Environmental Health Committee (EHC) Emerging Issue Brief

June 29, 2026

Lithium-Ion Battery (LIB) Fires

What is the issue?

The Emerging Environmental Hazards of Lithium-Ion Battery (LIB) Fires

Devices powered by lithium-ion batteries (LIBs) play an increasing role in every aspect of our lives - phones, laptops, toothbrushes, handheld radios, power tools, uninterrupted power supply for servers, mobility devices (wheelchairs), electric vehicles (EVs), scooters and bikes. They are even being deployed at a massive scale to improve the resilience of United States' national electrical grid. Other nations are also building new electric grids with massive storage of lithium-ion batteries. However, a critical and growing environmental health and safety concern is the potential for high-temperature fires, explosions, and toxic chemical emissons arising from the storage of large quantities of lithium-ion batteries in enclosed buildings without adequate ventilation and/or fire suppression systems. These conditions can lead to catastrophic thermal runaway that, according to firefighters, often "cannot be stopped once they start."

What makes lithium-ion battery (LIB) fires especially treacherous is their distinctive and extreme behavior:

- They present all the common hazards associated with vehicle and structure fires, plus a host litany of unique risks that must be considered during and after the fire.
- They can reach temperatures nearly three times hotter than conventional gasoline fires.
- They release highly toxic gases, such as hydrogen fluoride, hydrogen cyanide, and carbon monoxide, which can be lethal in enclosed spaces.
- They release flammable gases, such as hydrogen and carbon monoxide, which can create flash fires and explosions in contained environments.
- LIBs are energy dense storage devices that can present a threat of electrocution to emergency responders and remediators even after the fire is extinguished.
- They can reignite hours or even days after appearing to be extinguished.

- The persistent residual battery contents released during the fire is a hazardous dust (Black Mass) that is easily aerosolized when dry and is difficult to clean. This black mass contains metals not typical of common structure or vehicle fires including, but not limited to nickel, manganese, cobalt, lithium, etc. Firefighter turnouts are not protective against skin contact with these compounds during firefighting. The black mass often spreads great distances in a slurry as it is carried by fire suppression water from sprinklers or firefighter applications of water. The black mass is carried by air in the smoke emissions creating an inhalation hazard on and off site. This dust spreads throughout the origin structure, can infiltrate adjacent structures, and settles on surfaces creating persistent a re-entrainment inhalation hazard, a skin contact, and an ingestion hazard.

This combination of heat, electrocution hazards, toxicity during the fire, persistence of toxins after the fire is supressed, and reignition potential presents unprecedented challenges for both prevention strategies and emergency response protocols.

A Rapidly Escalating Crisis

The data paints a stark picture of the growing threat:

- Between 2017 and 2022, the United States reported over 25,000 fire or overheating incidents involving lithium-ion batteries.
- In the United Kingdom, battery fires rose by 46% between 2022 and 2023.
- In New York City, over 100 lithium-ion battery fires occurred in the first five months of 2024, resulting in 13 fatalities.

These incidents underscore a rapid escalation in frequency and severity—closely linked to the widespread adoption of lithium-ion battery technology.

Large-Scale Storage Fires: A Global Hazard

The global shift toward electrification as a power source has led to the construction of massive lithium-ion battery storage facilities. However, it is noted that these facilities carry significant environmental and public safety risks as described in this document.

Due to the intense heat and toxic emissions firefighters often opt to let lithium-ion battery fires burn out on their own rather than attempting direct suppression.

- **What does this mean for ASHRAE**?

As use of lithium-ion batteries continues to surge, so too must the implementation of comprehensive fire safety standards, ventilation protocols, and emergency response strategies tailored to the unique dangers of lithium-ion technology. More and specific consideration is needed to improve the prevention of, response to, and recovery from lithium-ion battery fires. The indoor storage of massive number of lithium-ion batteries in what are essentially warehouses is a concern due to the potential for the airborne release of contaminants. If overheated, damaged, or improperly

charged, a lithium-ion cell can result in thermal runaway, a chain reaction that generates extreme heat and can cause fire or explosion and can have significant impact on the environment. ASHRAE's members can work with other professionals to design and implement ventilation systems (as well as other control measures) to help mitigate smoke and toxins from moving into other areas that are not in flames. Engineering systems design and implementation can reduce the potential impacts of thermal runaway within buildings, such as installation of high-performance filtration; increased airflow rates in storage areas; and safety and health training of on-site staff to help prevent the spread of the fire throughout the building.

The impact of LIB-fire emissions in air as smoke and on surfaces as a slurry on neighboring properties and local inhabitants can be quite severe. In the long term, ASHRAE may need to change its existing standards or adopt new standards to provide industry guidance on addressing the storage of large quantities of lithium-ion batteries within a facility, both indoors and outdoors.

What Actions Should ASHRAE Consider?

- ASHRAE's Technical Committees (TC's) as well as ASHRAE's Environmental Health Committee (EHC) should engage with lithium-ion battery manufacturers to better understand the sources and controls for the batteries, and the precautions to implement for storage.
- ASHRAE's Technical Committees (TC's) as well as ASHRAE's Environmental Health Committee (EHC) should engage with lithium-ion battery first responders and experienced environmental consultants to better understand strategies for prevention, response, and recovery from lithium-ion battery fires.
- ASHRAE's Technical Committees (TC's) as well as ASHRAE's Environmental Health Committee (EHC) should engage with the government and industry entities and get a seat at the table to influence the in the development of laws, codes, standards and guidelines.
- ASHRAE's Technical Committees (TC's) as well as ASHRAE's Environmental Health Committee (EHC) should engage with end users to help frame the questions of how these batteries are used, handled, maintained, charges, stored, packaged, shipped, recycled, and discarded.
- ASHRAE should promote the education of its members and the public on LIB fire hazard prevention, response and recovery.
- ASHRAE should encourage the development of a Lithium-Ion Battery Management Program that can be provided to the public for use by building owners, property managers, and firefighters.
- ASHRAE may need to change its existing standards or adopt new standards to provide industry guidance on addressing the storage of large quantities of lithium-ion batteries within a facility, both indoors and outdoors.
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