NEW YORK CITY FIRE DEPARTMENT

Notice of Adoption of
New Fire Department Rule
3 RCNY 608-01, entitled
"Outdoor Stationary Storage Battery Systems"

NOTICE IS HEREBY GIVEN PURSUANT TO THE AUTHORITY VESTED IN THE Fire Commissioner of the City of New York pursuant to Sections FC102.6.3 and FC901.6 of the New York City Fire Code (Title 29 of Administrative Code of the City of New York), and in accordance with the requirements of Section 1043 of the New York City Charter, that the New York City Fire Department has adopted the above final rule.

The public hearing was held on May 30, 2019. The rule shall take effect on October 1, 2019.

The Notice of Adoption, final rule and the Statement of Basis and Purpose of Final Rule, will be available on the Fire Department's website (www.nyc.gov/fdny) and NYCRULES (www.nyc.gov/NYCRULES).

Statement of Basis and Purpose of Final Rule

The Fire Department adopts this rule to establish standards, requirements and procedures for the design, installation, operation and maintenance of outdoor stationary storage battery systems that use various types of new energy storage technologies, including lithium-ion, flow, nickel-cadmium and nickel metal hydride batteries. The rule does not govern indoor battery installations.

Background and Purpose

In April 2018, a working group coordinated by the City University of New York and the New York State Energy Research and Development Agency, in which the Fire Department participated, issued the first comprehensive set of guidelines for installing outdoor lithium-ion energy storage systems in New York City, to create a pathway for safe widespread use of lithium-ion stationary storage battery systems. This rule implements those guidelines through fully-developed design and installation requirements and emergency management procedures for outdoor stationary storage battery systems. (The standards, requirements and procedures set forth in this rule represent the considered judgment of the Fire Department, not CUNY, NYSERDA or other working group participants.)

This rule also seeks to address the fire safety concerns associated with new battery technologies by setting testing standards and establishing an equipment approval process for manufacturers. Establishing testing standards, and in particular, requiring full-scale testing of battery system components and pre-engineered products, will enable manufacturers to identify fire safety issues and eliminate them or engineer mitigating measures in the design. The evaluation of the performance of battery system components or products in this manner will also allow the Fire Department to eliminate or expedite its approval process for specific installations. Equipment

approvals will allow developers and installers to select products that are already approved for New York City use, with or without conditions or limitations.

Evolution of Battery Use and Technology

Stationary storage battery systems are commonly used in office buildings and other commercial buildings to provide emergency or standby power for life safety systems, or uninterruptible power for business operations. The storage batteries commonly used for these applications are lead-acid batteries similar to those found in automobiles, the science and safety of which is well-understood.

The movement to replace fossil fuels with alternative energy sources to address global environmental concerns has prompted the rapid development of new energy storage technologies. In recent years, new storage battery technology has been developed for large-scale power uses, such as storing power for general building use. The batteries can be charged overnight or during other low-demand periods, and provide building power during the daytime. Additionally, stationary storage batteries can be used to store power generated by rooftop solar panel installations and other local, small-scale energy generating systems. The power generated by these systems, when not needed on site, can supply power to the public utility's power grid.

Because of their energy density (high-energy generation considering the battery's size and weight), lithium-ion batteries are increasingly being used in a wide range of applications, including consumer products. However, lithium-ion batteries are subject to thermal runaway, which occurs when the heat generated by a malfunctioning energy cell or module causes others to fail, potentially generating intense fires and fires that reignite after being extinguished. Various highly-publicized incidents have illustrated the fire safety concerns associated with lithium-ion batteries. In addition to lithium-ion, the new stationary storage battery technology includes nickel-cadmium, nickel metal hydride and flow batteries. This rule applies to these technologies as well.

Testing and Listing Standards

The Fire Department has been actively engaged for several years in the development of appropriate standards for stationary storage battery systems. Working with national standard-making organizations, nationally-recognized testing laboratories and Federal, State and City agencies, the Fire Department has advocated for the testing of new technologies that would enable the Fire Department and other regulatory agencies to fairly assess, in a scientific manner, any potential hazards associated with the new technologies.

