United States
Consumer Product Safety Commission

February 10, 2023

Mrs. Diana P. Jordan
Chair, STP 2272 & STP 2849
UL Standards and Engagement
333 Pfingsten Road
Northbrook, IL 60062

Dear Mrs. Jordan:

The U.S. Consumer Product Safety Commission (CPSC) technical staff is requesting the formation of a joint working group under Standards Technical Panel (STP) 2272 - Electrical Systems for Personal E-Mobility Devices and STP 2849 - Electrical Systems for eBikes to identify potential improvements to ANS/CAN/UL 2272 - *Standard for Safety for Electrical Systems for Personal Micromobility Devices* and ANSI/CAN/UL 2849 - *Standard for Safety for Electrical Systems for eBikes* to address incidents that have been occurring with e-scooters, self-balancing scooters, e-unicycles and e-bikes.

From January 1, 2021, through November 28, 2022, CPSC received reports of at least 208 hoverboard, e-scooter, and e-bike fire or overheating incidents from 39 states, resulting in at least 19 fatalities, including five associated with e-scooters, 11 with hoverboards and three with e-bikes. CPSC also received reports of at least 22 injuries treated in hospital emergency departments, with 12 involving e-scooters and 10 involving e-bikes, over that same period of time. In New York City, both the Fire Chief and City Council expressed to CPSC Chair Alexander Hoehn-Saric their support for strengthening protections against hazards from lithium-ion battery related failures in e-bikes and e-scooters (the Chair's response to the Council members is enclosed). On December 19, 2022, the CPSC Office of Compliance and Field Operations issued the enclosed letter to manufacturers, importers, distributors, and retailers of micromobility devices for consumer use to urge that their products comply with UL 2272 or UL 2849, as applicable, underscoring the CPSC's commitment to reduce fire risks of e-mobility devices.

Accordingly, the CPSC technical staff is requesting the formation of a working group to further strengthen the requirements in these standards. Following are specific topics that the technical staff recommends for inclusion in the working group discussions:

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Rockville, MD 20850

- Review of UL 2272 Section 9.2 and UL 2849 Section 11 battery pack enclosure/compartment requirements (or ANSI/CAN/UL/ULC 2271 *Batteries for Use in Light Electric Vehicle (LEV) Applications*) to identify means of discouraging user servicing such as cell replacement, *e.g.,* use of tamper resistant fasteners or sealed enclosures.

- Review of UL 2272 Section 11 and UL 2849 Section 24 charger requirements to assure that only a charger that is fully electrically compatible with the unit's approved battery packs can supply power to the pack's cells. This may include adding prescriptive requirements for connectors or additional performance requirements to assure that a charger intended for a higher voltage battery pack but using the same connector as a lower voltage battery pack will not be able to damage the cells in the lower voltage pack.

- Review of UL 2272 Section 27 and UL 2849 Section 28 Temperature Test requirements to develop requirements that assure reasonable worst-case foreseeable use conditions are being addressed and that the cells remain within their specifications throughout all modes of operation such as a sequence of charging, maximum load discharge, recharge with minimal rest periods in between.

CPSC technical staff is eager to serve on any working groups that are formed in response to this request. Please let me know if you have any questions.

Sincerely,

Jay Kadiwala
Electrical Engineer
Division of Electrical Engineering and Fire Sciences

Enclosure(s):
October 31, 2022, letter from CPSC Chair Alexander Hoehn-Saric to New York City Council Members

United States
Consumer Product Safety Commission

December 19, 2022, letter from Robert S. Kaye to Manufacturers, Importers, Distributors, and Retailers of Micromobility Devices for Consumer Use

cc: Jacqueline Campbell, CPSC Voluntary Standards Coordinator
Megan M. Van Heirseele, Project Manager for STP 2272
Madison Lee, Project Manager for STP 2849

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

CHAIR ALEXANDER HOEHN-SARIC

October 31, 2022

The Honorable Keith Powers
Council Member
Council of the City of New York
250 Broadway, Suite 1833
New York, NY 10007

The Honorable Gail Brewer
Council Member
Council of the City of New York
250 Broadway, Suite 1875
New York, NY 10007

The Honorable Selvena N. Brooks-Powers
Council Member
Council of the City of New York
250 Broadway, Suite 1865
New York, NY 10007

Dear Council Members Powers, Brewer, and Brooks-Powers:

Thank you for your letter dated August 26, 2022, asking the U.S. Consumer Product Safety Commission (CPSC) to strengthen protections for consumers against dangers from lithium-ion batteries in electric bikes and scooters.

