BUILDING AND FIRE CODE REQUIREMENTS FOR STATIONARY STORAGE BATTERY SYSTEMS

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ABSTRACT

Assigning a separate section of building and fire codes to stationary storage battery systems avoids unnecessary, complicated, and costly requirements set forth in the hazardous materials chapters of the codes and presents best practices and national consistency for manufacturers, designers, contractors, building officials, and users.

This presentation is a journey that will explore the history and evolution of stationary storage battery system requirements in the building and fire codes of the United States. We'll see how the telecommunications industry teamed with prominent participants in the code industry to develop best practices for batteries and battery rooms.

The journey begins as recently as 1991, at a time when no requirements for batteries existed in any of the nation's building or fire codes. Over the next 14 years, the telecommunications and code industries worked hand in hand, one code at a time, until all the codes had a section specific to identifying requirements for lead acid batteries. Toward the end of our journey, we see building and fire codes becoming more fluid, memberships becoming more receptive to change, and building officials becoming more conciliatory, as new battery technologies emerge and are folded into those new and kinetic sections of the codes.

INTRODUCTION

Prior to the 1994 editions of the then three existing Model Codes, there existed no building or fire related requirements for lead acid batteries. For decades, three of the biggest users of lead acid batteries, telecommunications companies, power companies, and Commercial UPS systems simply installed batteries in specifically assigned areas of their facilities with no challenge from code officials. Other users did the same.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No battery requirements in any national code																

The main reason users circumvented challenges from code officials during these times was because the batteries were installed *after* all final construction inspections were made by the various construction officials, including the building inspector, fire marshall, electrical and plumbing inspectors, and so on. Batteries and other power equipment were moved into a facility afterward, in much the same way furniture would be moved into an office building after final construction inspections. Telecommunications has another unique set of circumstances – the industry is exempt from the requirements of the National Electrical Code® in its owned buildings, which kept electrical and fire inspectors even further away from the batteries and other power equipment.

Figures 1 and 2 – Typical Telecommunications Battery Installations

A series of events occurred during the 1980s:

- Building and fire officials became better trained, better educated, and more observant. Insurance agents and shoe salesmen, who were once part-time building inspectors were slowly replaced by college educated engineers who truly understood building design and construction. The eyes in the field were getting sharper.
- Jurisdictions (cities and towns) became hungrier for money and looked to sometimes surreptitious ways to increase their revenue without raising local property taxes. Building permits, inspection fees, plan review fees, and numerous citations, sometimes frivolous, became status quo. The thirst for money got officials deeper into the buildings. The hands in the field were getting greedier.
- The regulatory climate – and therefore the climate of litigation – was reawakened, matured rapidly, and quickly became smothering and complex. The rules in the field were getting onerous.
- The advent of computers enabled building officials, jurisdictions, regulators, and litigators more efficient methods of storage and retrieval of information. The information in the field was getting intense.
- The Internet and later the cell phone enabled building officials, jurisdictions, regulators, and litigators a faster and more reliable method of communication and transfer of the vast amounts of information in their computers. Society became overwhelmed by information fatigue. The speed of information transfer in the field accelerated. Indeed, Big Brother appeared just as Orwell had planned and frightfully close to the year he had imagined.

What actually happened was that building officials got into power rooms, saw the large amounts of sulfuric acid in the lead acid batteries, and classified those areas as a hazardous materials occupancy – at an elevated and unnecessary cost.

EPA DRAWS FIRST BLOOD

Born in the wake of elevated concern about environmental pollution, the U.S. Environmental Protection Agency (EPA) opened its doors in downtown Washington, DC, on December 2, 1970. Like all governmental agencies, EPA grew and assumed more responsibilities, one of which included the tracking of hazardous materials which included substances like sulfuric acid. Users of lead acid batteries had to record the amount of sulfuric acid in each building, and share that number with the local building official. Building officials became overwhelmed with the added responsibility and declared battery rooms a hazardous material occupancy. The cost of this unnecessary compliance was high, and soon officials were demanding retrofitting of existing power rooms.

EARLY WORK WITH THE MODEL CODES

Prior to the introduction of the International Codes in 2000, there were three geographically assigned building and fire codes in the country. The Building Officials Code Administrators (BOCA) National Code, dubbed the Yankee code, was used by the northeast; The Standard Code, owned by the Southern Building Code Congress International (SBCCI) and dubbed the Rebel code, was used in the southeast; the Uniform Code, owned by the International Fire Code Institute (IFCI) and dubbed the Pioneer code, was used west of the Mississippi River.

