telecommunications Industry Solutions

Merton W. Bunker, Jr., U.S. Department of State, VA [U]

William R. Drake, Power Products, LLC, CA [M]

Palmer L. Hickman, Electrical Training Alliance, MD [L]
Rep. International Brotherhood of Electrical Workers

David L. Hittinger, Independent Electrical Contractors of Greater Cincinnati, OH [IM]

Rep. Independent Electrical Contractors, Inc.

Richard A. Holub, The DuPont Company, Inc., DE [U]
Rep. American Chemistry Council

John R. Kovacik, UL LLC, IL [RT]

Neil F. LaBrake, Jr., National Grid, NY [UT]

Rep. Electric Light & Power Group/EEI

Richard P. Owen, Oakdale, MN [E]

Rep. International Association of Electrical Inspectors

James F. Pierce, Intertek Testing Services, OR [RT]

Vincent J. Saporita, Eaton's Bussmann Business, MO [M]

Rep. National Electrical Manufacturers Association

Alternates

Lawrence S. Ayer, Biz Com Electric, Inc., OH [IM]
(Alt. to David L. Hittinger)

James T. Dollard, Jr., IBEW Local Union 98, PA [L]
(Alt. to Palmer L. Hickman)

Stanley J. Folz, Morse Electric Company, NV [IM]
(Alt. to Michael J. Johnston)

Ernest J. Gallo, Telcordia Technologies (Ericsson), NJ [UT]
(Alt. to James E. Brunssen)

Alan Manche, Schneider Electric, KY [M]
(Alt. to William R. Drake)

Robert A. McCullough, Tuckerton, NJ [E]
(Alt. to Richard P. Owen)

Mark C. Ode, UL LLC, AZ [RT]
(Alt. to John R. Kovacik)

Christine T. Porter, Intertek Testing Services, WA [RT]
(Alt. to James F. Pierce)

George A. Straniero, AFC Cable Systems, Inc., NJ [M]
(Alt. to Vincent J. Saporita)

Nonvoting

Timothy J. Pope, Canadian Standards Association, Canada [SE]
Rep. CSA/Canadian Electrical Code Committee

D. Harold Ware, Libra Electric Company, OK [IM]
(Member Emeritus)

Mark W. Earley, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on minimizing the risk of electricity as a source of electric shock and as a potential ignition source of fires and explosions. It shall also be responsible for text to minimize the propagation of fire and explosions due to electrical installations.

Technical Committee on Emergency Power Supplies

David Stymiest, *Chair*
Smith Seckman Reid, Inc., TN [SE]

Herbert H. Daugherty, *Nonvoting Secretary*
Electric Generating Systems Association, FL [M]
Rep. Electrical Generating Systems Association
(Alt. to Herbert V. Whittall)

Ernest E. Allen, The Doctors Company, OH [I]
Rep. NFPA Health Care Section
Dan Chisholm, Sr., MGI Systems, Inc., FL [IM]
Khimchand H. Chudasama, U.S. Department of
Veterans Affairs, DC [U]
Kenneth A. Cotton, U.S. Energy, CA [M]
Jason D'Antona, Thompson Consultants, Inc., MA [SE]
David A. Dagenais, Wentworth-Douglass Hospital,
NH [U]
Richard L. Day, Michigan State Fire Marshal's Office,
MI [E]
Dennis DeMoss, Sargent & Lundy, IL [SE]
Randy Engelmann, Cummins Power Generation,
MN [M]
William H. Everard, Everard Mid Atlantic Inc., VA [SE]
Louis J. Feller, U.S. Army Corps of Engineers, WA [U]
James R. (Skip) Gregory, Health Facility Consulting,
FL [E]
Rep. Florida Agency for Health Care Administration
Ross M. Hardy, Jones, Lang, Lasalle at Beaumont
Hospitals, MI [U]
Jonathan Hartsell, Rodgers, NC [IM]
Chad E. Loomis, Cornell University, NY [U]
Alan Manche, Schneider Electric, KY [M]

George Mills, The Joint Commission, IL [E]
Rep. Joint Commission on Accreditation Healthcare
Organizations
Hugh O. Nash, Jr., Nash-Consult, TN [SE]
Michael D. Niclaus, Gregory Poole Power Systems CAT,
NC [IM]
Daniel J. O'Connor, Aon Fire Protection Engineering,
IL [I]
Gary L. Olson, kW Rx, LLC, MN [SE]
Ralph E. Patterson, Power Products & Solutions Inc.,
NC [IM]
Rep. InterNational Electrical Testing Association
Steven R. Sappington, Caterpillar Inc., GA [M]
Ronald A. Schroeder, ASCO/Power Switching
& Controls, NJ [M]
Ronald M. Smidt, Carolinas HealthCare System, NC [U]
Rep. American Society for Healthcare Engineering
Raymond J. Stanko, UL LLC, IL [RT]
Robert E. Thompson, Providence Hospital, AL [U]
Peter R. Walsh, Mersen, MA [M]
Rep. National Electric Fuse Association
Herbert V. Whittall, Electrical Generating Systems
Association, FL [M]
Rep. Electrical Generating Systems Association