I received a letter from the Acting Commissioner of the New York City Fire Department (FDNY) Laura Kavanagh making essentially the same request of CPSC. Please find attached the letter from the FDNY as well as my recent response. I hope you find my letter to the FDNY useful and instructive. If you have any further questions, please let me know.

Sincerely yours,

Alexander Hoehn-Saric
Chair

Enclosed: Letter to Acting Commissioner of the New York City Fire Department (FDNY) Laura Kavanagh

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CONSUMER PRODUCT SAFETY COMMISSION
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CHAIR ALEXANDER HOEHN-SARIC

October 18, 2022

Laura Kavanagh
Commissioner
Fire Department of the City of New York
9 MetroTech Center
Brooklyn, NY 11201

Dear Commissioner Kavanagh:

Thank you for your letter of August 19, 2022, to the U.S. Consumer Product Safety Commission (CPSC or Commission) regarding the risks of lithium batteries in consumer products. I share your concerns about the tragic loss of lives in these unfortunate incidents, and the Commission continually strives to improve the safety of all consumer products, including those that use lithium-ion cells.

The Commission works in a variety of ways to protect consumers from risks of injuries associated with consumer products, including recalling defective products, developing or improving safety standards, and promoting information and education campaigns. As the use of consumer products using lithium batteries increases, the Commission continues to employ each of our available tools within our authorities and resources.

Among the most effective ways to protect consumers is to address product safety at the manufacturing and design level through a strong safety standard. On the voluntary standards side, CPSC staff has actively engaged with the Standards Technical Panel (STP) for Underwriters Laboratories (UL) 2272, the *Standard for Electrical Systems for Personal E-Mobility Devices*, since the committee was formed in 2016. CPSC staff believes that products designed, manufactured, and third-party certified to this standard, or other applicable voluntary standards, reduce the risk of fire and shock.

Lithium-ion cells are well-suited for use in powering e-mobility devices. They are energy-dense for their size and weight, allowing them to produce sufficient currents and long operating times, more so than other current cell chemistry types. However, the most severe cell failure, known as thermal runaway, may result in a significant amount of energy release in the form of heat. In a multi-cell pack, thermal runaway can cascade the failure of one or more cells to other cells, elevating the risk of propagation of fire to adjacent combustibles. The most common reasons for cell failure include:

- Latent cell manufacturing defects[1]
- Thermal abuse (operation beyond its rated operating temperature range)
- Electrical abuse (short circuits or charging/discharging beyond its specified operating region)
- Mechanical abuse (physical damage to cell)

These circumstances can be exacerbated when an aftermarket battery that has not been approved for use with and may not be compatible with the e-mobility device or its battery charger is used.

In addition to the consensus voluntary safety standard for e-scooter and hoverboard products (UL 2272), CPSC has also been participating in the development of the standard for ebikes, UL 2849 - *Standard for Safety of Electrical Systems for eBikes*. UL 2272 and UL 2849 include requirements to help ensure that the cells are physically protected and operated within their specifications during charging and discharging, to mitigate the risk of fire and shock. They use a system approach to ensure that all electrical system components, *i.e.*, micromobility device, battery, cells and charger, are compatible and function safely together. Additional standards also provide relevant performance and construction requirements.[2]

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[1] A number of cell defects that do not immediately result in a failure can occur during manufacturing. High-quality manufacturers implement control procedures to detect and minimize defective cells from leaving the factory, but occasionally problems can still occur, *e.g.*, the 2017 Samsung Note 7 recall in 2016. (https://www.cpsc.gov/Recalls/2017/Samsung-Expands-Recall-of-Galaxy-Note7-Smartphones-Based-on-Additional-Incidents-with-Replacement-Phones).

