

Compliance Considerations for Standby Power Systems

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Abstract

International Building Code, IEEE, Factory Mutual (FM) Global, Underwriters Laboratories, Fire Safety codes (IFC and NFPA), among others must be considered with designing a site. Lowering the cost of compliance can be realized through the design and specification of solutions that meet these new standards. This presentation addresses the best practices, codes and regulations for standby power systems in critical sites and the new technology of safety and spill containment products. Design guidelines, compliance checklists and engineering specifications can be applied immediately to minimize compliance risks and save time when engineering standby power systems.

Introduction

Understanding what is required, recommended and what is best practice may be a bit confusing especially when technology is evolving. Easier ways to create, ship and install products are available that meet the requirements of regulatory agencies and company standards. Devices that measure and collect data are becoming more sophisticated. Also discussed are guidelines for each category and what needs to be understood in a broad sense, but keep in mind that the Authority Having Jurisdiction (AHJ) may require something different or something more than what is stated in the code or standard. An Authority isn't always the Fire Inspector, but could be your company Environmental Health and Safety (EH&S) department or the Insurance Company.

Creating a Corporate Responsibility Policy

While there are minimum guidelines to safety, many corporations are adopting policies to meet and exceed the adopted codes and regulations. The list below are areas to consider while creating your battery room safety and compliance plan. Notice the plan exceeds merely identifying, procuring and installing equipment.

1. Adopt core values for compliance and safety.
2. Identify and provide essential features.
3. Keep up with new laws, codes, regulations and new technology.
4. Inspect and maintain safety policies and equipment.
5. Extend your safety and compliance program through the value chain.
6. Address employee/associate expectations.
7. Provide appropriate resources.
8. Annually reevaluate

Codes and Regulations

Building and fire codes are developed by associations and adopted by federal, state and local municipalities and enforced by the authorities having jurisdiction (AHJs). Local municipalities often make amendments or changes to the model codes during adoption. We will review an example of a local municipality change later in this paper. In some cases, municipalities will choose not to adopt newer revisions in the code. Keep in mind, codes are regulatory and typically enforced by government officials such as your local fire department. Because of these variables, care must be exercised to understand the codes and compliance requirements in your area.

Codes and Regulations Summary

ICC	International Code Council	
IBC	International Building Code	
IFC	International Fire Code	2000 Section 608 2003 Section 608 (VLA) 2003 Section 609 (VRLA) 2006, 2009, 2012 and 2015 Section 608
NFPA	National Fire Protection Association	NFPA 1 Article 52 "Fire Code" NFPA 101 "Life Safety Code" NFPA 70 (NEC) National Electrical Code NFPA 70E NFPA 5000 (NFPA's version of the Building Code)
UFC	Uniform Fire Code (merged into NFPA 1 "Fire Code")	Article 64, Section 80.304 Article 64, Section 80.314
UBC	Uniform Building Code (merged into IBC)	Section 304.8
BOCA NBC	Building Officials and Code Administrators National Building Code (merged into IBC)	Section 417
NFC	National Fire Code (merged into IFC)	Section F-2315 Section F-2802
SBCCI	Southern Building Code Congress International (merged into the ICC)	
SBC	Standard Building Code (merged into IBC)	Section 407 Standard Fire Prevention Code Section 2203
OSHA	Occupational Safety and Health Administration	29 CFR 1926.441 29 CFR 1910.268 29 CFR 1910.151
ANSI	American National Standards Institute	
IEEE	Institute of Electrical and Electronic Engineers	Standard 1578 - 2007 Standard 1187-2013 Standard 484-2002
ASTM	American Society of Testing Materials	
EPA	Environmental Protection Agency	40 CFR 264.175 40 CFR 266.80
DOT	Department of Transportation	49 CFR 173.159

Application of Codes, Regulations and Guidelines

The table below describes the differences in what is a code/regulation, guideline, requirement, and other approved methods per category. While there may be a minimal requirement for a particular item or category, technology may exceed the expectation of that particular item. This is found in the area of spill control, neutralization and safety equipment categories where items are built with advanced features making these systems easier to install or maintain. Alternate products may include enforcement of a category where mainstream products are not available to meet the AHJ requirements, but there are custom products that can be built to satisfy the spirit of the local code. A good example of this is providing neutralization for larger VRLA batteries. While a containment barrier may not be practical, a tray with minimal neutralization will satisfy the requirement. Another example is while measuring hydrogen gas may be a requirement, an installed monitoring system may not be required, but rather the most effective means of collecting and reporting data.

