

Orange County Fire Authority

Planning & Development Services Section

1 Fire Authority Road, Building A, Irvine, CA 92602 www.ocfa.org 714-573-6100

Stationary Storage Battery Systems



Guideline G-10

Serving the Cities of: Aliso Viejo • Buena Park • Cypress • Dana Point • Irvine • Laguna Hills • Laguna Niguel • Laguna Woods • Lake Forest • La Palma • Los Alamitos • Mission Viejo • Placentia • Rancho Santa Margarita • San Clemente • San Juan Capistrano • Santa Ana • Seal Beach • Stanton • Tustin • Villa Park • Westminster • Yorba Linda • and Unincorporated Areas of Orange County

Stationary Storage Battery Systems

PURPOSE

The intent of this guideline is to outline the requirements and regulations for stationary storage battery systems, including batteries for cellular sites and indoor storage of electric carts or cars. The following “Submittal Requirements” outline the minimum information required for plan review as set forth by Section 608 of the 2016 California Fire Code (CFC), as locally amended, and Table 509 of the 2016 California Building Code (CBC).

SCOPE

This guideline applies to all new installations and/or alterations to existing stationary storage battery systems, including flooded lead acid, nickel cadmium, valve-regulated lead acid and lithium-ion battery systems within the jurisdiction of the Orange County Fire Authority (OCFA). The following definitions are provided to facilitate the consistent application of this guideline.

Battery System, Stationary Lead Acid – A system which consists of three interconnected subsystems:

1. A lead-acid battery.
2. A battery charger.
3. A collection of rectifiers, inverters, converters, and associated electrical equipment as required for a particular application.

Lithium-ion battery, A storage battery that consists of lithium ions embedded in a carbon graphite or nickel metal-oxide substrate. The electrolyte is a carbonate mixture or a gelled polymer. The lithium ions are the charge carriers of the battery.

Lithium metal polymer battery, A storage battery that is comprised of nonaqueous liquid or polymerized electrolytes, which provide ionic conductivity between lithiated positive active material electrically separated from metallic lithium or lithiated negative active material.

Nickel cadmium, (Ni-Cd) battery – An alkaline storage battery in which the positive active material is nickel oxide, the negative contains cadmium and the electrolyte is potassium hydroxide.

Nonrecombinant battery – A storage battery in which, under conditions of normal use, hydrogen and oxygen gases created by electrolysis are vented into the air outside of the battery.

Recombinant battery – A storage battery in which, under conditions of normal use, hydrogen and oxygen gases created by electrolysis are converted back into water inside the battery instead of venting into the air outside of the battery.

Stationary storage battery – A group of electrochemical cells interconnected to supply a nominal voltage of DC power to a suitably connected electrical load, designed for service in a permanent location.

Valve-regulated lead acid (VRLA) battery – A lead-acid battery consisting of sealed cells furnished with a valve that opens to vent the battery whenever the internal pressure of the battery exceeds the ambient pressure by a set amount. The liquid electrolyte in the cells is immobilized in an absorptive glass mat (AGM cells or batteries) or by the addition of a gelling agent.

Vented (Flooded) lead acid battery – A lead-acid battery consisting of cells that have electrodes immersed in liquid electrolyte. Flooded lead-acid batteries have a provision for the user to add water to the cell and are equipped with a flame-arresting vent which permits the escape of hydrogen and oxygen gas from the cell in a diffused manner such that a spark, or other ignition source outside the cell will not ignite the gases inside the cell.

SUBMITTAL REQUIREMENTS

1. General
 - A. Plans are required for OCFA review when battery systems contain more than 50 gallons of electrolyte or more than 1,000 pounds of lithium-ion batteries.
 - B. All new plan submittals and revisions will consist of 2 hard copies and 1 electronic copy in .pdf format. Electronic copies may be submitted on CD, DVD, memory stick or via email. Provide a minimum of one copy of the manufacturer's data sheets for the stationary battery system. All data sheets shall be current and complete. *Note: Some building departments within OCFA's jurisdiction require additional sets. Verify plan submittal requirements with the building department prior to submittal.*
 - C. Plans shall be legible, scaled to nationally recognized standards, and blue- or blacklined.
 - D. Complete an OCFA Service Request form, which can be obtained at the building department or OCFA headquarters.
 - E. Plans not conforming to these minimum requirements will be returned as incomplete.
2. Provide the following information on the title page
 - A. The building construction type and occupancy classification(s) as defined by the CBC.
 - B. Applicable codes and standards used for the system's design (e.g., 2016 CFC, 2016 CBC)
 - C. Project location, including the address of the facility, building number, if applicable, and tract, lot and/or parcel number information.
 - D. The contractor's name, telephone number, address, and California State contractor's license number.
 - E. Identify the total number of batteries.
 - 1) Lead-acid, Nickel cadmium, and VRLA batteries:

