



U.S. Fire Administration
Working for a fire-safe America

Risks and Response Strategies for Lithium-ion Battery Fires

Lithium-ion batteries have emerged as the power source of choice for a vast array of modern tools and mobility devices. From toothbrushes to smartphones, construction tools to medical devices, scooters to cars, these rechargeable power sources have transformed the way we power our homes, cities and everything in between.



However, there are risks associated with lithium-ion batteries, and firefighters must be aware of the challenges they present and the measures needed to mitigate these dangers when tackling incidents involving these devices.

Understanding the risks

Conditions that can lead to potentially dangerous incidents

- Overcharging and overheating: Overcharging a lithium-ion battery beyond its designed capacity can lead to overheating.
- Cycling and aging: Lithium-ion batteries degrade over time due to charge and discharge cycles.

Chemical composition

Lithium-ion batteries contain volatile electrolytes, and when exposed to high temperatures or physical damage, they can release flammable gases.

Ejection

Batteries can be ejected from a battery pack or casing during an incident thereby spreading the fire or creating a cascading incident with secondary ignitions/fire origins.

Risk of reignition

Even after extinguishing a lithium-ion battery fire, there is a risk of reignition.

Thermal runaway

This is the chain reaction of uncontrolled heating can lead to fire or explosion.

Signs of damage or thermal runaway include:

- Mechanical damage such as cracking (from abuse or dropping/collision).
- Bulging.
- Popping/hissing.
- Visible gases venting.
- Rising temperature.



Understanding the challenges for firefighters

Chemical exposure

Firefighters should be cautious of potential chemical exposure during firefighting operations, and proper personal protective equipment should be donned.

Intensive cooling requirements

Firefighters need to adopt strategic cooling methods to manage these incidents effectively.

Complex vehicle construction

Vehicle construction and design is different for BEV/PHEV makes and models, so firefighters and other first responders should get Emergency Response Guides (ERGs) from original equipment manufacturers to inform critical actions such as safe and effective rescue and vehicle extrication. Familiarity with these unique designs is essential for swift and effective response.

Reignition risks

Even after extinguishing a lithium-ion battery fire, there is a risk of reignition. Firefighters should implement thorough post-fire assessments and continued monitoring to prevent rekindling, including during post-incident transport and placement.

Response strategies

Establishing safety zones

Establish safe zones to protect from potential hazards, minimizing risk.

Cooling techniques

Implement and use cooling techniques to manage the heat generated by lithium-ion batteries.

Collaboration/Partnerships

Establish partnerships with EV manufacturers and industry experts for more informed and effective firefighting techniques.



Training programs

Conduct regular training programs for firefighters.

Emergency shutdown procedures

Be familiar with emergency shutdown procedures for EVs to isolate the power source and mitigate potential risks.

FEATURED MATERIALS

Lithium-Ion Battery Safety for Electric Devices

Lithium-Ion Battery Safety for Electronic Devices



Before purchasing

1. Review the Consumer Product Safety Commission website (www.saferproducts.gov) for any recall information on the products you are considering.
2. Look for a Nationally Recognized Testing Laboratory stamp on the packaging and product. Examples can be found on this link: www.osha.gov/nationally-recognized-testing-laboratory-program/current-list-of-nrtls.



How to stay safe when charging

1. Always use the charger provided by the manufacturer for the device being charged.
2. Do not overload outlets. Using multiplug adapters or power strips on an outlet may result in overheating and a potential fire hazard.
3. Charging devices should be plugged directly into an outlet and not into extension cords or multiplug adapters.
4. When in doubt, have a professionally licensed electrician test your existing circuits to ensure safe use.



Proper disposal of batteries

1. Place tape over battery ends and terminals to help prevent accidental discharges and potential fires.
2. Repairs to any lithium-ion battery packs should only be performed by a certified repair facility.
3. Do not place lithium-ion batteries in trash or recycle bins as they have the potential to ignite. Locate collection sites in your community and check with your local authorities to determine proper recycling methods for used batteries.

To learn more, visit usfa.fema.gov.



 English PDF

NFIRSGRAMS

Reporting for firefighters

Because of the nature and complexity of battery fire incidents, it is also critical that fire departments accurately report battery fire incidents. This can enable an added level of investigation, and clarification can facilitate strategies to effectively reduce battery fire incidence.

How to code fire incidents involving lithium-ion batteries

Learn how to code a NFIRS report for a fire incident in a vehicle, structure or equipment where a lithium-ion battery is present and involved.

Coding an electronic cigarette fire

Learn how to code an electronic cigarette fire.