The rule requires the use of the current edition of the Underwriters Laboratories Test Method 9540A for full-scale testing, but the Fire Department is aware that these testing standards, like the technologies themselves, are still in development. The rule acknowledges the evolving standards by specifying the latest listing and testing standards, but authorizing the Fire Department to accept later editions or other standards that address the Fire Department's fire safety concerns. Also under development is a new listing standard that will be used to establish listings with installation conditions based on test data. The rule anticipates that when such listing

standard is developed, and approved by the Fire Department and the Department of Buildings, it will replace the existing listing and testing standards and the Fire Department's equipment approval process, and supersede required separation distances to the extent addressed in the new listing.

Regulatory Requirements

The rule regulates outdoor stationary storage battery systems based on their technology and size. Table 1 establishes thresholds for small, medium or large outdoor stationary storage battery systems. The size of the stationary storage battery system is based on the energy storage/generating capacity of such system, as rated by the manufacturer, and includes any and all storage battery units operating as a single system.

Table 2 lists the compliance requirements in the rule and indicates, in a readily accessible format, the requirements applicable to each size, and in some cases type, of battery system.

The fire safety regulations in the rule include the following requirements:

- Permits. The rule requires a Fire Department permit for medium and large outdoor stationary storage battery systems. Operational permits ensure that the Fire Department and its firefighting force are aware of the location of the stationary storage battery systems and can conduct periodic inspections as the Fire Department determines appropriate.

- Supervision. The rule requires that all outdoor stationary storage battery systems be under the general supervision of a trained and knowledgeable person holding a Fire Department Certificate of Fitness. The Fire Department anticipates that installers or other persons associated with the design or installation of the stationary storage battery system would be the persons qualified to supervise such systems.

  A Certificate of Fitness requirement helps ensure that installers and other businesses involved in stationary storage battery systems – who may be new to New York City – are familiar with New York City regulatory requirements, and the Certificate of Fitness holder can serve as a point of contact with the Fire Department. The rule requires the Certificate of Fitness holder to assist the Fire Department in any emergency involving or affecting the stationary storage battery system that the Certificate of Fitness holder supervises, including responding to the incident location in a timely manner to confirm that the stationary storage battery system is in good working order, or to mitigate the condition and decommission the stationary storage battery system. The rule anticipates that the required emergency management plan would be developed by manufacturers, installers and, in some cases, property owners, to address how such situations would be handled.

  Certificates of Fitness are obtained by studying the online study materials applicable to the particular certificate and submitting to administration of a computerized examination at Fire Department Headquarters. Test results are immediately available, and if a passing

score is achieved, the certificate is issued on the spot. The fee for most Certificates of Fitness is $25 for a 3-year period.

- Multiple battery systems. The rule requires Fire Department review of multiple outdoor stationary storage battery systems on a single premises to ensure that the fire safety requirements for larger stationary storage battery systems are not being circumvented by a number of smaller systems.

- Mobile battery systems. Stationary storage battery systems are typically fixed, not portable. However, stationary storage battery systems can be mounted on trailers and towed to locations, in the same way as air compressors, diesel-fueled emergency generators, and other mobile power and heating trailers. The rule allows mobile stationary storage battery systems and make appropriate adjustments in the approval and permitting process.

- Installation approvals. It is anticipated that only large stationary storage battery systems will require site-specific installation approvals. The rule sets forth the information that will be required for such applications, including any related Department of Buildings applications, Fire Department equipment approvals for stationary storage battery units or components, and site plans.

- Commissioning/decommissioning. The rule requires that outdoor stationary storage battery systems be installed or removed only by trained and knowledgeable persons. The Certificate of Fitness holder assuming responsibility for the battery system must supervise its commissioning (activation) and the Certificate of Fitness holder responsible for the battery system must supervise its decommissioning (deactivation). The Fire Department anticipates that these will be the same businesses and individuals who will be responsible for maintaining the system once installed and who will be required to obtain a Certificate of Fitness.

  The rule requires notification to the Fire Department in connection with the commissioning and decommissioning of these outdoor stationary storage battery systems. For small battery systems, the owner or Certificate of Fitness holder must report the commissioning of a battery and provide the name and contact the Certificate of Fitness who will be responsible for this system. No advance notice is required. For medium and large systems, advance notice must be given to the Fire Department by calling a Fire Department communications office, so Fire Department firefighters or other representatives can, if they wish, attend the commissioning to familiarize themselves with these installations. The removal of any stationary storage battery system experiencing abnormal temperatures or gas emission readings as a result of physical damage, exposure to fire or other cause of failure, must be coordinated with the Hazardous Materials Unit of the Fire Department's Bureau of Operations.