- a. Identify the total quantity of electrolyte per battery in gallons (e.g. 3.8 gallons per battery).
 - b. Identify the *concentration* of each chemical in the electrolyte (e.g., 12.5% sulfuric acid).
 - c. Provide a copy of the battery manufacturer's hydrogen evolution table based on the intended use.
 - d. Identify the total amount of electrolyte per system. If there are multiple systems, identify the total electrolyte for all systems that are not separated by a minimum of a one-hour fire barrier. If a one-hour fire barrier separates battery systems, provide the total electrolyte for each/all system(s) on each side of the one-hour fire barrier.
- 2) Lithium-ion and lithium metal polymer batteries:
- a. Identify the total weight of lithium-ion or lithium metal polymer batteries.
- F. Provide a building floor plan identifying the location of each battery system.
3. Required Information
- A. Room design and construction:
- 1) The battery system must be in a room that is separated from other portions of the building by a minimum of a one-hour fire barrier in other than Groups A, E, I and R Occupancies.
 - 2) In Groups A, E, I, and R Occupancies, the battery system shall be located in a room separated from other portions of the building by a minimum of a two-hour fire barrier. CBC Table 509.
 - 3) When stationary batteries are installed in a separate equipment room accessible only to authorized personnel, they may be installed on an open rack for ease of maintenance. CFC 608.4.1
 - 4) When a system of VRLA, lithium-ion or other type of sealed, non-venting batteries is situated in an occupied work center, it may be housed in a noncombustible cabinet or other enclosure to prevent access by unauthorized personnel. CFC 608.4.2
 - 5) When stationary batteries are contained in cabinets in occupied work centers, the cabinet enclosures shall be located within 10 feet of the equipment they support. CFC 608.4.3
- B. Safety caps:
- 1) Vented lead acid, nickel-cadmium or other types of non-recombinant batteries shall be provided with safety venting caps. CFC 608.2.1
 - 2) VRLA batteries shall be equipped with self-resealing flame-arresting safety vents. CFC 608.2.2
- C. Thermal runaway:
- 1) VRLA battery systems shall be provided with a listed device or other approved method to preclude, detect and control thermal runaway. CFC 608.3

- D. Spill control and neutralization:
- 1) Show that an approved method exists for the control and neutralization of an unintentional release of electrolyte in areas containing lead-acid, nickel-cadmium or other types of batteries with free-flowing liquid electrolyte. This does not include VRLA, lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte. CFC 608.5
 - 2) For battery systems containing lead-acid, nickel-cadmium or other types of batteries with free-flowing liquid electrolyte, the method and materials shall be capable of neutralizing a spill from the largest lead-acid battery to a pH between 7.0 and 9.0. CFC 608.5.1
 - 3) For VRLA or other types of sealed batteries with immobilized electrolyte, the method and material shall be capable of neutralizing a spill of 3% of the capacity of the largest VRLA cell or block in the room to a pH between 7.0 and 9.0. Lithium-ion and lithium metal polymer batteries do not require neutralization. CFC 608.5.2
- E. Room ventilation:
- 1) Show the required ventilation by one of the two methods stated below:
 - a. For flooded lead acid, flooded nickel-cadmium, and VRLA batteries, the ventilation system shall be designed to limit the maximum concentration of hydrogen to 1 % of the total volume of the room, or
 - b. Continuous ventilation shall be provided at a rate of one cubic foot per minute per square foot of floor area of the room. Lithium-ion and lithium metal polymer batteries do not require additional ventilation beyond that which would normally be required for human occupancy of the space in accordance with the 2016 California Mechanical Code. CFC 608.6.1
- F. Cabinet ventilation:
- 1) Show that when VRLA batteries are installed inside a cabinet, the cabinet is approved for use in occupied spaces and is mechanically or naturally vented by one of the following methods:
 - a. The cabinet ventilation shall limit the maximum concentration of hydrogen to 1% or the total volume of the cabinet during the worst-case event of simultaneous “boost” charging or all the batteries in the cabinet, or
 - b. Where calculations are not available to substantiate the ventilation rate, continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot of floor area covered by the cabinet. The room containing the cabinet must also be ventilated as required as shown under E-1 above. CFC 608.6.2
- G. Specify on the plan that the doors to the battery room shall be provided with signs with the following information:
- 1) The room contains energized battery systems.
 - 2) The room contains energized electrical circuits.
 - 3) The battery electrolyte solutions, where present, are corrosive liquids.

All lettering shall be capital letters on a contrasting background. Letters shall be a minimum of 1" in height. Provide specific details as to the sign design. CFC 608.7.1

- H. Specify on the plan that cabinets have exterior labels identifying the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system. There shall also be signs within the cabinet to indicate the relevant electrical, chemical and fire hazards. CFC 608.7.2
- I. Provide details showing the battery system is seismically braced according to the CBC. CFC 608.8
- J. Demonstrate that an approved automatic smoke detection system is provided in all rooms containing stationary battery systems. CFC 608.9
- K. Provide the following notes, verbatim, on the plan under "FIRE AUTHORITY NOTES":
 - 1) OCFA final inspection required. Please schedule all field inspections at least 48 hours in advance. Inspections canceled after 1 p.m. on the day before the scheduled date will be subject to a reinspection fee. Call OCFA Inspection Scheduling at 714-573-6150.
 - 2) Stationary battery systems shall be in compliance with 2016 CFC Section 608, as amended.
 - 3) A smoke detection system shall be installed in the battery room in compliance with 2016 CFC and 2016 NFPA 72. A separate plan submittal is required for the smoke detection system. Smoke detection system is required to be monitored by a central, proprietary, or remote station (as defined by NFPA 72), or a local alarm that will give an audible signal at a constantly attended location.
 - 4) An approved method to neutralize spilled electrolyte shall be provided and maintained in the battery room.
 - 5) Batteries shall be provided with safety venting caps.
 - 6) Locations and classifications of extinguishers shall be in accordance with CFC 906.2 and Chapter 3, Title 19 CCR. Placement is subject to the approval of the fire inspector.
 - 7) Storage, dispensing, or use of any flammable and combustible liquids, flammable and compressed gases, and other hazardous materials shall comply with CFC regulations.
 - 8) Modifications to existing fire detection or alarm system(s) shall be approved by OCFA prior to the installation. A separate plan submittal is required.