Alternates

Raymond J. Battalora, Aon Fire Protection
Engineering, TX [I]
(Alt. to D. J. O'Connor)
Dan Chisholm, Jr., MGI Systems, Inc., FL [IM]
(Alt. to D. Chisholm, Sr.)
Joshua Dugger, Facility Shield International, CA [M]
(Alt. to K. A. Cotton)
Brian J. Escott, ASCO Power Technologies, NJ [M]
(Alt. to R. A. Schroeder)

Michael J. Lang, Mersen, GA [M]
(Alt. to P. R. Walsh)
Larry Lau, U.S. Department of Veterans Affairs, DC [U]
(Alt. to K. H. Chudasama)
Stephen McCluer, APC by Schneider Electric, TX [M]
(Alt. to A. Manche)
Bogue M. Waller, Gresham Smith & Partners, TN [SE]
(Alt. to H. O. Nash, Jr.)

Christopher Coache, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on performance criteria for the selection and assembly of the components for emergency and standby power systems in buildings and facilities, including categories of power supplies, transfer equipment, controls, supervisory equipment, and all related electrical and mechanical auxiliary or accessory equipment needed to supply emergency or standby power to the utilization equipment. The Committee also shall be responsible for criteria on the maintenance and testing of the system. This Committee does not cover requirements for the application of emergency power systems, self-contained emergency lighting units, and electrical wiring, except that wiring that is an integral part of the system up to the load side of the transfer switch(es). This Committee shall report to Technical Correlating Committee of the National Electrical Code.



Contents

Chapter 1 Administration	111- 6	5.2 Energy Conversion Equipment (ECE) — General	111- 9
1.1 Scope	111- 6	5.3 Instrumentation	111- 9
1.2 Purpose	111- 6	Chapter 6 Transfer Switches and Protection	111-10
1.3 Application	111- 6	6.1 General	111-10
1.4 Equivalency	111- 6	6.2 Transfer Switches	111-10
1.5 Function	111- 7	6.3 Load Switching (Load Shedding)	111-11
Chapter 2 Referenced Publications	111- 7	6.4 Bypass Switches	111-11
2.1 General	111- 7	6.5 Protection	111-11
2.2 NFPA Publications	111- 7	Chapter 7 Installation and Environmental Considerations	111-12
2.3 Other Publications	111- 7	7.1 General	111-12
2.4 References for Extracts in Mandatory Sections	111- 7	7.2 Location	111-12
Chapter 3 Definitions	111- 7	7.3 Heating, Cooling, Ventilating, and Humidity Control	111-12
3.1 General	111- 7	7.4 Protection	111-12
3.2 NFPA Official Definitions	111- 7	7.5 Distribution	111-12
3.3 General Definitions	111- 7	7.6 Installation Acceptance	111-13
Chapter 4 Classification of Stored-Energy Emergency Power Supply Systems (SEPSS)	111- 8	Chapter 8 Routine Maintenance and Operational Testing	111-13
4.1 General	111- 8	8.1 General	111-13
4.2 Type	111- 8	8.2 Manuals, Special Tools, and Spare Parts	111-13
4.3 Class	111- 8	8.3 Maintenance and Operational Testing	111-14
4.4 Category	111- 8	8.4 Operational Inspection and Testing	111-14
4.5 Level	111- 8	Annex A Explanatory Material	111-14
Chapter 5 Emergency Power Supply: Energy Sources, Convertors, Inverters, and Accessories	111- 9	Annex B Diagram of SEPSS Versus EPSS Use of Stored-Energy System	111-20
5.1 Energy Sources	111- 9	Annex C Informational References	111-23
		Index	111-25

NFPA 111

Standard on

Stored Electrical Energy Emergency and
Standby Power Systems

2016 Edition

IMPORTANT NOTE: This NFPA document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notices and Disclaimers Concerning NFPA Standards." They can also be obtained on request from NFPA or viewed at www.nfpa.org/disclaimers.