[2] One or more of the following standards covers battery packs: UL 2271- *Batteries for Use in Light Electric Vehicle (LEV) Applications*; UL 2580 - *Batteries for Use in Electric Vehicles*; UL 62133 - *Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from them, for Use in Portable Applications*; or UL 2054 - *Household/Commercial Batteries*. Requirements for lithium cells are in UL 1642 - Standard for Lithium Batteries or UL 62133. Safety standards for the chargers are in UL 60950-1 - *Standard for Information Technology Equipment - Safety - Part 1: General Requirements* or UL 1310 - *Class 2 Power Units*.

Latent cell defects remain the most challenging problem to address. Accordingly, CPSC staff has been executing a project on high-energy density batteries to develop strategies to mitigate further the consequences of cell failures. Information can be found on the webpage, Batteries | CPSC.gov,[3] while other efforts are described in a CPSC staff 2020 status report.[4] Additional research sponsored by CPSC at the Naval Surface Warfare Center, Carderock Division (NSWCCD) laboratory to study mitigation techniques for propagation of single-cell failures in multicell packs is in Report on Evaluation of Cell-to-Cell Propagation in Lithium-Ion Batteries Containing 18650 Sized Cells[5] and Report on Emerging Energy Storage Technologies.[6] NSWCCD is one of the Navy's leads in lithium battery safety research and development. This information will support improvements for the voluntary safety standards for e-mobility devices and other consumer products to reduce the severity of fire incidents.

In support of our efforts to protect the American consumer, staff continues to review incidents to identify potential issues with UL 2272 and UL 2849, to improve the standards, as warranted, and to seek ways to further reduce the fire hazard. For example, CPSC's Office of Compliance and Field Operations issued a letter on February 22, 2018,[7] noting that hoverboards that do not comply with UL 2272 may be a substantial product hazard, opening them up to potential recall.

Concerning New York City, specifically, CPSC Field staff has investigated nearly 50 incidents that have occurred in New York since 2019, to help identify defective products and find insight into areas where the standards can be improved to enhance safety. The Fire Department of the City of New York (FDNY) reported to CPSC staff that some of the incidents occurred with device batteries, either manufactured by, or modified by, non-factory authorized personnel in New York City, without the modifications being checked by technical personnel for safety or quality. This type of information, as well as whether the product was certified by an accredited testing laboratory to the applicable safety standards, are key elements for our investigations,

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[3] https://www.cpsc.gov/Regulations-Laws--Standards/Voluntary-Standards/Topics/Batteries

[4] https://www.cpsc.gov/s3fs-public/High%20Energy%20Density%20Batteries_Status%20Memo_FY20_1-6bCleared-04012020.pdf?Qj4t_otWKfBZYLpvu4l6sUvx9ZJfFc4f

[5] https://www.cpsc.gov/s3fs-public/Consumer Product Safety Commission (CPSC) Staff%E2%80%99s Statement on Naval Surface Warfare Center, Carderock Division%E2%80%99s (NSWCCD) Report on %E2%80%9CEvaluation of Cell-to-Cell Propagation in Lithium-Ion Batteries Containing 18650 Sized Cells%E2%80%9D.pdf

[6] https://www.cpsc.gov/s3fs-public/NSWCCD-63-TR-2020-39_Emerging-Energy-Storage-Technologies_DIS_A_VERSION_ForPostingVersion12012020.pdf?wYqrWGArQLL53BlqSYr8RfCwb2eiznIT

[7] https://www.cpsc.gov/s3fs-public/Hoverboard-Letter_Kaye_signed_2.22.18.pdf?qHCrGaTD6FjvgY4W7yFum7C4f347FGKs

and any further insights you can share in that regard are most appreciated.

In May 2022, CPSC Field and technical staff coordinated with the City Research Scientist and a Lieutenant from the New York City Department of Sanitation. They screened, for possible collection and assessment, incident e-mobility artifacts that the Department had salvaged from fire scenes. The collected specimens are being analyzed for patterns of failure at the CPSC's National Product Testing & Evaluation Center in Rockville, MD. CPSC staff will use its research results and incident data analysis to develop proposals for the applicable standards.

