BATTERY CODES AND STANDARDS: CHANGES IN 2002 AND 2003

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ABSTRACT

Two papers at Battcon 2002 addressed the alphabet soup of Codes and Standards pertaining to batteries. This paper presents a brief update on activities pertaining to batteries that have occurred in the past year within various government and non-government agencies. It attempts to identify trends and their possible implications for the industry. For example:

- NFPA 1 Uniform Fire Code document was released with a 1000 gallon limit for free-flowing electrolyte, and no prescriptive method for containment systems
- Several other NFPA standards were updated, but there were no major impacts to batteries
- ANSI T1E1.5 Battery Room Environment standard was balloted, but returned for revision; it should be released in 2003
- Several IEEE battery standards have been released, re-issued, or are in balloting as we speak
- The ICC formally combined with BOCA, SBCCI, and ICBO

Positive trends include: less restrictive language for spill control and VRLA batteries

Negative trends include: competition between the ICC and NFPA; duplication of codes, etc.

Codes and Standards are known by their acronyms, and they use a lot of acronyms. Acronyms are defined at the end of this document.

CODES

Codes have the force of law. They are enacted at the city, county or state level. "Model Codes" are consensus documents created by national organizations, and include such things as fire codes, building codes, electric codes, etc. Several organizations exist to create model Codes. Jurisdictions (for example, cities, counties, states, etc.) may choose which Code to adopt, they may modify a Code, or they might even write their own Code. Most jurisdictions do not adopt the most current model Code. Usually they lag behind by about one revision cycle (about three years). The largest model Code bodies in the United States are the International Code Council (ICC) and the National Fire Protection Agency (NFPA).

NFPA 1 and UFC Combined

The biggest news of the year for large stationary battery users is the combination of the Uniform Fire Code (UFC) and NFPA-1. The UFC had been published by the Western Fire Chiefs Association [WFCA] and the Uniform Fire Code Association. These groups have joined with NFPA to write a brand new fire code. NFPA-1 was formerly called the "Fire Prevention Code" and is now renamed as the Uniform Fire Code, published under the auspices of the NFPA.

Several changes to the Uniform Fire Code should make users and battery manufacturers happy (since they both fought for these changes). Chief among the changes is an implicit exemption from spill containment for VRLA batteries. The Code says that spill containment only applies to batteries with "free-flowing electrolyte". Note that the term “free flowing electrolyte” is not formally defined, so there will still be a need to educate Authorities Having Jurisdiction (AHJ). There will still be that five percent of AHJs who won’t be moved. Anticipate possible intransigence in cities such as Phoenix, San Jose, Los Angeles, Denver, Portland and Seattle.

In the same vein, the minimum quantity of electrolyte in a room requiring spill containment is 1000 gallons — much higher than the 50 gallon minimum required by the International Fire Code (IFC). This came from the NFPA's desire to treat battery electrolyte no differently if it is in a battery than if it is in a storage container for future use at a battery manufacturer's location. In essence, they harmonized the spill containment requirements for all caustic liquids, regardless of where they are stored or used.

Also on the spill containment front, the new Code removes any proscriptive requirements concerning a 4" spill control barrier. Instead, it refers the user to the appendix, where several possible methods of achieving spill control are discussed.

Although there is no separate section for VRLA batteries, the Code does add several items specific to VRLA (such as temperature compensation or other methods of thermal runaway control). These items are similar to the items found in the new Article 609 of the IFC that is specific to VRLA batteries.

Perhaps the most important thing for users to remember about these changes though, is that they don't take effect immediately where you live, nor will they ever take effect everywhere. Depending on the jurisdiction, the 2000 or 2003 IFC, the 1997 or 2000 UFC, or another local Code might be in force.