- Design and installation requirements. The rule sets forth general design and installation requirements, including Fire Department access and water supply, and separation distances from streets, building openings, overhead power lines, infrastructure and other

sensitive locations. The rule authorizes the Fire Department to reduce separation distances if the full-scale testing results show minimal hazards, or increase them if there are hazards that have not been addressed by the manufacturer in engineering of the stationary storage battery system.

The Fire Department anticipates that medium and large outdoor stationary storage battery systems will be housed in containers and other enclosures. Malfunctioning stationary storage battery systems can generate flammable gases and the enclosures in which they are housed could allow these gases to collect and reach dangerous levels. Accordingly, the rule requires that the enclosures be designed with fire and gas detection systems and other fire protection systems, explosion protection and a manual exhaust system for firefighter use. In some cases, these requirements may be omitted when testing of the battery system demonstrates that such systems are not required to mitigate the potential hazards.

- Rooftop installations. The rule allows the installation of stationary storage battery systems on building rooftops, but includes requirements designed to address the fire safety concerns associated with rooftop installations.

- Remote monitoring and reporting. The Fire Department understands that all outdoor stationary storage battery systems will be designed with a battery management system (BMS) that will be remotely monitored on a 24/7 basis. The rule requires such remote monitoring to ensure timely notifications to the Fire Department, Certificate of Fitness holder and manufacturer of the battery if the stationary storage battery system exhibits abnormal behavior indicative of a serious malfunction.

- Emergency management plan and technical assistance. The rule requires that the property owner, manufacturer and/or installer develop an emergency management plan or protocol that includes procedures for notifications, technical assistance and response to the incident location in the event of an emergency involving or affecting an outdoor stationary storage battery system.

- Signage. The rule requires detailed signage indicating the type of stationary storage battery system, providing emergency contact information, and other information at the fire department (hose) connection, public utility connection or other conspicuous location. The signage must also indicate whether the battery system is connected to a public utility power grid, such that its shut-down could have widespread or power grid impacts.

- Maintenance. The rule requires periodic inspection of the outdoor stationary storage battery system, on not less than an annual basis, by the Certificate of Fitness holder to ensure that the battery system is in good condition and all signage and other requirements remain in place. The rule also clarifies that the replacement of battery components with different battery technologies or chemistries (or other change to the listed components) constitutes an alteration of the system that must be submitted for Fire Department review and approval in accordance with the requirements of the rule.

- Recordkeeping. The rule requires that records of the installation, maintenance and removal of the outdoor stationary storage battery system and associated equipment must be maintained by the Certificate of Fitness holder and/or the property owner.

Public Comments and the Fire Department's Response

Twenty public comments were received. Most included detailed comments on lithium-ion battery technology and the various requirements of the rule.

Virtually all of the public comments received, both in writing and at the public hearing, expressed support for the rule as a critical step in establishing a regulatory framework for evaluating and approving outdoor stationary storage battery systems. Virtually all the comments also expressed support for the adoption of industry standards and battery system testing.

The public comments confirmed that the party who would be responsible for maintenance of stationary storage battery systems and therefore most likely to obtain the required Certificate of Fitness and serve as the Fire Department point of contact would likely be the installer, not building staff. Battery systems are in many cases being leased, not sold, or are under service agreements.

The Fire Department responds to the public comments as follows:

- Comment: The rule uses the term "stationary storage battery system" rather than "energy storage system," which is the generally-accepted industry term and used in NFPA Standard 855.

  Response: "Stationary storage battery" is this term currently used in the Fire Code. The Fire Department will address whether to adopt new industry definitions – including those in NFPA Standard 855, which is still in the development process – through the Fire Code revision process.

- Comment: The rule uses the term "full-scale" to refer to testing of batteries. The generally-accepted industry term for such testing is "large-scale."

  The Fire Department acknowledges that "large-scale" is now widely used. However, "full-scale" more clearly describes the testing that the rule (and the listing standards it references) require to be conducted. Accordingly, the Fire Department has determined to retain the term "full-scale" testing in the rule.