As part of CPSC's approach to mitigate hazards posed by lithium-ion batteries, staff works to provide consumers with information to optimize the safe use of their e-mobility devices. To minimize the risk of fire, staff highly recommends that consumers:

- ONLY use e-mobility devices that have been certified by a third-party laboratory to the relevant standards.
- ONLY use chargers that are certified for use with the e-mobility device.
- ONLY use battery packs recommended by the e-mobility device manufacturer.
- NEVER use an e-mobility device with a battery pack that has been modified/reworked by unqualified personnel or with re-purposed or used cells.

I appreciate the cooperation of FDNY staff with CPSC staff, and I look forward to continuing our work together to improve the safety of lithium battery-operated consumer products.

Sincerely,

Alexander Hoehn-Saric
Chair

United States
Consumer Product Safety Commission

December 19, 2022

Dear Manufacturers, Importers, Distributors, and Retailers of Micromobility Devices for Consumer Use:

The U.S. Consumer Product Safety Commission (CPSC) is an independent federal regulatory agency responsible for protecting consumers from unreasonable risks of injury and death from consumer products.

As you may be aware, in recent years there has been a rise in fires and other thermal events involving micromobility products—including e-scooters, self-balancing scooters (often referred to as hoverboards), e-bicycles, and e-unicycles. From January 1, 2021, through November 28, 2022, CPSC received reports from 39 states of at least 208 micromobility fire or overheating incidents. These incidents resulted in at least 19 fatalities, including 5 deaths associated with e-scooters, 11 with hoverboards, and 3 with e-bikes. CPSC also received reports of at least 22 injuries that resulted in emergency department visits, with 12 of the injuries involving e-scooters and 10 of them involving e-bikes.

I am writing to urge you to ensure that the micromobility devices for consumer use that you manufacture, import, distribute, or sell in the United States have been designed, manufactured, and certified for compliance with the applicable consensus safety standards.[1] These safety standards include ANSI/CAN/UL 2272 – *Standard for Electrical Systems for Personal E-Mobility Devices* dated February 26, 2019, and ANSI/CAN/UL 2849 – *Standard for Safety for Electrical Systems for eBikes* dated June 17, 2022, and standards they incorporate by reference. The UL standards, which can be viewed for free and purchased from the UL Standards Sales Site,[2] were designed to reduce the serious risk of dangerous fires in these products. Compliance with the standards should be demonstrated by certification from an accredited testing laboratory.

Manufacturing these products in compliance with the applicable UL standards significantly reduces the risk of injuries and deaths from micromobility device fires. Consumers face an unreasonable risk of fire and risk serious injury or death if their micromobility devices do not meet the level of safety provided by the relevant UL standards. Accordingly, products that do not meet these standards could present a substantial product hazard under Section 15(a) of the CPSA, 15 U.S.C. § 2064(a); and, should CPSC's Office of Compliance and

[1] This letter supersedes the letter from Robert S. Kaye dated February 22, 2018, to Manufacturers, Importers, and Retailers of Self-Balancing Scooters.

[2] https://standardscatalog.ul.com/ProductDetail.aspx?productId=UL2272 (UL 2272), https://www.shopulstandards.com/ProductDetail.aspx?productId=UL2849_1_S_20200102 (UL 2849).

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Field Operations encounter such products, we will seek corrective action as appropriate.

I urge you to review your product line immediately and ensure that all micromobility devices that you manufacture, import, distribute, or sell in the United States comply with the relevant UL standards.[3] Failure to do so puts U.S. consumers at risk of serious harm and may result in enforcement action.

Please also note that Section 15(b) of the CPSA, 15 U.S.C. § 2064(b), requires every manufacturer, importer, distributor, and retailer of consumer products to report immediately to the Commission when the firm obtains information that reasonably supports the conclusion that a product distributed in commerce contains a defect that could create a substantial product hazard or that the product creates an unreasonable risk of serious injury or death. The statute also provides for imposition of civil and criminal penalties for failing to report the required information.

If you have any questions, or if we can be of any assistance, you may contact micromobility@cpsc.gov.

Sincerely,

Robert S. Kaye
Director
Office of Compliance and Field Operations

[3] Any third-party certification body that is accredited by an international accreditation body for ANSI/CAN/UL 2272 or ANSI/CAN/UL 2849 product certification is acceptable to ensure compliance.