



LITHIUM ION BATTERIES: Potentially Dangerous Unless Stored Properly

It was a warm August night in Harlem. The Jackie Robinson Houses were quiet, filled with slumbering working-class families, when tragedy struck.

A faulty e-bike battery caught fire. By the time the family in the impacted apartment awoke, it was too late.

The blaze simply accelerated too fast leading to extensive property damage and, sadly, loss of life.

This tragedy was preventable and continues to happen.

These tragedies occur most often in highly concentrated apartment buildings where tenants are doing all they can to make ends meet.

Often, tenants will work diligently as bicycle messengers to generate income. E-bikes allow them to navigate city streets more efficiently. But there is a cost associated with this efficiency. Light electric vehicles (LEVs) have become an efficient way to transport people and goods. But the lithium ion batteries that power them are flammable. If stored or charged improperly, these batteries can result in loss of property - or human life.

From January 1, 2021, through November 28, 2022, the CPSC reported at least 19 deaths because of fires or overheating incidents related to battery-powered products such as e-bikes, scooters and hoverboards.

These fires aren't limited to LEVs or e-bikes stored in high-density apartments. Boats and luxury yachts are susceptible to these fires, as are homeowners who store batteries in their garage that accompany toys like hoverboards, scooters, and e-bikes. Laptop users who utilize lithium ion batteries risk fires, as occurred on a United Airlines flight recently.

There are solutions to these challenges, and one of the most effective is simple: battery-safe aluminum cases designed to contain fires before they spread.



ABSTRACT

There are many millions of lithium ion batteries in use around the world, powering electronic devices as well as smaller modes of transportation that require an overnight recharge. As well, there are tens of thousands of delivery workers in New York City alone. A congested city requires alternate means of transportation. For decades, that role was played by bicycle messengers who adeptly navigated cars, pedestrians, and other hazards.

In less congested areas, e-bikes are also a popular means of transportation. They allow riders of all ages to navigate longer distances quickly without the use of a car. However, improper battery storage can result in loss of life or property as well.

The two markets above have caused the number of LEVs to more than triple from 2019 to 2022: over a million LEVs were sold in 2022, up from 288,000 in 2019. The global electric scooter market size was estimated at \$21.54bn in 2022 and will expand to over \$40bn by 2030, with a compound annual growth rate of 8.1% from 2022 to 2030.

The advent of the e-bike has given rise to new challenges. Smartphone users are accustomed to the sense of dread that can arise when their phone's charge is below a certain percent. Bicycle messengers confront the same challenges, only their loss of power could result in the loss of income or a job.

For that reason, messengers typically cycle multiple batteries throughout the course of a day, charging several at home each night out in the open. During the day, messengers often charge batteries at e-bike shops to get juice when they run low. Batteries can be pricey for these delivery workers who are scraping to get by, with high-quality options costing around \$750.

At any given point, a slumbering messenger could have several poorly-made flammable batteries resting on aftermarket chargers in their apartment. These batteries, composed of dozens of small battery cells, can lead to a fire or explosion that sets off a chain reaction. Because of this, fires tend to burn hotter than typical house fires and accelerate more quickly.

Fires in single-family homes where batteries are stored can be tragic, but the economic loss and loss of human life is magnified in high-rise apartment buildings or mass transit vehicles such as airplanes or trains. Storage in any setting, whether single-family home or a multi-family dwelling, requires protection that can save lives and property in the event of a fire.

While authorities are in agreement that "requiring UL standards for all batteries sold would reduce the risk of fires," the Consumer Products Safety Commission (CPSC) has not required this standard - merely recommended it. Absent regulations, proper storage of lithium ion batteries is a must.