UPDATES, ALERTS, AND FUTURE EDITIONS: New editions of NFPA codes, standards, recommended practices, and guides (i.e., NFPA Standards) are released on scheduled revision cycles. This edition may be superseded by a later one, or it may be amended outside of its scheduled revision cycle through the issuance of Tentative Interim Amendments (TIAs). An official NFPA Standard at any point in time consists of the current edition of the document, together with any TIAs and Errata in effect. To verify that this document is the current edition or to determine if it has been amended by any TIAs or Errata, please consult the National Fire Codes® Subscription Service or visit the Document Information (DocInfo) pages on the NFPA website at www.nfpa.org/docinfo. In addition to TIAs and Errata, the DocInfo pages also include the option to sign up for Alerts for each document and to be involved in the development of the next edition.

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope.

1.1.1* This standard shall cover performance requirements for stored electrical energy systems providing an alternate source of electrical power in buildings and facilities in the event that the normal electrical power source fails.

1.1.2 Systems covered in this standard shall include power sources, transfer equipment, controls, supervisory equipment, and accessory equipment, including integral accessory equipment, needed to supply electrical power to the selected circuits.

1.1.3 This standard shall cover installation, maintenance, operation, and testing requirements as they pertain to the

performance of the stored-energy emergency power supply system (SEPSS).

1.1.4 Exclusions.

1.1.4.1* This standard shall not cover the following:

- (1) Application of the SEPSS
- (2) Distribution wiring
- (3) Systems having total outputs less than 500 VA or less than 24 V or systems less than Class 0.033
- (4) Unit equipment
- (5) Nuclear sources, solar systems, and wind stored-energy systems
- (6) Uninterruptible power systems (UPS) supplied by an emergency power supply system (EPSS) or a UPS supplied by a SEPSS
- (7) Optional standby systems

1.1.4.2 The following shall not be within the scope of this standard:

- (1) Specific buildings or facilities, or both, requiring an SEPSS
- (2) Specific loads to be served by the SEPSS
- (3) Type, class, or level to be assigned to any specific load (See Section 4.1.)

1.2 Purpose.

1.2.1 This standard shall provide performance requirements for SEPSS and also shall be used in conjunction with other standards.

1.2.2 It shall be the role of other NFPA standards to specify which occupancies require an SEPSS and the applicable level, type, and class.

1.2.3 This standard shall not specify where an SEPSS is required. (See 1.1.4.2.)

1.2.4 This standard shall provide guidance for inspectors, designers, installers, manufacturers, and users of an SEPSS and shall serve as a basis for communication between the parties involved.

1.2.5 This standard shall not be considered a design manual.

1.2.6 Compliance with this standard shall not absolve the parties involved of their respective responsibilities for the design, installation, maintenance, performance, or compliance with other applicable standards and codes.

1.2.7 The installation of a stored-energy system(s) conforming to this standard shall ensure that alternate power is available to minimize life safety hazards resulting from power loss to certain continuous chemical or industrial processes, computer controlled systems, emergency lighting, and the like.

1.3 Application.

1.3.1 This document shall apply to new installations of SEPSS.

1.3.2 Existing systems shall not be required to be modified to conform except where the authority having jurisdiction determines that nonconformity presents a distinct hazard to life.

1.4 Equivalency. Nothing in this standard shall be intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety to those prescribed by this document, provided the requirements of 1.4.1 and 1.4.2 are met.



1.4.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5 Function.

1.5.1 SEPSS shall provide a source of electrical power of required capacity, reliability, and quality to loads for a given length of time within a specified time after loss, failure, or disruption of the normal power supply.

1.5.2 An SEPSS shall include a means to recharge the stored-energy system.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1, *Fire Code*, 2015 edition.

NFPA 70®, *National Electrical Code*®, 2014 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2016 edition.

2.3 Other Publications.

2.3.1 ASCE Publications. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE/SEI 7, *Minimum Design Loads for Buildings and Other Structures*, 2010.

2.3.2 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code*, 2015 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2016 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction

and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Battery. Two or more cells connected together electrically in series or parallel, or both, to provide the required operating voltage and current levels.

3.3.1.1* Lead-Acid (LA) Cell. A secondary cell in which the active material of the positive electrode is lead dioxide, the active material of the negative electrode is lead, and the electrolyte is dilute sulfuric acid.

3.3.1.1.1* Valve-Regulated (VRLA). A lead-acid battery consisting of sealed cells furnished with a valve that opens to vent the battery whenever the internal pressure of the battery exceeds the ambient pressure by a set amount. [1, 2015]

3.3.1.1.2* Vented (Flooded). A lead-acid battery consisting of cells that have electrodes immersed in liquid electrolyte. [1, 2015]

3.3.1.2 Nickel-Cadmium (NiCd) Cell. 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.

3.3.1.3 Nickel-Metal Hydride (NiMH) Cell. A secondary cell in which the active material of the negative electrode is a hydrogen-absorbing alloy and the positive electrode is nickel.

