BATTERY ROOM REGULATIONS AND SAFETY

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There are many different rules, regulations and standards affecting stationary battery selection, installation, operation and maintenance. Some of these address the battery while others address the battery room or other associated equipment.

The following is intended to be a brief listing and discussion of these various rules and standards and not a legal interpretation.

The first and most familiar are the IEEE standards. These standards are a consensus by manufacturers and any interested users as to the best method to get safe reliable operation of a stationary battery system. They are not law. The following is a listing and summary of each standard. For details contact IEEE.

IEEE

The Institute of Electrical and Electronics Engineers has detailed requirements on the installation and maintenance of batteries. Listed below are its specific recommendations on storage batteries. A summary of each is provided: for details contact IEEE.

IEEE-450. "Recommended Practice for Maintenance, Testing and Replacement of Large Lead Storage Batteries for Generating Stations and Substations"

Maintenance inspection procedures are explained along with the proper parameters for various tests. Replacement criteria along with record keeping are detailed.

IEEE-484 "Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations"

Many aspects of safety, mounting alarms, Nuclear 1E classification, installation criteria and procedures and record keeping are described in this section.

IEEE-485 "Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations"

This particular section defines loads and duty cycle, and details the sizing of large stationary batteries, cell selection, determining battery size, etc.

IEEE-635 "Standard for Qualification of Class 1E Load Storage Batteries for Nuclear Power Generating Stations"

IEEE-537 "Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic Systems"

IEEE-1105 "Recommended Practice for Maintenance, Testing and Replacement of Ni-Cad Storage Batteries for Generating Stations and Substations"

DRAFT IEEE-1187 "Recommended Practice for Installation of Valve Regulated Lead Acid Batteries" Same as equivalent practice for wet cells.

DRAFT IEEE-1188 "Recommended Practice for Maintenance and Testing of Valve Regulated Lead Acid Batteries" Same as equivalent practice for wet cells.

DRAFT IEEE-1189 "Recommended Practice Guidelines for Sizing Valve Regulated Lead Acid Batteries" Same as equivalent for wet cells.

OSHA (Occupational Safety and Health Administration) rules are concerned only with the safety of employees. They are laws, administered by the states based on uniform federal law.

OSHA 1925.403
(A) General Requirements -

1. Batteries of the non-seal type shall be located in enclosures with outside vents or in well ventilated rooms, so arranged as to prevent the escape of fumes, gases, or electrolyte spray into other areas.
2. Ventilation shall be provided to ensure diffusion of the gases from the battery to prevent the accumulation of an explosive mixture.
3. Racks and trays shall be substantial and treated to be resistant to the electrolyte.
4. Floors shall be of an acid resistant construction or be protected from acid accumulations.
5. Face shields, aprons, and rubber gloves shall be provided for workers handling acids or batteries.
6. Facilities for quick drenching of the eyes and body shall be provided within 25 feet of the work area for emergency use.
7. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

OSHA 1910.178 subparagraph (g)
Changing and Charging Storage Batteries
This particular section deals more with motive power battery usage than with stationary battery installations, but several paragraphs may still apply.

2. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage, and for adequate ventilation for dispersal of fumes from gassing batteries.
3. When racks are used for the support of batteries, they should be made of materials nonconductive to spark generation or be coated or covered to achieve this objective.

10. Smoking shall be prohibited in the charging area.
11. Precautions shall be taken to prevent open flames, sparks or electric arcs in battery charging areas.
12. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

The National Electrical Code (NEC) is also law, enforced by local electrical inspectors. The NEC has very limited mention of stationary batteries.

Selections that mention back up power, emergency lighting, and/or telecommunications follow:

701-4 (c): Battery Systems Maintenance. Where battery systems or unit equipment are involved (including batteries used for starting, control or ignition in auxiliary engines), the authority having jurisdiction shall require periodic maintenance.

701-5 (d): Written Record. A written record shall be kept of such tests and maintenance.

480-1 through 480-9 Storage Batteries. This section provides a definition of what a battery is, and describes the types of batteries and how they are designed. It also lists other codes to reference. Sealed and wet cells are described along with ventilation, load requirements, and other topics.

480-6 Separation of 250 VDC. A separation of air between voltages higher than 250 VDC is required. Typically, the rack design meets this requirement.

The Uniform Building Code (UBC) is one of the three major building codes used in the United States but the UBC has been adopted more readily than the other two. UBC addresses two issues regarding storage battery installations: seismic qualifications and spill containment for materials that are health hazards.

1994 UBC 1630 "Lateral Forces on Elements of Structures, Nonstructural Components and Equipment Supported by Structures" This particular section of the UBC code has been adopted as the standard for design by many vendors. It covers the design and development of storage battery racks and trays.