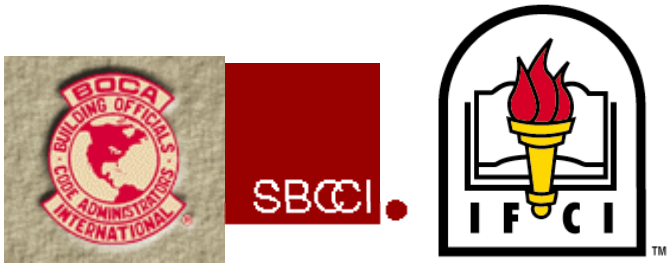

Figure 3 – Three Vintage Model Code Groups

A “telco team”* was formed in 1990 that consisted of Telcordia (representing the Regional Bell Companies) and Hughes Associates (representing AT&T). Negotiations with the Yankees and the Rebels went rather smoothly and quickly, and the 1994 editions of both building codes carried a new exemption in a long laundry list from hazardous materials classification: “Stationary batteries used for facility emergency power supply or telecommunications facilities provided that the batteries are provided with safety venting caps and ventilation is provided in accordance with the mechanical code.” This “exemption” was neatly placed in the Hazardous Materials chapter.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
			BOCA and SBCCI – Battery exception in National and Standard Codes													

The Pioneers were not as easy to sway. First, the organization that ran the building Code (ICBO) said that it was a fire code issue. The Uniform Fire Code was run by a second cousin organization called the International Fire Code Institute (IFCI). IFCI, through the Western Fire Chiefs Association (WFCA) and the California Fire Chiefs Association (CFCA) wanted more regulation than the other codes and negotiations lasted longer. The infamous Article 64 (a separate section for lead acid batteries) was created and worked on by both the telco team and several western and mid-western fire districts. The compromise section was voted on in Spokane, Washington August of 1994 and accepted by the full membership. It was first published in the 1996 supplement of the UFC, which was released in March of 1996. It later came out in the 1997 edition of the UFC. The compromise required a lot more than the venting caps and ventilation required in the two other codes. In addition, Article 64 required spill control, neutralization, compartmentation, signage, seismic protection, and fire detection.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
						UFC – Article 64 in Uniform Codes										

Most major users of lead acid batteries had already been complying with most of the provisions in Article 64, such as detection, neutralizing kits, and compartmentation. But there was a contentious requirement called “spill control” that prescriptively asked for 4” spill containment barriers around battery racks. Many building officials forced this requirement retroactively as well. As Valve Regulated Lead Acid (VRLA) batteries moved into buildings, officials forced the same requirements (including spill containment) on the VRLA batteries even though they don’t have the propensity to leak the way flooded batteries do. The regulatory environment had gotten out of hand as building officials became police, lawyer, judge and jury – and at times, executioner regarding battery regulation.

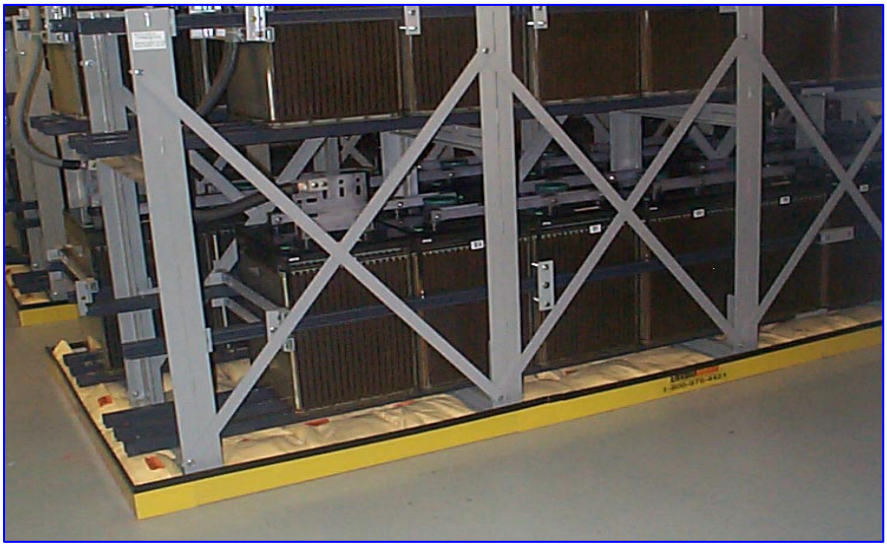

Figure 4 – 4” Spill Containment System
(also shows seismic bracing)

A NEW COMMON CODE IS BORN – THE ICC

In the early 1990s, the three major Model Code groups (BOCA, SBCCI, and IFCI) met and agreed to combine their codes into one national and harmonized "common" code. The initiative would end up including a building code, a fire code, plumbing and mechanical codes, residential, property maintenance, sewage disposal, zoning, fuel gas, and energy conservation codes. The combined code group held hundreds of committee meetings during the mid and late 1990s and published 10 full codes in 2000. Later additions to the original 10 would include an existing building code, a performance code, and an urban wildland interface code. The group came to be known as the International Code Council (ICC).