IFC Changes

2003 is a new edition year for the International Codes. Perhaps the most important change on that front is the addition of Article 609 to the International Fire Code. This article supplements Article 608 (vented/flooded batteries), but is specific to VRLA batteries. It specifically excludes VRLA batteries from spill containment. This change had previously been implemented as a "Supplement" to the 2000 Code (just as the original Article 64 of the UFC was implemented in 1995 as a supplement to the 1994 UFC), but not all users and AHJs were aware of it. A lot of thanks goes to the battery manufacturer consortium Battery Council International (BCI), which led the charge and provided the visual proof to the Code committees to obtain this exemption.

STANDARDS

Standards do not have the force of law. They are consensus documents created by national or international organizations in order to bring consistency in the design, installation, use and maintenance of products. Included under this broad heading are “standards” (including mandatory compliance), “guidelines,” and “recommended practices.” While technically having no force of law, products that do not comply to recognized standards are at risk of being rejected by the marketplace.

ANSI T1 Battery Room Environment Standard

Telecommunications Engineering Power Standards Committee T1E1.5 has been busy writing a standard for battery room environments. It has been sent out for ballot once, but is being revised based on ballot comments. It could be published sometime in 2003 (ANSI document number not yet assigned). Although it is written by a telecommunications committee, there is a lot of useful new information to help the battery user and Code official. Of special note are the calculations for ventilation. They are significant expansions to existing published documents that will help a mechanical engineer design a ventilation system to meet the Building and Fire Code requirements for maximum hydrogen buildup. The calculations also help with outdoor cabinet compartments containing batteries (an area not generally under the jurisdiction of the Building and Fire Codes). IEEE and ASHRAE will probably reference some of this material in their forthcoming universal national standard on battery room ventilation.

IEEE Battery Standard Updates

Several IEEE Recommended practices on batteries have been newly issued or re-issued in the past year (or soon will be). Those with the most substantive changes include:

- IEEE 450 (Flooded Battery Maintenance)
- IEEE 484 (Flooded Battery Installation)
- IEEE 1184 (UPS Batteries)
- IEEE 1187 (VRLA Installation)
- IEEE 1188 (VRLA Maintenance)
- IEEE 1189 (VRLA Selection)
- IEEE P1491 (Battery Monitoring)
- IEEE P1578 (Spill Containment)
- IEEE P1635 (Battery Compartment Ventilation)

The "P" in front of the last three standards indicates that they are new unpublished works, still in draft form. The Ventilation standard is a joint work with ASHRAE, so the final numbering may be an ASHRAE document number, or there may be both ASHRAE and IEEE designations.

Major changes include the addition of alternate methods for capacity determination on high-rate discharge batteries (those with designed discharges of less than an hour) in both IEEE 450 and 1188. Safety sections among the flooded and VRLA battery documents have been harmonized. Standards for determining the meaning of ohmic measurements were tightened or loosened as necessary (for both VRLA and flooded batteries) in deference to the most recent research and data on the correlation between ohmic measurements and actual discharge capacity tests. Minor changes were made in both 450 and 1188 to the frequency of certain maintenance functions.

The previous issue of IEEE 1184 only included selection and sizing criteria. The new document is an end-to-end user guide for UPS batteries, including selection, sizing, and maintenance, among other things.

In the VRLA documents, the language was strengthened to emphasize that spill containment systems are not necessary for these types of batteries. The VRLA standards also emphasize spacing and airflow to help control thermal runaway, and to facilitate maintenance. The myths around the supposed problems of paralleling many VRLA strings have been debunked. Figures and pictures were added to both 1187 and 1188 to show the proper methods of taking measurements (1188 should be re-issued later this year). IEEE 1189 added a short discussion on catalysts, as well as greatly expanded the section on VRLA battery failure mechanisms. This document also added information on the differences between different plate designs and alloys, and AGM and gel cells.

IEEE 1491 is a new document that gives a comprehensive battery monitoring plan, for both remote (automated) monitoring, and hands-on (on-site) monitoring/maintenance. It should be issued later this year.

IEEE 1578 (Spill Containment) and 1635 (Ventilation) are in progress, but the expected publication dates are unknown. The IEEE PES Stationary Battery Committee has also set up a Task Force to study the issues around possible certification for battery technicians.

