Uninterruptible Power Supply (UPS) Batteries

It is common in today’s data centers for the UPS to have a large supply of Valve-Regulated Lead-Acid (VRLA) batteries. These batteries are connected in a series which is constantly being charged by the UPS. Having these batteries constantly charged in a series, creates a very dangerous situation for any personnel in the area.

A larger system poses an increased risk to responding personnel due to the amount of corrosive liquid found in some systems, and due to the potential for escaping gas to produce fire or explosion when subject to a source of ignition, such as a dead short or a thermal runaway.

It is necessary to know all of the fire codes regarding the UPS and its batteries to prevent a major accident from occurring to personnel, property or equipment.

What is NFPA 1?

NFPA 1 is the fire code intended to advance fire and life safety for the public and first responders as well as for protection of the property and surrounding properties. Safety can be achieved by providing a comprehensive approach to fire code regulation and hazard management.

Chapter 52 of NFPA 1 directly relates to a stationary storage battery system, in other words, a UPS. Any VRLA stationary storage battery systems having an electrolyte capacity of more than 100 gallons in sprinklered buildings or 50 gallons in unsprinklered buildings used for facility standby power, emergency power, or uninterrupted power supplies must be in accordance with chapter 52.

Chapter 52: Stationary Storage Battery Systems

Chapter 52 states that a VRLA battery system must satisfy seven (7) requirements for it to be in compliance with NFPA 1. Those seven require the batteries to have:

1. Safety Caps (must be Self-Resealing Flame-Arresting Caps)
2. Thermal Runaway protection
3. Neutralization prevention capabilities on-site
4. Ventilation
5. Signage within battery cabinet indicating relevant electrical, chemical, and fire hazard
6. Seismic braces in seismically active areas
7. Fire detection in battery system room
1. Safety Caps

VRLA batteries are required to have Self-Resealing Flame-Arresting Caps installed. This requirement will be fulfilled by the factory upon manufacturing.

2. Thermal Runaway

Thermal runaway is a chemical reaction due to decomposition that is self-accelerating due to the heat it creates during decomposition. This heat can cause damage to the battery causing a spill or a fire.

The batteries themselves should be equipped with a listed device, but other approved methods exist to preclude, detect, and control thermal runaway.

Johnston Technologies can satisfy this requirement by installing a Battery (cell) Monitoring System, which would alert the responsible parties, if the threat of thermal runaway exceeds the predetermined limits.

3. Neutralization

Equipment shall be available and capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0 including but not limited to absorbent material, neutralizing chemicals, or a containment and removal system and a response plan and neutralizing material must be available on-site.

This responsibility is on the user or facility to fulfill.

4. Ventilation

The room shall have a ventilation system to the exterior and shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room during the worst-case event of simultaneous "boost" charging of all the batteries.

This responsibility will be on the facility to design proper ventilation within the room.

5. Signs

The battery cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system. The cabinet's interior shall have signs that indicate the relevant electrical, chemical, and fire hazard.
The proper signage necessary for the cabinet is already posted by the manufacturer. However, the signage necessary to meet this standard must also be posted on the doors or accesses into the rooms, buildings or areas containing the stationary storage battery system. This must be fulfilled by the user or facility.

6. Seismic Control

In seismically active areas, battery systems shall be seismically braced in accordance with the building code.

7. Fire Detection

An approved automatic smoke detection system shall be installed in such areas and supervised by an approved central, proprietary, or remote station service of a local alarm that will give an audible signal at a constantly attended location.

This responsibility is on the user or facility to fulfill.