Figure 5 – International Codes

The telco team that had worked so hard with the original three model code groups proactively worked with the building and fire code committees of the International Code Council throughout the entire process of the development of the international codes. With regards to stationary lead acid battery requirements, Article 64 from the UFC became Section 608 of the IFC. Most language stayed the same with one significant exception: While spill control provisions remained, the earlier requirement for 4" spill containment curbs disappeared and was replaced with more performance oriented language that said "An approved method and materials for control and neutralization of a spill of electrolyte shall be provided." This change gave much more latitude in the design of spill control methodologies for battery systems.

Section 608 of the first (2000) edition of the International Fire Code (IFC) was a major victory for battery manufacturers, designers, contractors, and users. And the building and fire officials helped write it!

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
									ICC – Section 608 of the IFC							

While the spill containment language was softened up, there still existed an overly restrictive requirement for VRLA batteries. The telco team proposed a new section 609 for VRLA batteries, which was voted on and accepted by the full membership during the code development hearings in Pittsburg, Pennsylvania in March 2001. It appeared in the second (2003) edition of the IFC.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
										ICC – Section 609 added to code						

NFPA IS ADDRESSED

During the development of the IFC in the late 1990s, the ICC and the NFPA reached out to each other in an attempt to combine their fire codes for truly one national fire code. NFPA's existing fire code at the time was referred to as NFPA 1 *Fire Prevention Code*. Actually, the relationship started out pretty good in the beginning – hands were pumping, faces were smiling, and similarities were discussed. Then something went wrong – real wrong. Relationships faded, meetings became stagnant and directionless, feelings between the two groups became acrimonious, tempers flared, and eventually lawsuits flourished. A promising marriage ended in bitter divorce, as the two groups realized there were more differences between them than there were similarities.

Bitter, NFPA (whose existing fire code was already adopted in 17 states) walked away and formed an alliance with the old UFC group to develop a "harmonized" fire code. If successful, this code would be adopted by many of the old UFC states, trumping the ICC's IFC.

NFPA formed a Technical Correlating Committee and several technical committees to hammer out a new fire code. The original NFPA fire code had no provisions for stationary lead acid batteries. As such, they pulled in the infamous Article 64 from the old UFC to address battery requirements. The telco team, well rested from working so diligently with the ICC, sprung to life again, and began attending more meetings. The group that was assigned custodianship of Article 64 was an Ad Hoc Committee charged with developing requirements for hazardous materials. There was early dismay at this oxymoron, but cool heads and intelligent decision making prevailed and Article 64 morphed into a fraternal twin of Section 608 from the IFC. It was accepted unanimously at an Ad Hoc committee meeting in Baltimore, Maryland in June 2002, and became Chapter 52 of the first (2003) edition of NFPA 1 *Uniform Fire Code* and did not require 4" spill containment, rather the ability to "manage and control" a spill.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
												NFPA – Chapter 52 in NFPA 1				

FINAL FRONTIER - NEW TECHNOLOGIES ENTER THE FIELD

Seemingly, the dust had settled and the telco team's work was done. Not quite. Three events happened very quickly. First, the telco team was restructured to Telcordia and representation from American Power Conversion (APC). The second event occurred in Oakland Park, Kansas in May 2004, and was a proposed change by the telco team to combine Sections 608 and 609 (stationary lead acid and VRLA batteries) into one section, add Nickel Cadmium batteries to the section, and create a table to better enable the inclusion of additional battery technologies as they came into use. This proposed change was accepted unanimously, first by the committee then by the full membership.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
													ICC – Sections 608 and 609 combined. Add Ni-Cad batteries			

The third event occurred in Cincinnati, Ohio in February 2005, and was another proposed change by the telco team to Section 608 to add Lithium-Ion batteries to the section. This proposed change was also accepted unanimously by the full membership.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
														ICC – Lithium-Ion batteries added to code		

Consideration will be given by the telco team, to other battery technologies as they develop and as their use in buildings becomes apparent.

In the meantime, Chapter 52 of NFPA 1 Uniform Fire Code, as new as it is, has already become obsolete. It includes only lead acid technology. The telco team will submit proposed changes to NFPA 1 during the next code change cycle to include the newer technology batteries that have already been accepted by the ICC.

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
																NFPA – Revisions to Chapter 52 in NFPA 1 in ROP

SUMMARY

Manufacturers, designers, contractors, and users of stationary battery systems have reaped the benefits of having very specific yet moderate requirements for battery systems in the nation's codes.

- The unnecessary and costly requirements of the hazardous materials chapters of the codes have been avoided.
- Guidelines now exist for the safe and comprehensive installation of batteries in buildings.
- The battery custodians (ourselves) are on good terms with the code industry, both the ICC and NFPA.
- We are also on good terms with the thousands of building, fire, and electrical officials.

In addition to the updated building and fire codes, IEEE has been developing a recommended practice on battery system spill containment. This practice, when complete, will address different methodologies in the management of electrolyte spills.

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* The "telco team," which was assembled in the early 1990s, originally consisted of this paper's author; Lew Parks of Telcordia (retired); Richard Gewain of Hughes (deceased); and Larry McKenna of AT&T (retired). The current team consists of the author and Steve McCluer of APC.