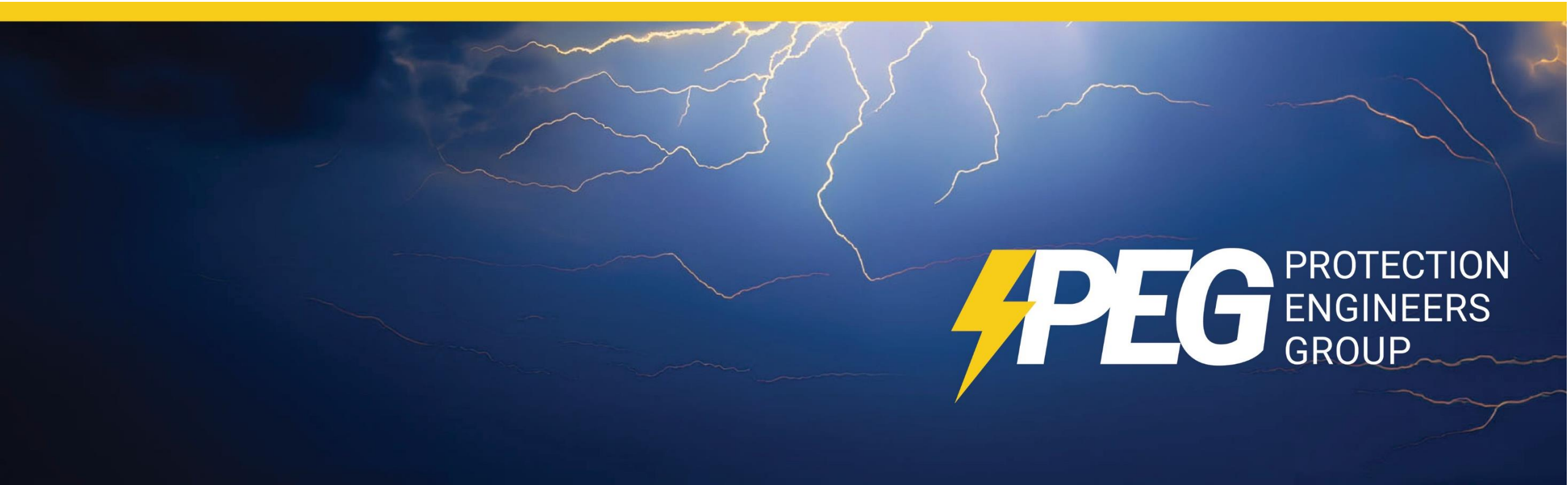
NFPA Code (except NEC®) Changes Affecting Batteries



Agenda

- How Local Fire Codes get Adopted
- Major Changes with NFPA 855
- What is NFPA 800
  - Forthcoming Fix to NFPA 704 for Sulfuric Acid Electrolyte
- Upcoming Improvements in NFPA 70E Battery “Stuff”

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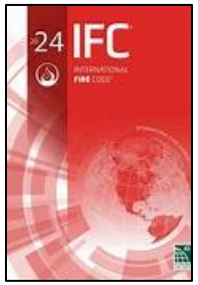
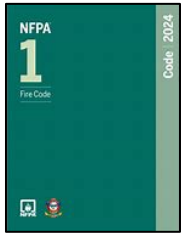
NFPA Code (Except NEC®) Changes Affecting Batteries

- Curtis Ashton

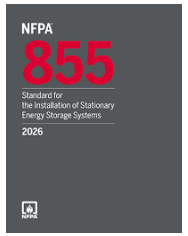
Model Fire Codes

- Two Major Model Codes in the USA
  - IFC
    - About 80% of Jurisdictions Use (Sometimes Modified)
  - NFPA 1
    - About 15% of Jurisdictions Use (Sometimes Modified)





- Model Codes On 3 Yr Cycle
  - 2027 is Next
- NFPA 855 Feeds the Battery Requirements of the Model Codes
  - Since 2021 for NFPA 1 and 2024 for IFC
  - More and More Closely Aligned Each Cycle



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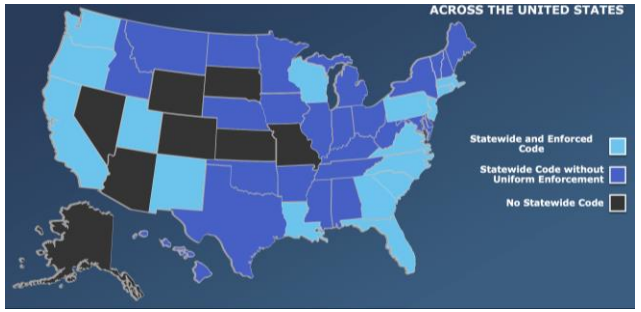
Local Adoptions of Fire Codes



