

FinDreams Battery Lithium-ion Battery Risk and Fire Safety Tip Guidance

As a professional research institution in the field of lithium-ion battery safety, FinDreams Battery Co., Ltd. has been committed to the research and innovation of fire safety for lithium-ion batteries, aiming to jointly build a safe and reliable battery safety management system. Based on our scientific research outcomes and years of experience, we are issuing this “Lithium-ion Battery Risk and Fire Safety Tip Guidance” to provide fire protection requirements and precautions for the production plants, storage warehouses, transportation and transit, fire prevention and extinguishing, and daily management and use of lithium-ion batteries. This is intended to help our customers enhance their awareness of fire safety related to batteries, reduce the probability of accidents, and ensure personal and property safety.

Lithium-ion batteries are characterized by their high energy density, listed in the *International Maritime Dangerous Goods (IMDG) Code* and classified as Class 9 dangerous goods for management. Due to their characteristics, our firm has adopted various safety designs to ensure the security of lithium-ion batteries. However, during storage, transportation, and application processes, factors such as incorrect storage, improper use, physical impact, and environmental changes may still lead to lithium-ion batteries to heating, smoking, thermal runaway, and cause combustion. If coupled with deficiencies in management, these risks could potentially evolve into accidents.

I. Building requirements for lithium-ion battery production plants and storage warehouses

The manufacturing plants and storage facilities for lithium-ion batteries should be located away from fire sources, flammable materials, and other locations with explosive hazards. It is essential to ensure that the surrounding environment is free from open flames, electrical sparks, and other factors that could cause fires, and to maintain good ventilation to reduce the accumulation of hazardous gases. When conditions permit, storage sites for lithium-ion batteries and safety & environmental testing facilities should ideally have independent fire compartments or in separate buildings, keeping a certain distance from other important locations or equipment to prevent the spread of fire.

Buildings should comply with national fire safety standards, with a fire-resistance rating not less than Class II. Fire separation should be established in accordance with national regulations, to ensure effective isolation of the spread of fire. Interior decoration should comply with the requirements of national and industry standards, and the use of combustible building materials explicitly prohibited by the state is strictly forbidden. Evacuation passages and safety exits should be set up according to the design requirements, with both the number and width meeting the stipulated standards.

II. Fire protection facilities requirements for lithium-ion battery production plants and storage warehouses

The manufacturing factories, warehouses and safety & environmental testing sites for lithium-ion batteries should be equipped with automatic sprinkler fire suppression systems, hydrant systems, automatic fire alarm systems, emergency lighting and evacuation sign systems, and smoke exhaust systems that meet the specifications' requirements.

The fire control room should be staffed with two persons on duty 24 hours a day. The fire alarm system and other fire control systems should be connected to the fire control room, and the personnel on duty should have been professionally trained and have the ability to deal with emergencies under fire conditions.

III. Storage requirements for lithium-ion batteries.

Lithium-ion batteries should be categorized, divided into piles and stored in limits. Different types of lithium-ion batteries should be stored separately from chemicals, combustible materials, etc., and faulty lithium-ion batteries should be stored separately from normal lithium-ion batteries, and the separation measures should meet the requirements of the standardized fire-resistance rating to prevent the risk of cross-contamination and fire spread, and the lithium-ion batteries should not be stored in contact with each other in intensive storage. For individual batteries greater than 3 volts, as well as defective batteries with safety hazards such as swelling, short-circuiting, physical damage and overcharging, effective physical separation measures should be implemented. These measures include the use of solid walls, explosion-proof cabinets, metal cabinets, separate containers, fire shutters, and other effective separation methods to segregate faulty batteries from non-faulty ones.

The temperature and humidity conditions in the storage place of lithium-ion batteries should meet the requirements of product specifications, and avoid storing lithium-ion batteries for a long time.

IV. Transportation requirements for lithium-ion batteries.

Strict adherence to transportation regulations, especially those related to dangerous goods, and compliance with the relevant provisions of the International Air Transport Association (IATA) and the International Maritime Dangerous Goods (IMDG) Code.

Select dedicated transportation tools that meet the specified fire-resistant standards and install fire alarm and fire-extinguishing equipment.

Use packaging that complies with regulatory requirements to protect the product from damage due to external factors such as vibration, impact, dropping, and temperature and humidity changes.

During transportation, properly secure the packaged items to prevent excessive displacement and falling of the package, which could lead to accidents.