UBC 307 "Requirements for Group H Occupancies." This section references a table which describes the requirements of a spill containment system for lead acid storage batteries. Basically, the UBC code is used as the foundation of the 1994 Uniform Fire Code Article 64.

UBC 307 1.1 General. Group H Division 7 (term is defined below) occupancies shall include buildings or structures, or portions thereof, that involve the manufacturing, processing, generation or storage of materials that constitute a high fire, explosion or health hazard. For definitions see table 3-E and divisions.

UBC 307 1.2 Multiple Hazards. When a hazardous material has multiple hazards, all hazards shall be addressed and controlled in accordance with the provisions of this chapter.

UBC Division 7. Occupancies having quantities of materials in excess of those listed in Table 3-E that are health hazards, including:

1. Corrosives. Liquids in excess of 500 gallons.

UBC 307.2 Construction, Height and Allowable Area.

UBC 307.2.3 Spill Control. When required by the Fire Code, floors shall be recessed a minimum of 4 inches or shall be provided with a liquid-tight raised sill, with a minimum height of 4 inches so as to prevent the flow of liquids to adjoining areas. Except for surfacing, the sill shall be constructed of noncombustible material, and the liquid-tight seal shall be compatible with the material being stored. When the liquid-tight sills are provided, they may be omitted at door openings by the installation of an open-grate trench which connects to an approved drainage system.

UFC

The Uniform Fire Code was developed through the cooperation of local and state fire department officials with other agencies to create a uniform code of regulations for local authorities. The UBC code references local Fire Code for spill-containment situations.

If the local authority does not have a fire code, the UFC code may be used as a reference; in some states, this is required.

Specifically, the UFC code Article 64 requires six items for storage battery installations. These items are:

Occupancy Separation 64.104 (c)
Ventilation 64.104 (f)
Spill Containment 64.104 (d)
Signs 64.104 (g)
Neutralization and Absorption 64.104 (e)
Seismic Protection 64.104 (h)

64.104 (c) Occupancy Separation. Battery systems shall be located in a room bounded by an occupancy separation having a minimum one-hour fire-resistive rating, exterior walls, roof or foundation of the building.

64.104 (d) Spill containment. Each rack of batteries, or group of racks, shall be provided with a liquid tight 4-inch deep spill-control barrier which extends at least 1 inch beyond the battery rack in all directions.

64.104 (e) Neutralization. An approved method to neutralize spilled electrolyte shall be provided. The method shall be capable of neutralizing a spill from the largest lead-acid battery to a pH between 7.0 and 9.0.

64.104 (f) Ventilation. Ventilation shall be provided in accordance with the Mechanical Code. Unless the ventilation is designed to limit the maximum concentration of hydrogen to .8 percent of the total volume of the room in accordance with nationally recognized standards, the rate of ventilation shall not be less than 1 cubic foot per minute per square foot.

64.104 (g) Signs. Doors into rooms or buildings containing stationary lead-acid battery systems shall be provided with approved signs. The signs shall state that the room contains lead-acid battery systems, that the battery room contains energized electrical circuits and that the battery electrolyte solutions are corrosive liquids.

64.104 (h) Seismic Protection. Battery systems shall be seismically braced according to the building code.

DOT

The Department of Transportation regards lead-acid batteries as hazardous *material*, not hazardous *waste*. Lead-acid batteries are subject to all DOT regulations applicable to the packaging, labeling and transporting requirements noted in Clauses 40CFR of the Code of Federal Regulation. Clauses 49CFR 106-180 further define the packaging, placarding and transporting of hazardous materials.

Clauses 40CFR

261.5 Requirements for Recyclable Materials

(a) (1) Hazardous wastes that are recycled are subject to requirements for generators, transporters and storage facilities of paragraphs (b) and (c) of this section, except for the materials listed in paragraphs (a) (2) and (a) (3) of this section. Hazardous wastes that are recycled will be known as "recyclable materials."

Subpart G: Spent Lead-Acid Batteries Being Reclaimed

(a) The regulations of this subpart apply to persons who reclaim spent lead-acid batteries that are recyclable materials ("spent batteries"). Persons who generate, transport, or collect spent batteries, or who store spent batteries but do not reclaim them are subject to regulations under Parts 262 through 266 or Part 270 or 124 of this chapter, and also are not subject to the requirements of section 3010 of RCRA.

Clauses 49CFR

172.101 Hazardous Materials Table Provides a complete listing of hazardous materials, the classes or division of those materials, as well as specific identification and labeling procedures, and other special provisions.

173.159 Batteries, Wet

(a-c) Explains the proper packaging of batteries based on their weights and dimensions.

(d-h) Explains the proper packaging of wet non-spillable batteries.

Awareness of and attention to the above regulations can increase safety and reliability of stationary battery systems and avoid legal problems for the user.