TRENDS

Sprinklers in Battery Rooms

Sprinklers in industrial buildings are a way of life for most people; however, the telephone companies have historically not installed them due to the need to keep telecommunications service running (water causes a lot of damage to equipment that will cause service interruptions). The phone companies have exemptions to the sprinkling requirements in the Sprinkler Code (NFPA 13), the Building Codes (IBC, UBC, and NFPA 5000), the Fire Codes (IFC, and UFC), and the Life Safety Code (NFPA 101). However, these exemptions are coming under increasing attack (especially in battery rooms) with the passage of local Codes and ordinances that don't allow the same exemptions as the national codes, or because of interpretations of the existing Codes by local officials.

ICC vs. NFPA

In December 2002 the ICC officially consolidated BOCA, SBCCI, and the ICBO into a single organization. This completes activity started in 1994 to harmonize a complete set of codes, including building and fire codes. At the same time the NFPA is publishing its own building code with the backing of ANSI, and is concluding a friendly takeover of the UFC from the WFCA. NFPA Continues uncontested publication of the National Electric Code. Consequently, we are left basically with two model Code organizations going forward.

Presently, the ICC holds an edge in jurisdictions that have adopted its Codes, probably because it had a head start of at least 2 years over the NFPA (in the area of a companion set of Building and Fire Codes). Unlike ICC, which started fairly recently with the goal of a single set of unified standards, NFPA has a legacy of many standards that were created independently of one another. NFPA is struggling to harmonize many of its standards. It is too soon to tell whether or not the NFPA will gain adherents to its model Codes.

So how does a user who is designing a new battery room, or redoing an old one, know which Codes to follow? One place to start is the NFPA and ICC websites. Both contain some (mostly up-to-date) information on which jurisdictions have adopted their model Codes. The final check should be with your AHJ (fire marshal or building inspector) however. They will tell you to which Codes they are going to inspect.

Battery Knowledge

The people who write Codes are getting wiser, thanks in part to forums such as Battcon, and to education efforts on the parts of interested parties, such as battery manufacturers and integrators. VRLA vs. vented is fairly well-understood. Next up: NiCad.

CONCLUSION

The past year has brought some wonderful changes in Code requirements from a battery user and manufacturer perspective. The most important of these concern requirements around spill containment.

However, the most important advice to users is to be patient and be willing to educate your AHJs. It will take time for the new Codes to be adopted by local jurisdictions. Also, most local inspectors aren't battery experts. Patient and friendly (as opposed to adversarial) explanations of the workings of the battery will go a long ways towards resolving disputes with AHJs over interpretations of Codes. Remember that when it comes to interpreting the Codes, they are always right, and if they aren't see rule 1. It will do you no good to become an adversary to an inspector, as it will work to your detriment in the future.

ACRONYMS

A-hr	Ampere-hour
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air-conditioning Engineers
ASME	American Society of Mechanical Engineers
BCI	Battery Council International
BOCA	Building Officials and Code Administrators
DC	Direct Current
HazMat	Hazardous Material
IBC	International Building Code
ICBO	International Conference of Building Officials
ICC	International Code Council
IEEE	Institute of Electrical and Electronics Engineers
IFC	International Fire Code
IFCI	International Fire Code Institute
IT	Information Technology
MSDS	Material Safety Data Sheet
NBC	National Building Code
NEC	National Electrical Code
NFPA	National Fire Protection Association
NiCad or NiCd	Nickel-Cadmium battery
NRC	Nuclear Regulatory Commission
PAR	Project Authorization Request (a draft IEEE standard; denoted by a "P" preceding the document number)
PES	Power Engineering Society (of the IEEE)
PV	Photo-Voltaic
SBC	Standard Building Code
SBCCI	Southern Building Code Council International
s.g.	specific gravity
T1E1	Telecommunications standards committee 1, Engineering subcommittee 1
UBC	Uniform Building Code
UFC	Uniform Fire Code
UPS	Uninterruptible Power Supply
V	Volts
VRLA	Valve-Regulated Lead-Acid battery
WFCA	Western Fire Chiefs Association

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