Critical Reasons Lithium Ion Batteries Must Be Safely Stored

1. *The potential human cost of not storing them safely is simply too great.*

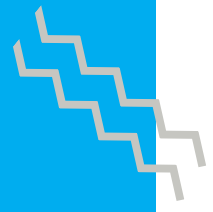
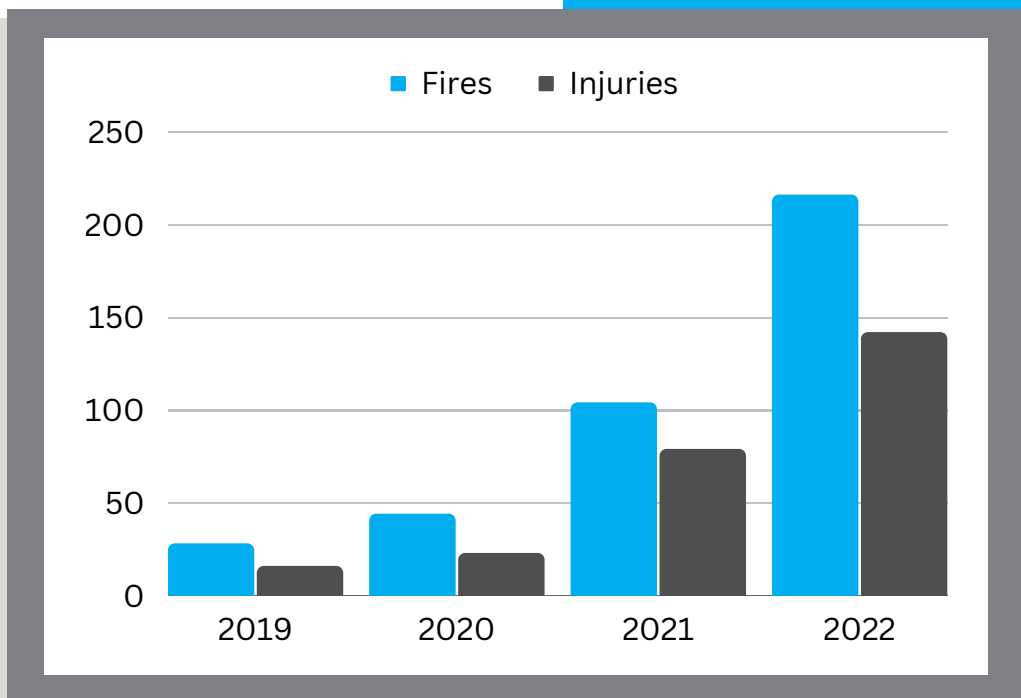
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At least 22 emergency room visits resulted from fires related to these batteries.

New York City had seen six deaths and 142 injuries related to these fires. In 2021, there were 79 injuries and 4 deaths, and in 2020, there were 23 injuries.

The more that LEVs are used by delivery drivers and batteries are stored in apartments, the more likely tragedy is to strike. It is a numbers game.

NYC Incidents Related to Lithium-Ion Batteries



2. Along with human life, costs of property loss are significant.

The increase in the incidence of fires has resulted in increased insurance costs. Heather Mason, the president of the National Bicycle Dealers of America, reports that “Some insurance companies won’t even insure bicycle retailers who carry more than 50 percent of e-bikes in their store,” or simply raise premiums to untenable levels.

This is because, as Mason notes, 10% of her members report having “some sort of thermal runaway in their store” from a battery.

British insurer AXA said that in June and July 2022 alone it...
“...had covered almost half a million pounds (\$600,000 USD) in losses from lithium-battery fires, usually in residential buildings.”

Many e-bike manufacturers do not carry product liability coverage or are insured by a foreign insurance carrier. This means that a retailer who is selling e-bikes would be liable for any claims related to the failure of e-bike batteries, as would its property and casualty insurer.

In an environment where manufacturers may not carry insurance and shops may still opt to repair these batteries, there is ample exposure for shop owners. For individuals who are storing batteries in their homes, there may also be financial exposure if property is destroyed as a result of their negligence or unsafe storage.

This loss of property is not limited to land: Allianz Global Corporate & Specialty found that 18 percent of marine claims from 2017 to 2021 resulted from fire and racked up \$1.7 billion worth of losses. While these are not all due to lithium ion batteries, there have been notable carriers and yachts impacted.

In the event of a product failure causing bodily injury, the retailer and its liability carrier may end up responsible for the liability and subsequent claim. This is another hidden cost of carelessly storing lithium ion batteries.

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3. Consumers who have no concept of the potential risk of fires and explosions may simply purchase items containing lithium ion batteries as a means of transportation or a toy, without regard for hazard or certifications.

It is not uncommon, when purchasing an item from an online retailer, to search for a generic set of keywords to identify the product. From there, shoppers will typically look at reviews and prices. Many of the names are unfamiliar.

These are items purchased by shoppers who merely want a quick mode of transport, whether for business or pleasure. For this reason, shoppers are less likely to seek a familiar name like Trek or Cannondale, and gravitate to any port in a storm. The same calculation applies for other toys and devices powered by these batteries.