- Most Jurisdictions Adopt and Modify Model Codes
  - Typically on a 1-20 yr lag
    - This is Important For Batteries Because Not All Editions are Equal
      - Batteries First Covered in 1997 UFC
        - Technically a TIA in 1995 to the 1994 UFC Was First
        - UFC Became the Model for the IFC (2000 and Beyond)
      - Major Changes to Fire Code Battery Sections in 2018 Due to Li-ion Fires
        - 2021 Edition of IFC Missed Some Exemptions for Traditional (e.g., Lead-Acid) Batteries that were in 2018 Edition
          - Try to Show AHJs the “Better” 2018 and 2024 Editions
      - NFPA 855 Came Along in 2020 and Started to Get Adopted for Battery Sections by NFPA 1 and IFC
        - Exemptions Have Gotten Better and Better
          - 2026 Edition is Latest

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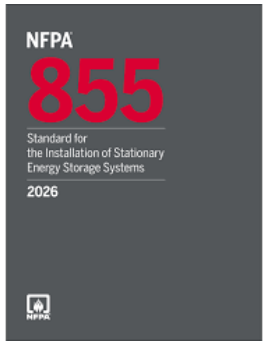
Key Changes in 2026 Edition of NFPA 855



- Standardization of Lead-Acid/Ni-Cd/Ni-Zn/NiMH Carveouts
- Elimination of MAQ Table
- Addition of HSCs (aka LiCs), aqueous metal-air (e.g., Form's iron-air), Li-metal, Ni-H_2, $ZnMnO_2$, NaS, and zinc-bromide (non-flow)
- Allowed HMA to Define Backup Times for Fire Sensing and Control Systems
  - Separated HMA (Hazard Mitigation Analysis) and FRA (Fire Risk Assessment)
  - Clarified that the RDP is the Person to do the HMA
- Separated Thermal Runaway from Thermal Runaway Propagation
  - Defined Systems (TRPP) that can Help Mitigate Propagation (e.g., Li-ion Tamer®)
  - Aqueous Batteries Incapable of Runaway (Thermal "Event")

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More Key Changes in 2026 NFPA 855

- Clarified what a True Large-Scale Fire Test (LSFT) is
  - Not Just a Cell Level Test from UL 9540A

UL 9540A

- Added Requirement for Emergency Response Plan and Training
- Worked with NFPA 704 to Expand Locations @ BESS Install for Diamonds
  - 704, 2027 Edition Will Make Clear that Sulfuric Acid Electrolyte is a 1 (Water Allowed for Fires)
- Traditional NFPA 13 Sprinklers Added In as Fire Suppression Alternative
  - Recognizing That its Not Just About Li-ion Technologies Only
- EV Charging System Requirements Added
  - Including Protection for BESS from Vehicle Impact

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Aqueous Electrolytes and the NFPA 704 Diamond

- Pure Sulfuric Acid or Potassium Hydroxide (KOH) has a Reactivity to Water (Yellow Diamond) of 2, so you'll Find a 2 Listed on Many Battery SDS Sheets
  - However, the Diluted Electrolyte (depending on specific gravity) has a water reactivity of only 0 or 1
- Using a 2 technically means that a ₩ must be put in the white space, which means the fire department is not supposed to use water
  - which is wrong – they can use water all day long on fires in lead-acid battery rooms
- Use the Diamond Shown on this Slide for Lead-Acid and Ni-Cd Unless Customer Specifies Otherwise

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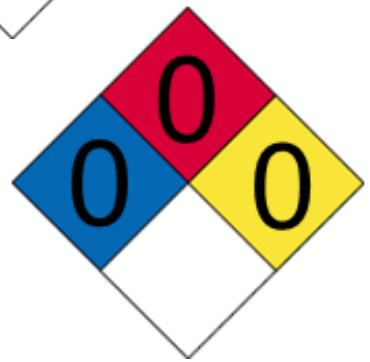
NFPA 704 Diamond for Other Chemistries

- Lacking Other Guidance from the Customer or Battery Manufacturer, you can Use the Diamond to the Right for Li-ion
- Lacking Other Guidance from the Customer, you can Use the Diamond to the Right for NaNiCl Batteries



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NFPA 800 Fire Safety Code (Provisional)

- Why?
  - Address Battery Fire Safety for More than Just Battery Energy Storage Systems (BESS)
- 1st Edition Will Probably Come Out in April-June Timeframe
  - Will Immediately Enter 3-yr Standard Cycle
  - I am on the Committee (as well as 855 [BESS]), and am a Task Group Chair
- Lead-Acid/Ni-Cd Mostly Exempt

Upcoming NFPA 70E Changes? for DC/Batteries

- Some Changes Relevant to Us in 1st Draft of 2027 Edition
  - 1 mm/V DC Arc Flash Maximum Distance
    - Possible Even Better Formula for Max DC Arc-Flash Sustaining Gap in Annex D.5?
  - Proposed to Make Default DC Arc Flash PPE Table 130.7(C)(15)(b) Less Onerous
    - Not an Issue if Calculated
      - Improvements to Formulas for DC Arc Flash Calculation Guidance in Annex D.5
  - Possible Recognition that Batteries Probably Don't Need an Energized Work Permit (EWP)
    - Segmentation Procedure to Lower Voltage in Order to Lower Shock / Arc Flash Risk
- Has to Go Through 2nd Draft Process to Get Changes Locked in

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Questions

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