Codes and Regulation Application Guide

Regulation / Code (Note 1)	Spill Control						Neutralization			Safety Equipment			
	Spill Control (Note 2)	Liquid tight barrier	Minimum 4 inch high sill	Compatible material	Method of detection	Contain volume of largest battery	Neutralization	Absorption (Note 3)	Neutralize to pH 5.0 - 9.0	Spill clean-up kit w/ personal protection	Signs	Eyewash	Hydrogen gas monitoring
<i>The requirements defined in this table are guidelines. The Authorities Having Jurisdiction (AHJ) may pose different or additional requirements and must be consulted in all cases.</i>													
FEDERAL													
EPA	✓	✓	✓	✓	✓		☐	☐					
OSHA (Note 4)	✓	✓		✓			✓		✓	✓	✓	✓	
ANSI/IEEE	△	△		△			△			◆		◆	
ASTM		◆		◆									
NEC (NFPA 70)							✓				✓		
STATE & LOCAL													
UFC	✓	✓	✓		✓	✓	✓	☐	✓		✓		
UBC	✓	✓	✓		✓	✓	✓		✓				
NBC (BOCA)	✓	✓	✓										
NFC (BOCA)	✓	✓	✓	△	△		✓	☐					
SBC (SBCCI)	△	△	△	△			△						
SBCCI	△	△	△	△			△						
IFC (Note 5)	✓	●	●		✓	✓	✓	☐	✓	■	✓		☐
NFPA 1 (Note 5)	✓	●	●		✓	✓	✓	☐	✓	■	✓		☐
✓ Code / Regulation requirement ■ Typically required. Check with Authority Having Jurisdiction (AHJ) ◆ Guidelines for ancillary equipment						△ Guidelines for storage of hazardous materials ● Approved method & materials as defined by AHJ ☐ Alternate method and materials							
1. The table above only covers subsections of the codes referring to spill control, neutralization and safety equipment. Other requirements are specified. See actual code for all requirements. 2. For VRLA Batteries, check with local AHJ for actual requirements. 3. Absorption enhances control of liquid and simplifies cleanup. 4. State approved OSHA regulations may differ from federal OSHA regulations. 5. IFC and NFPA 1 are the most updated and widely adopted.													

Changes in Rack Codes

UBC earthquake requirements have been in place for over 35 years and have been relatively simple to understand with the “Rack Zone Rating” (zones 1-4) methodology. The last update to this code was in 1997 and was replaced by the International Code Council (ICC) with the International Building Code (IBC) in the year 2000. While IBC adoption is ongoing by the states, it has been gaining traction in recent years.

Typical parameters in the items below are required in an IBC 2012 Rack Sizing Specification

To achieve S_{DS} specification which is five-percent damped design spectral response acceleration at short periods, S_s and Calculated value combining S_s , Site Class factors and multiplying by $2/3$

Parameters in determining S_{DS}

Site Class	(Soil Factors) – A through F values that determine load factors applied to the S_s/S_1 values. <ul style="list-style-type: none"> ○ A = Hard bedrock ○ D = Stiff Soil (default for IBC analyses if unknown)
z/h	Location in the building as a percentage of building height <ul style="list-style-type: none"> ○ 0.0 = at/below grade ○ 1.0 = top of building
Ip	Importance factor <ul style="list-style-type: none"> ○ 1.5 = Essential Facility ○ 1.0 = Non-Essential
Ss	Short Term Acceleration (0.2 sec) <ul style="list-style-type: none"> ○ From the U.S.G.S. Short Term (0.2 second) Spectral Response Acceleration Ground Motion Maps

Site Class, Risk Category, and Location in building are required to define the rack requirement.

Advanced Spectral Response is the value called out in battery rack specifications that meet IBC 2012.

Below are required for seismic racks:

- Established SDS Levels for all seismic racks for different z/h factors and Site Classes.
- Stamped drawings identifying racks as IBC 2012 certified
- **Tri-Axial shake table** results available for IBC 2012 Essential Facilities
- Certification Letter(s) identifying IBC Certification and SDS Levels

More information may be found by reading Ken Sabo’s paper in the archive from 2013.

The Authorities Having Jurisdiction

Authorities having jurisdiction are many including the regulatory inspectors, federal agencies, insurance companies and more. The definition of of an AHJ according to the NFPA:

“Who is the Life Safety Code authority having jurisdiction for my building?”

“The authority having jurisdiction (AHJ) is that person or office charged with enforcing the Life Safety Code. In many states the AHJ is the state fire marshal who has local inspectors work on his/her behalf. In some cities, fire department fire prevention division personnel fulfill the role of AHJ; sometimes it is the building official. For some occupancies, there is more than one AHJ; each AHJ's approval must be secured. For example, the authorities having jurisdiction for a hospital might include: state fire marshal; building official; fire department fire prevention officer; state health care licensing agency; The Joint Commission; U.S. Department of Health and Human Services – Centers for Medicare and Medicaid Services (CMS); and the facility's insurance carrier. If you're unsure who the AHJ is, contact your state fire marshal.”

AHJs are typically thought of as the fire inspector, but today, they are from various departments even inside your company. As companies mature their safety programs beyond the minimum guidelines for safety to further protect their capital, human capital and brand reputation, the AHJ may become your Environmental Health and Safety or Safety Manager. Insurance companies are taking notice of materials and may have their own standards about flammability of materials placed inside the battery room.