In late 2022, approximately 25,000 e-bikes distributed by Gyroor and Ancheer were recalled due to the risk of their batteries catching fire. These brands continue to be sold on popular websites including eBay, Amazon, Walmart, and Rakuten.

In fact, only 13 battery manufacturers have certified to Underwriters' Laboratories (UL) standards. Chances are, if a consumer were to purchase an e-bike, the battery would not be UL certified, putting those living in close proximity at risk. Protection is possible, but consumers may not be aware of the potential dangers.

Even multi-billion dollar companies like Lyft can fall prey: in 2019, two of their fleet of e-bikes caught fire in San Francisco. These fast-moving blazes left firefighters taken aback due to the popping and explosions.

4. Consumers have little concept of how to maintain or replace lithium ion batteries or chargers.

Even the best-intentioned consumers, when a lithium ion battery fails, will simply search for the model number and attempt to find it online. They will purchase the least expensive one from an online retailer, install it, and move on. The same goes for chargers. Specific to LEVs, the FDNY recommends that unapproved chargers and batteries not be purchased because of the potential for loss of life.

Consumers are not educated in detecting when a lithium ion battery is failing: smoke, a strange smell, the presence of odd noises among the warning signs.

Additionally, charging lithium ion batteries using an extension cord or power strip can also have unintended consequences. Per the FDNY, "lithium-ion battery charging requires a lot of electrical current, more than most extension cords and power strips can handle."

5. Consumers are not aware of the risk of lithium ion battery failure.

Elf a battery fails, most consumers think it simply stops working, like the batteries in your remote control or a flashlight. However, it's not that simple.

Lithium ion batteries can fail and the negative effects can be staggering: the aforementioned explosions and fires can happen at any time.

Less expensive lithium ion batteries may not meet manufacturing standards, including manufacture in clean rooms. Even if one speck of dust is on a battery at the time of manufacture, it can lead to corrosion - and its effects may not be known for several years. Ultimately, this can result in a ticking time-bomb for users who unknowingly keep unprotected batteries past their useful life.

6. Cheaper e-bikes, LEVs, and water toys simply may not meet standards - because they don't have to.

In 2016, the "de minimis" ceiling for import products was changed to \$800. What this means is that any items below \$800 that are imported to the United States do not have to pass basic safety requirements. Major online retailers claim that all products sold on their websites must submit paperwork stating that they have passed UL 2849, the standard on e-bike batteries, but this is simply not enforced. In fact, many e-bikes retail for \$799.99 to capitalize on the "Amazon loophole."



7. While there is a UL standard to test e-bike batteries to ensure their safety, fires can still result from improper storage of a lithium ion battery.

Lithium ion batteries are used far more than what was intended by delivery workers who often work over 70 hours in a week. These same delivery workers simply can't afford to purchase high-end lithium ion batteries; their average hourly wage is merely \$12.21 an hour.

Safe storage of batteries is possible and easy with cases like the ZARGES BatterySafe. This is a small price to pay for the knowledge that even if a battery fails, you and your loved ones will remain protected.

8. In spite of the growth of lithium ion batteries, there can be minimal government oversight.

The CPSC has warned bicycle manufacturers to comply with safety standards, but this warning - and the threat to seize noncompliant imported batteries at ports - isn't fully enforceable yet. The government is aware there is an issue, and there is a voluntary UL certification to ensure battery safety. It just isn't something that many manufacturers have complied with.

For this reason, many consumers are using and storing unsafe batteries in their homes and bike shops. This is not from a sense of malice. In many cases, people are just unaware of the potential issues with lithium ion batteries.

5 Solutions to Enhance Safety

1. Improved battery storage options.

In many instances, batteries are simply left out charging in common areas or garages that also contain other flammable substances. In smaller dwellings such as apartments, these batteries can be charged in bedrooms. Regardless of the setting, charging batteries without regard for the worst-case scenario can be devastating.

Cases such as the ZARGES BatterySafe are built for the safe packaging and transport of lithium ion batteries. They are designed to completely contain and filter fires, limit thermal runaway, protect adjacent cells, and ensure the exterior temperature remains below 100°C.