3.3.2* Bridging System. A type of energy conversion equipment (ECE) intended to temporarily support the critical load with stored energy until an alternate energy source can assume the load.

3.3.3* Electrochemical Energy Storage Device. A device based on the interrelated transformations of chemical and electric energy, usually consisting of an anode, a cathode, and an electrolyte plus such connections (electrical and mechanical) as needed to allow the cell to deliver or receive electric energy.

3.3.4 Emergency Power Supply. See 3.3.8.1.

3.3.5 Emergency Power Supply System (EPSS). A complete functioning EPS system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power. [110, 2016]

3.3.5.1 Stored-Energy Emergency Power Supply System (SEPSS). A system consisting of a UPS, a rectifier plant, or a motor generator powered by a stored electrical energy source; a transfer switch designed to monitor preferred and alternate load power source and provide desired switching of the load; and all necessary control equipment to make the system functional.

3.3.6 Energy Conversion Equipment (ECE). A system of either a UPS, a battery bank and battery charger (central battery system), or a rotating motor generator (with or without inertia flywheel), often supplied by a central battery system power source.

3.3.7 Internal Ohmic Measurement. A measurement of the electronic and ionic conduction path within a cell or unit, using techniques commonly known as impedance, conductance, or resistance tests.

3.3.8 Power Supply.

3.3.8.1* Emergency Power Supply (EPS). The source of electric power of the required capacity and quality for an emergency power supply system (EPSS). [110, 2016]

3.3.8.2* Uninterruptible Power Supply (UPS). A device or system that provides quality and continuity of ac power through the use of a stored-energy device as the backup power source during any period when the normal power supply is incapable of performing acceptably.

3.3.9 Transfer Switch.

3.3.9.1 Automatic Transfer Switch (ATS). Self-acting equipment for transferring the connected load from one power source to another power source. [110, 2016]

3.3.9.2 Nonautomatic Transfer Switch. A device, operated manually by a physical action or electrically by either a local or remote control, for transferring a common load between a normal and alternate supply. [110, 2016]

Chapter 4 Classification of Stored-Energy Emergency Power Supply Systems (SEPSS)

4.1* General. Stored-energy emergency power supply systems (SEPSS) shall be classified as detailed in Sections 4.2 through 4.5.

4.2 Type.

4.2.1 The type shall determine the maximum time, in seconds, that the SEPSS will permit the load terminals of the transfer switch to be without acceptable electrical power.

4.2.2* The interruption times of the SEPSS types covered by this standard shall be as provided in Table 4.2.2.

Table 4.2.2 was revised by a tentative interim amendment (TIA). See page 1.

Table 4.2.2 Types of SEPSS

Type	Interruption Time
Type O	No interruptions — UPS carrying load, 0.0 sec
Type U	UPS system with utility as preferred source
Type A	0.25 cycle: 0.0042 sec
Type B	1.0 cycle: 0.0167 sec
Type 10	10 sec
Type M	Manual stationary or nonautomatic — no time limit

4.3* Class. The class shall determine the minimum time, in hours, for which the SEPSS is designed to operate at its rated load without being refueled or recharged as shown in Table 4.3.

Table 4.3 Classes of SEPSS

Class	Reserve Time
Class 0.033	0.033 hr (2 min)
Class 0.083	0.083 hr (5 min)
Class 0.25	0.25 hr (15 min)
Class 1.5	1.5 hr (90 min)
Class X	Other time, in hours, as required by the application, code, or user

4.4 Category. This standard shall regulate stored-energy devices into the following two categories:

- (1) Category A includes stored-energy devices receiving their energy solely from the normal supply under conditions of normal operation.
- (2) Category B includes all devices not included in Category A and not specifically excluded elsewhere in this standard.

4.5* Level. The level of equipment installation, performance, and maintenance shall be as specified in 4.5.1 through 4.5.5.

4.5.1* Level 1 systems shall be installed where failure of the equipment to perform could result in loss of human life or serious injuries.

4.5.2* Level 2 systems shall be installed where failure of the EPSS to perform is less critical to human life and safety.

4.5.3 All equipment shall be permanently installed.

4.5.4* Level 1 and Level 2 SEPSS shall supply alternate power of a quality that ensures reliable operation of the load, within the time determined by the type and for a duration determined by the class.

4.5.5* Other equipment and applications, including optional standby systems, not defined in Levels 1 and 2 are beyond the scope of this document.