



2000-2015
**Early Considerations
for Battery Storage and
Fire Safety**

- Prior to 2018, codes primarily addressed traditional lead-acid battery systems, with limited provisions for emerging lithium-ion and advanced battery chemistries.
- The 2015 IFC included general battery system safety provisions, primarily for stationary lead-acid storage.
- As lithium-ion and other high-energy-density storage technologies gained traction, fire protection concerns around thermal runaway, explosion hazards, and emergency response started surfacing in the industry.



2018
**IBC/IFC: Initial
Recognition
of Lithium-Ion
and Emerging
Technologies**

- The 2018 IFC introduced some of the first requirements distinguishing lithium-ion and other newer battery chemistries from traditional lead-acid systems.
- These updates began addressing fire suppression, ventilation, and separation requirements but lacked a comprehensive framework for ESS fire risk mitigation.
- Research and real-world fire incidents (such as failures in electric vehicle battery storage applications) began to inform regulatory discussions.



2018
**IBC/IFC: Expansion
of Fire Protection
Requirements for
Energy Storage**

- The 2018 IFC Chapter 12 was significantly expanded to include specific provisions for energy storage systems, marking the first substantial integration of dedicated ESS regulations.
- Key requirements included:
 - Size and capacity thresholds for ESS installations.
 - Fire suppression and thermal runaway mitigation strategies.
 - Separation distances and clearance from structures.
 - Firefighter safety provisions, including emergency shutoffs.
- This code cycle also recognized the emerging role of UL 9540 listing as key standards for evaluating battery energy storage system (BESS) fire behavior.



2021
**IBC/IFC/IRC: Refining
ESS Regulations and
Integration of Large-
Scale Systems**

- The 2021 IFC saw significant refinements to energy storage fire safety provisions based on real-world fire testing and updated research.
- Notable advancements included:
 - Expanded use of UL 9540A testing for thermal runaway risk assessment.
 - Updated spacing and fire protection criteria for large-scale installations in commercial and industrial applications.
 - New emergency planning and response provisions to ensure safer operations for fire service personnel.
 - Refinements to indoor and outdoor ESS siting criteria, including specific considerations for rooftop and multi-family residential deployments.
- The 2021 IFC also introduced structural requirements for ESS installations in buildings, ensuring fire-rated construction, ventilation, and accessibility for maintenance. The 2021 IFC and IRC included extensive requirements for detached one- and two-family dwellings and townhouse units.



2024
**IBC/IFC/IRC: A
Comprehensive
Framework for ESS in
the Built Environment**

- The 2024 IFC builds on past progress by further refining thermal runaway prevention strategies and requiring detailed fire and explosion risk assessments based on ESS chemistry and configuration.
- The IFC 2024 updates ensure that building-integrated energy storage installations adhere to clear structural, electrical, and fire protection requirements.
- The IRC 2024 introduces new provisions for residential energy storage, addressing:
 - Location restrictions (e.g., prohibiting ESS in sleeping areas or near exits).
 - Integration with renewable energy systems (e.g., solar PV and battery backup).
 - Enhanced safety measures for attached garages and living spaces.
 - Additional refinements align international codes with evolving standards such as NFPA 855 (Standard for Installation of Stationary Energy Storage Systems).