- Code Enforcement Inspector (FD)
- Building Inspector
- Hazmat Inspector
- Insurance Carrier Inspectors
- Loss Prevention
- Facility Owners and Managers
- Real Estate Professionals
- Environmental Compliance Manager
- Corporate Health and Safety
- Site Security and Human Resources
- Environmental Health and Safety
- Outside Environmental or Safety Auditor
- Environmental Protection Agency
- State Toxic Substance Control Division
- County Environmental Health and Safety
- State Water Quality Inspectors
- State Fish and Game
- Bureau of Land Management
- County Waste and Water Treatment Plant
- Site Safety Manager

Roles of the AHJ

Authorities Having Jurisdiction that enforce the laws are firmly rooted and empowered by the state legislature. The role of the AHJ is to make sure buildings are planned and built to the code. Upon completion of construction, they review all final testing and documents. After the building receives the occupancy permit, the AHJ routinely inspects the facility to ensure the owner performs proper maintenance and enforces safety regulations and companion standards including fire protection. This includes hazardous materials and safety equipment as well. The AHJ official also has the authority to interpret the code and adopt policies and procedures to provide clarification.

AHJs also have a permitting function which provides yet another level of review and inspection. They must inspect for items or additional items according to items on the permit issued and enforce compliance. However, keep in mind that while the local AHJ has a lot of authority, they can be overridden by OSHA regulations and their inspectors as they have the authority to enforce any federal regulation at any facility in the country.

Example of Insurance Company as an AHJ

FM Global, who is the largest insurance company in the world, released a statement in their loss prevention data sheet that states “Do not use battery acid absorbent bags unless they are required by the local government authorities, in which case, use FM Approved battery acid absorbent bags.” This is an example of the insurance company being the AHJ in a facility that they insure. There are other products in a facility that have been tested and approved by the insurance company in their research facility in Chepachet, RI.

Example of Local AHJ Code Policy - NYC Certificate of Fitness

The Certificate of Fitness for Supervision of Battery Systems and other Related Equipment B-29 was enacted by New York City in September of 2014 for businesses in all five boroughs. The applicant to be tested must be recommended by their employer and the certificate is issued to the employee for the address of the employer. The exam is 30 questions, timed and the employee must achieve a 70% to pass. The certificate is good for three years. If the employee changes jobs, then they need to submit for a change of work location as this is a location specific certificate.

New York has specific design requirements for stationary battery systems and their battery rooms since 2008, which needs to be understood by the applicant and include emergency procedures, monitoring and maintenance practices, ventilation, specific sign requirements, hydrogen detection, fire suppression systems and recordkeeping. Much of the code references the IFC 608, but New York has added its unique requirements and schedule of fees. It is entirely possible for this trend to continue throughout other AHJs.

This code developed by FDNY is not optional and has special requirements. The sign requirements are unique and needed to be developed to meet the requirement. The certificate requires the employees responsible for the battery system(s) to be educated and maintain the education through the renewal process.

Conclusion

Understanding the current codes and how they vary based on each area of the country is essential for creating a safety plan for your company. From safety products to sizing racks, the codes are a very important part of building and maintaining a stationary battery room. The Authorities Having Jurisdiction are responsible for enforcing the codes and regulations adopted in each state and municipality. AHJs can be the fire department, departments within a company and even the insurance company. The governing AHJs have the ability to modify the codes per their area and enforce additional actions and/or requirements. It is important to keep up to date on changing codes in your area and what is required by your personnel and facility.

References

International Fire Code 2000, 2003, 2006, 2009, 2012, 2015

National Fire Prevention Authority, NFPA 1, Article 52, NFPA 70

Uniform Fire Code, Article 64, Sec 80, 304

Uniform Building Code, Section 304.8

Building Officials and Code Administrators, Sec 417

National Building Code

National Fire Code, Sec F-2315, F 2802

Southern Building Code Congress International

Standard Building Code, Sec 407

Standard Fire Prevention Code, Sec 2203

Occupational Safety and Health Administration, 29 CFR 1926.441, 29 CFR 1910.268, 29 CFR 1910.151

American National Standards Institute

Institute of Electrical and Electronic Engineers, Standard 1187-1996, 484-1996

American Society of Testing Materials

Environmental Protection Agency 40 CFR 264.175

STUDY MATERIAL FOR THE CERTIFICATE OF FITNESS FOR SUPERVISION OF BATTERY SYSTEMS AND OTHER RELATED EQUIPMENT B-29 9/2014

<http://www.nfpa.org>

<ftp://ftp.nist.gov>

https://www.nfpa.org/Assets/files/AboutTheCodes/101/101_FAQs.pdf

<http://ecmweb.com/nec/who-s-got-power>

<http://www.iccsafe.org/wp-content/uploads/stateadoptions.pdf>