Develop emergency response plans for potential situations that may arise during transportation and be prepared with measures for emergency handling of accidents.

V. Daily management and usage precautions for lithium-ion batteries

Lithium-ion batteries should be kept away from high temperatures, fire sources, and flammable materials. Open flames and smoking are prohibited in production and storage sites.

Batteries should be regularly inspected to ensure there are no safety hazards such as short circuits or electrical leakage. When lithium-ion batteries are used in packs, effective management and protective devices for voltage, current, and temperature should be installed.

During the reprocessing and use of lithium-ion batteries, it is important to avoid factors that may damage the batteries, such as short-circuiting, physical impact, compression, high temperatures, and damage to the battery insulation and wiring insulation.

During the processing, storage, and transportation of lithium-ion batteries, regular checks and tests should be conducted to monitor the State of Charge (SOC) of the batteries. The SOC should be controlled within a certain range to ensure the safety and reliability of the batteries. Generally, the SOC of ternary batteries should not exceed 30%, and for lithium iron phosphate batteries and consumer batteries, the SOC should not exceed 70%. During air transportation, the SOC of lithium-ion batteries should not exceed 30%.

Establish a dedicated disposal mechanism for spent batteries to ensure they are treated safely and in an environmentally friendly manner.

VI. Requirements for lithium-ion battery fire prevention and extinguishing

Ensure that the fire lanes around the factory buildings, warehouses, and their vicinity are not occupied, remain unobstructed, and have clear safety signs in place.

Depending on the different locations and the scale of the batteries in use, fire extinguishing equipment should be equipped as required. It is recommended to configure a certain proportion of water-based or clean agent fire extinguishers and etc. to ensure that initial fires can be effectively and promptly

extinguished.

When a small number of lithium-ion battery cells are heating up, smoking, or catching fire, the fire-extinguishing blanket, carbon dioxide-based or water-based fire extinguisher can be used to extinguish the fire.

When the fire is significant, it is necessary to disconnect the AC power supply before using the on-site sprinkler system and fire hoses to extinguish the fire. If possible, the batteries can be immersed in a 5% sodium chloride (NaCl) solution until the discharge reaction is complete.

In the case of a fire involving the lithium-ion battery module, the lithium-ion battery pack, the large number of lithium-ion batteries, or a significant fire in the lithium-ion battery warehouse, the emergency plan should be immediately activated. Evacuate personnel and initiate the fire linkage system as required to carry out firefighting measures.

After successfully extinguishing a burning battery, there is still a risk of re-ignition. It should be continuously cooled for over an hour or treated by soaking in a sodium chloride (NaCl) solution (for battery packs that have not had their high voltage disconnected, it is recommended to use a solution with a concentration of less than 1% sodium chloride).

VII. The fire management system and staffing arrangements for lithium-ion battery sites

Lithium-ion battery sites should establish a comprehensive fire safety management system, clearly define the management responsibilities and operational procedures for all levels of personnel, and ensure that fire safety work is effectively implemented.

Appoint dedicated (or part-time) fire safety management personnel to conduct daily fire inspections, promptly identify and eliminate fire hazards, and ensure that firefighting facilities are in proper working order.

VIII. Fire safety inspections, drills and training at lithium-ion battery sites

For sites or locations where lithium-ion batteries are used and stored, at least one inspection should be conducted daily. During special times such as nights, weekends, holidays, work breaks, meal times, etc., the safety guarding and patrolling of areas where lithium-ion batteries are used and stored should be intensified.

Regularly organize fire evacuation and firefighting drills to enhance employees' emergency response to fires and their firefighting skills. It is recommended to establish a rescue mechanism with local fire and

rescue services.

Strengthen fire safety awareness training for all employees to improve their understanding and knowledge of fire safety. Employees should be able to skillfully operate common firefighting equipment and facilities such as fire-extinguishing blankets, fire extinguishers, and hydrants, and possess the ability to extinguish early-stage fires of lithium-ion batteries. Additionally, they should know how to raise the alarm and organize evacuation and escape procedures.

The above is only a preliminary introduction to the risks associated with lithium-ion batteries and fire safety guidelines. We will continue to follow up on the latest scientific research and engineering practices, continuously improving the level of fire safety management for lithium-ion batteries, and making ongoing efforts to ensure social stability and the safety of personal and property for enterprises.

We look forward to further deepening our cooperative relationship with all parties and jointly creating a better future!

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FinDreams Battery Co., Ltd.
