DEPARTMENT OF ADMINISTRATIVE SERVICES

PROPOSED CHANGE OF THE CONNECTICUT STATE BUILDING CODE AND FIRE SAFETY CODE

DATE SUBMITTED: 3/13/2024

CODE INFORMATION

Proposed change to: ☐ Building Code ☑ Fire Safety Code

Code section(s): 1207.6.6 & Table 1207.6

PROPONENT INFORMATION

Name: Steve Cummings Representing: Nexceris

Telephone: 614-842-6606 Email: s.cummings@nexceris.com

Address: 404 Enterprise Dr. (*Street Address*) Lewis Center (*Town*) OH (*State*) 43035 (*Zip Code*)

PROPOSAL INFORMATION

Description of change and reason for change (attach additional information as needed):

This proposed change seeks to carry over a provision from the 2022 CSFC that requires electr

Proposed text change, addition or deletion (attach additional information as needed):

1207.6.6. The thermal runaway detector shall activate upon detection of gas vapors produced I

Supporting data and documents (attach additional information as needed)

See separate document.

☐ **This Proposal is original material.** (Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought or research and, to the best of his/her knowledge, is not copied from another source.)

☑ **This Comment is not original material, its source (if known) is as follows:** (such as material / code development proposal from a prior development cycle or proposal submitted to model code committee etc.)

2022 Connecticut Fire Safety Code

☐ **I would like to make an in-person presentation of my proposal.**

Release

I hereby grant the State of Connecticut full rights to the use of this material without benefit to me, including, but not limited to, publication and reproduction rights.

Proponent's Signature

Steve Cummings

Printed Name

PLEASE EMAIL (PREFERRED) TO DAS.CodesStandards@CT.GOV OR MAIL OR FAX (SEE BELOW)

Department of Administrative Services
Office of the State Building Inspector
450 Columbus Boulevard, Suite 1303
Hartford, CT 06103
Tel: 860-713-5900 Fax: 860-713-7410
Affirmative Action/Equal Opportunity Employer

2025 CT FSC Code Change Proposal – Supporting Data and Documents

Description of change and reason for change

This proposed change seeks to carry over a provision from the 2022 CSFC that requires electrolyte vapor detection for li-ion battery energy storage systems. During the last code adoption cycle, the state of Connecticut recognized the importance of early detection and mitigation of li-ion battery failure. Electrolyte vapor detection is a non-proprietary and mature technology that can help to prevent catastrophic damage to property and danger to the public and fire service.

Proposed text change, addition or deletion

1207.6.6. The thermal runaway detector shall activate upon detection of gas vapors produced by liquid electrolyte in a lithium-ion cell at the start of a battery venting event. Upon detection of gas vapors, the detection system shall shut down the affected ESS rack and transmit a fire alarm signal. Detection of a thermal runaway event shall activate the mechanical ventilation when it is provided as a method of explosion control.

Amend Table 1207.6 [Remove footnote e from Table 1207.6]

Supporting data and documents

The effectiveness of electrolyte vapor detection is stated in NFPA standards 75, 76 and 855

- NFPA 75, 2024 Ed. (see Section 11.5.4.1 for requirement to install off-gas detection system capable of detecting electrolyte [solvent] vapor, https://link.nfpa.org/free-access/publications/75/2024)
- NFPA 76, 2024 Ed. (see Section 11.5.4.1 for requirement to install off-gas detection system capable of detecting electrolyte [solvent] vapor, https://link.nfpa.org/free-access/publications/76/2024)
- NFPA 855, 2023 Ed. (see Section G.7.3.6.1 and A.4.8.1, https://link.nfpa.org/free-access/publications/855/2023).

A recent paper published by researchers at Sandia National Laboratories validates the ability to use electrolyte vapor detectors to provide early warning of a failing lithium-ion battery cell prior to thermal runaway with sufficient time to mitigate thermal runaway if action is taken.

- Torres-Castro, Loraine et al, Early Detection of Li-Ion Battery Thermal Runaway Using Commercial Diagnostic Technologies, 2024 J. Electrochem. Soc. 171 020520 (https://iopscience.iop.org/article/10.1149/1945-7111/ad2440)

Further, electrolyte vapor detection has been added to other industry standards and best practices such including:

- FM Global Property Loss Prevention Datasheet 5-33: Lithium-ion Battery Energy Storage Systems (see Sections 2.5.3.3 and 3.4.2.2 https://www.fmglobal.com/research-and-resources/fm-global-data-sheets).
- European Guidance Documents including:
    - Fire Industry Association (FIA) Guidance on Li-ion Battery Fires (see Section 6.3 https://www.fia.uk.com/static/2a999c49-760b-47e3-b02f96a2ca89ecd9/Guidance-Document-on-Li-Ion-Battery-Fires-12-20-v1.pdf)
    - Euralarm Guidance on Integrated Fire Protection Solutions for Lithium-ion Batteries (see Sections 4.3.1, 7.2, 9.2.5.1, 9.2.5.3, and Annex 1 https://www.euralarm.org/resource/guidance-li-ion-battery-protection-pdf.html#:~:text=This%20Euralarm%20guidance%20paper%20provides,guidance%20on%20post%20fire%20management.).
    - Fire Protection Association/RISCAuthority Need to Know Guide RE1 – Battery Energy Storage Systems: Commercial Lithium-ion Battery Installations (see Section 3.7, https://www.thefpa.co.uk/advice-and-guidance/free-documents?q=RE1:%20Battery%20energy%20storage%20systems%20%E2%80%93%20commercial%20lithium-ion%20battery%20installations)

The above references demonstrate codes, standards, regulations, and best practices which have included the use of electrolyte vapor detection. The addition of electrolyte vapor detection should be considered during this period of proposed recommendations for Fire Code updates to best align with codes from around the United States and the world in order to ensure their safe and reliable operation of battery energy storage systems.