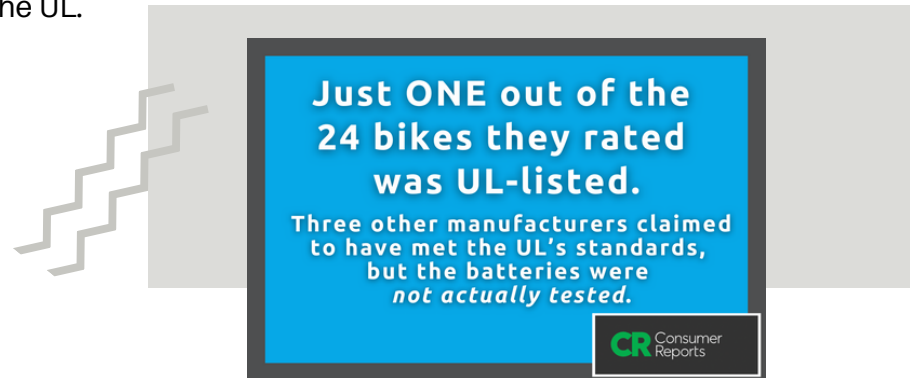
2. More educated, aware consumers.

The FDNY has made a public relations push to make consumers more aware, and organizations like Consumer Reports have created videos and social media content to attempt to do the same. However, educating consumers has been challenging. This campaign needs to find a tipping point so that influencers in high-density population areas can spread the word to others.



3. Adherence to safe manufacturing standards.

For many manufacturers, the cost to have their lithium ion batteries meet the UL standard is too much to bear. Per [Consumer Reports](#), just one of the 24 bikes they rated was actually UL-listed, and while three of the manufacturers claimed to have met the UL's standards, the batteries were not actually tested by the UL.



Again, while there is financial cost of testing batteries, gaining certification, and manufacturing batteries to a higher standard, is cutting corners on these essential elements of safety worth the potential cost of human life and property damage?

4. Purchase of batteries, bikes, and chargers from reputable sellers.

While many consumers think nothing of visiting the website of their online retailer of choice and purchasing a bike, scooter, hoverboard, or battery to accompany it, responsible consumers should understand that not all LEVs are created equal.

Consumers need to know to do their research in order to make the best choices for their families, friends, and neighbors. This does not apply only to LEVs; water toys and laptops should also be meaningfully considered, as should replacement batteries. "Low-quality lithium-ion batteries often aren't produced with stringent protocols and are more susceptible to structural failure."

5. Proper disposal options for lithium ion battery users.

In most places, it is illegal to simply throw rechargeable lithium ion batteries in the trash. Many consumers are simply not aware of this fact, and dispose of batteries with their regular household waste. Recycling can be an option, although it requires a deliberate attempt on the part of the user to locate a recycling center and transport their batteries there.

Recycling used batteries can also solve the problem of mining new metals to create batteries, as the metals extracted from the used batteries can often be sold at a price nearly comparable to that of mined metals.

Entities such as [Call2Recycle](#) can provide valuable information on disposal and recycling of lithium ion batteries, educating consumers on means to dispose of these potentially hazardous batteries.

CONCLUSION

In absence of excessive legislation to ensure the safety of consumers, safe storage is the next best option, along with purchasing safer, higher quality products regardless of cost. While the concept of banning e-bikes has been raised by organizations such as the New York Public Housing Authority, bans can be difficult on residents due to the number of residents who rely on e-bikes to do their jobs.

Other bureaucratic solutions, including education, recycling, and safe community storage have all been raised in big cities. Each of these solutions will take time and resources to implement. Individual solutions that include storage outside or in community areas may result in theft or damage to the batteries themselves.

For those who live in suburban areas, the option of charging batteries away from bedrooms or in sheds may be an option. Apartment dwellers do not have those same options, and in communities such as these, a fire can spread and quickly result in loss of human life and property.

And those who are on the water need to be cognizant of storage, too. Engel-Jan De Boer, global yacht segment director for maritime advisers Lloyd's Register, says that "Charging and storage of lithium gadgets should only be carried out in dedicated lockers, cabinets or spaces being compliant with the safeguards."

In the short term, the solutions that are easiest to adopt revolve around safe storage. The ZARGES BatterySafe offers best-in-class battery storage, even in the event of a catastrophic battery failure. For more information and videos of the BatterySafe in action, visit the ZARGES website.



ZARGES is a global supplier of storage and transport equipment, used in a multitude of industries and companies worldwide. Our lightweight aluminum cases are appropriate for safe and secure storage and transport of Lithium Ion batteries.

- Over 87 years in the industry
- 30+ years of hazmat protection and experience
- 100 years of combined on-staff expertise in hazmat
- Produce 2,000+ cases per week