STANDARDIZATION: JOURNAL OF RESEARCH AND INNOVATION

JSRI 2023;2(3):1–3

RESEARCH-ARTICLE

The Safety Science Behind New York City's Lifesaving Micromobility Legislation

By Alec Krabbe

The popularity of micromobility devices (such as electric bikes and electric scooters) has grown due to their decreasing cost, environmental friendliness, and convenience compared to gas-powered vehicles. However, these devices can pose electrical and fire-related hazards due to the lithium ion (li-ion) batteries that power them. Over the last three years, cities across the United States have seen a drastic increase in hazardous events related to micromobility devices. These incidents can be triggered by overcharging, short-circuiting, puncturing, crushing, or exposure to high temperatures, leading to thermal runaway events, toxic gases, and corrosive liquids.

On March 6, 2023, New York City (NYC) Mayor Eric Adams signed into law Introduction 663-A, which requires powered mobility devices that are sold, rented, or leased within the city to be certified to the following UL standards:

- UL 2849, the Standard for Electrical Systems for e-Bikes, for the electrical system of any powered bicycle;
- UL 2272, the Standard for Electrical Systems for Personal E-Mobility Devices, for all powered mobility devices, including e-scooters; and
- UL 2271, the Standard for Batteries for Use in Light Electric Vehicle (LEV) Applications, for any storage battery for a powered bicycle or mobility device.

This new law demonstrates the commitment NYC has made to promoting a safe transition to micromobility, but what is the safety science behind the standards, and what are the requirements set forth by these standards?

MICRO MOBILITY, MAJOR PROBLEMS

The main sources of the electrical and fire-related hazards of micromobility devices are the li-ion batteries that power these devices.

A li-ion battery fire is a serious hazard that can cause severe damage to property and people and cannot be properly mitigated by traditional means, such as dousing with water or using a standard fire extinguisher. These fires become even more disastrous when they occur in multi-family dwellings such as apartment buildings.

A battery fire can occur when a battery is overcharged, short-circuited, punctured, crushed, or exposed to high temperatures. These conditions can trigger a thermal runaway event, which UL Research Institutes defines as "a phenomenon in which the li-ion cell enters an uncontrollable, self-heating state." When a cell is in thermal runaway, its temperature rises at a rate greater than 20°C per minute, leading to the release

of flammable gases, sparks, and flames and even causing explosions (all of which can result at the time of the initial incident or even days later due to stranded electrical energy inside the damaged battery). A battery fire can also produce toxic fumes and corrosive liquids that can be harmful to human health and the environment. Therefore, it is important to handle batteries with care and follow proper safety procedures when using and disposing of them.

From January 2021 through November 2022, the U.S. Consumer Product Safety Commission (CPSC) received reports of at least 208 micromobility fire or overheating incidents. These incidents resulted in at least 19 fatalities—five associated with e-scooters, 11 with hoverboards, and three with e-bikes.

In response to these incidents, the CPSC called on micromobility device manufacturers to ensure their products comply with established voluntary safety standards or face possible enforcement action. The CPSC stated that failure to adhere to applicable UL safety standards might subject consumers to an unreasonable risk of fire and serious injury or death.

WHAT'S IN THE STANDARDS?

The safety tests required by UL 2271, UL 2272, and UL 2849 are designed to help ensure that battery-powered personal mobility devices such as e-bikes, electric scooters, and hoverboards are safe to use and will not cause harm to the user or the environment.

The requirements address the following safety concerns:

Electrical safety

These requirements cover the design of the electrical circuits, the insulation of the wiring, and the grounding of the electrical components. They include specifications for testing to help ensure each device can handle the voltage and current levels without causing a fire or electrical shock hazard.

Fire safety

These requirements cover the flammability of the materials used in the device, the heat resistance of the battery, and the ability of the device to prevent or extinguish a fire. They include specifications for testing to help ensure each device can withstand high temperatures without causing a fire and prevent or extinguish a fire in the event of a thermal runaway incident.

Mechanical safety

These requirements cover the durability of the device, the strength of the materials used, and the stability of the device. They include specifications for testing to help ensure each device can withstand various impacts, vibrations, and stresses without breaking or tipping over.

Environmental safety

These requirements cover the resistance of the device to water, dust, and other environmental factors. They include specifications for testing to help ensure each device can withstand exposure to the environment without causing a hazard to the user or the environment.

Performance and reliability

These requirements cover the battery life, charging time, and overall performance of the device. They include specifications for testing to help ensure each device can perform as expected and will not fail prematurely, causing harm to the user or the environment.

Overall, these safety tests are designed to help ensure battery-powered personal mobility devices are safe to use, reliable, and durable.

CONCLUSION

By enacting legislation requiring certification to UL 2271, UL 2272, and UL 2849 for

micromobility devices, New York City has taken an important step toward addressing the safety concerns and reducing the number of hazardous incidents from li-ion batteries. These standards are designed to help ensure that battery-powered personal mobility devices are safe to use without causing harm to users or the environment, and compliance with these standards is essential to promoting safe expansion in the transition to electrification. With these safety concerns in mind, however, users should always take caution and follow proper safety procedures when using and disposing of these devices. If you are involved in the design, construction, sale, or operation of e-mobility devices, and you would like to help improve safety for these devices, please visit ULSE.org/get-involved to learn how you can take part in our standards development process.

Alec Krabbe is a standards project engineer for UL Standards & Engagement with a broad background in electromagnetic compatibility, RF spectrum management, and information technology. He serves as a technical contributor to the development and maintenance of UL and ULC standards, with a focus on electrical safety and electrification. He holds a bachelor of science degree in electrical and computer engineering from Northern Illinois University.