- Comment: What is meant by "other approved listings" or "other approved data." Why doesn't the rule specify what those other standards are?

  Response: "Approved" is a defined term in the Fire Code (see FC202). It means "acceptable to the commissioner." The term is used to indicate that the Fire Code

requirement must be satisfied in a manner acceptable to the Fire Department. In most cases, no special approval is needed.

The references in the rule to other "approved" listings or data explicitly authorize the Fire Department to consider and accept listings and data other than those specified in the rule, such as certifications from foreign standard-making bodies, proprietary test results or new standards and listings not yet published. This explicit authorization is included in the rule in recognition of the fact that energy storage technology is developing very quickly and that is in the public interest to promptly consider new standards, listings, test results and other information as they become available.

Similarly, the reference in connection with rooftop installations to an "approved" distance from standpipe hose outlets sufficient to ensure safety of firefighting operations is intended to afford the battery system designer and the Fire Department flexibility in achieving the desired performance objective based on site conditions. The reference to an "approved" water supply in the absence of a rooftop standpipe means that there must be and reliable water supply to fight a rooftop fire. Typically, this would be a street fire hydrant or private fire hydrant.

- Comment: The term "outdoor" should be defined to clarify where the battery systems may be installed.

  Response: The Fire Code uses the term "outdoor" and gives it its plain meaning – outside of a building or structure – unless specified otherwise.

- Comment: A minimum size threshold should be established for each battery technology.

  Response: The rule is addressed to stationary battery systems (installations designed for installation and/or use at a fixed location) and does not apply to portable devices, including most common household products. However, the Fire Department agrees that there is merit to establishing a minimum size threshold. The rule has been revised to make it applicable only to stationary storage battery systems with an aggregate rated energy capacity of at least two (2) kWh for all battery technologies.

- Comment: It is not necessary to reference UL Standards 1741 and 1973, as they are incorporated by reference in UL Standard 9540.

  Response: UL9540 is predicated on, and makes reference to, the other standards, but, after a careful reading of the standard, the Fire Department has concluded that the rule should separately reference the other standards

- Comment: The rule should address emergency, standby and uninterruptible systems, not exclude them.

  Response: Requirements for emergency, standby and uninterruptible systems are set forth in Fire Code Section 608. Those requirements, which in part have been rendered

outdated by technological developments, will be addressed through the Fire Code revision process.

However, a stationary storage battery system that provides emergency, standby or uninterruptible power as a secondary function, with the primary function energy storage and supply for other purposes, is subject to the rule.

- Comment: The stationary storage battery systems associated with stationary electric vehicle charging stations are akin to uninterruptible power supplies and should not be regulated by the rule.

  Response: Agreed, for small and medium battery systems that are a component of individual outdoor motor vehicle charging stations and are used for the purpose of motor vehicle charging. The scope of the rule has been revised accordingly.

- Comment: The requirement that all buildings be shown on an installation plan is onerous on large sites.

  Response: Agreed. The rule has been revised to require all buildings on the premises or within 100 feet, whichever is less.

- Comment: The rule should recognize that lithium-ion phosphate battery technology is less hazardous than other technologies because it is less likely to experience thermal runaway.

  Response: The Fire Department is not undertaking to select the "best" technology or products. The testing standards being developed by the industry and adopted by this rule will enable manufacturers, product designers, building owners, public utilities and others to evaluate the performance of the different battery technologies and products, including the consequences of battery failure, and select the technology or product that they conclude is the "best" for their needs. Presumably over time better-performing products will prevail in the marketplace.

- Comment: Must all battery systems have battery management systems (BMS), including small systems? What requirements apply to BMS monitoring? Maintaining a staffed facility could be costly.

  Response: Multiple comments were received reflecting some confusion about how the rule regulates BMS systems and monitoring.

  It was the Fire Department's understanding that all stationary storage battery systems, including small systems, were being equipped with a BMS that is (or could be) remotely monitored. UL9540 listings require a BMS. However, comment was received that currently, some battery systems are not equipped with a remotely-monitored BMS.

The rule requires that all newly-installed stationary storage battery systems have a remotely-monitored BMS. The Fire Department believes that the widespread use of a BMS, which enables remote monitoring, with or without remote system control and shut-down, is an essential tool to provide early warning of a fire or other hazard.

The rule does NOT undertake to regulate BMS monitoring facilities. It was evident from the public comments and discussion at the public hearing that uniform industry standards and procedures for monitoring battery systems – and the emergency management plans that BMS system monitoring and notifications should trigger to mitigate battery fires and other emergencies – have not yet been established. It was also evident that there is no uniform industry standard as to failure thresholds requiring emergency notifications. The Fire Department hopes that this rule will prompt development of such standards and procedures.

BMS and the facilities that monitor their signals should be designed with a high degree of reliability. Monitoring facilities should be staffed with trained and knowledgeable persons who can identify and address a potential emergency, either from the facility and/or by making timely notifications on a 24/7 basis to persons who can do so. If unstaffed, BMS monitoring facilities should be designed to make immediate automatic notifications to trained and knowledgeable persons who can address the potential emergency. Industry standards for BMS monitoring would promote the development of independent facilities that can monitor different types of battery systems and reduce the cost of such monitoring.

What the rule DOES require is that fire protection systems installed in battery system *enclosures*, including gas detection systems, fire alarm systems and sprinkler systems, be monitored by an "approved central station." This is a term of art used in the Fire Code and Fire Department rules to refer to a monitoring facility holding a Fire Department company certificate, which ensures that such facilities meet applicable code, rule and industry standards for equipment and staffing. Central station monitoring has been required by the New York City Building Code for newly-installed fire protection systems since at least 2008. Fire protection systems may be additionally monitored at a constantly-attended location at the premises, but such monitoring cannot substitute for central station monitoring unless a modification (variance) is granted by the Fire Department.

- Comment: Fifteen minutes is not a reasonable timeframe for expecting a technical assistance.

  Response: The Fire Department believes 15 minutes should be a reasonable timeframe to provide a subject matter expert to be available to provide technical assistance to the Fire Department responding to a fire or other incident affecting a battery system.

  The signage and shut-down control required by the rule will provide Fire Department firefighters with certain key information about the system. The contact information

required to be posted at the premises will enable the Fire Department to contact the BMS monitoring facility and the Certificate of Fitness holder.

The BMS monitoring facility staff (or the persons who receive notifications from an automated facility) should be able to provide information about battery readings and what they indicate about battery status, especially as the BMS is monitoring battery performance for purposes other than emergency notifications. If they are not sufficiently knowledgeable to address more technical questions about the battery's likely performance and the actions that should be taken to render it safe, the BMS monitoring facility should maintain a notification tree for emergency notifications by which they can reach out to a subject matter expert on a 24/7 basis and arrange for a direct communication with the on-scene Fire Department commander. Fifteen minutes from an emergency notification (in most cases from the BMS itself or if the battery system condition has not yet been affected, such as from an external fire, from the Fire Department) is a reasonable timeframe to arrange such communication.

The Certificate of Fitness holder should additionally be notified, as a response to the premises will be required if the battery system has failed and/or caught fire. Lithium ion battery systems, for example, have been known to reignite, so appropriate precautions should be taken to de-energize the battery system and/or safely remove the battery system or the damaged components from the premises. The Certificate of Fitness holder would be expected to manage the situation pursuant to its emergency management plan, once the fire or emergency has been abated by the Fire Department.

The rule has been revised to make clear that any battery system that undergoes a serious failure, including one that results in a fire, release of flammable or toxic gas, and/or physical damage, must be removed from service and not be restored to service until it has been evaluated by a trained and qualified person, repaired and tested, and re-commissioned by the Certificate of Fitness holder.

Prompt provision of technical assistance will protect the owner's investment. In the absence of timely, accurate information, the Fire Department may determine to flood (and permanently damage) a battery system that, for example, is releasing smoke, when no action or more limited action may be warranted by the BMS data or after the BMS monitoring facility has remotely shut down the malfunctioning units.

- Comment: Does each battery unit require a manual shut down or is it sufficient to provide a switch at the inverter that de-energizes the battery system?

  Response: The emergency shut down control (e-stop) should prevent electrical current from flowing into or out of the battery system. Ideally, the e-stop should de-energize and render safe all electrical connections to the battery system. The Fire Department recognizes that these types of battery systems retain significant residual energy and that certain components may remain energized. The e-stop should de-energize as much of the battery system electrical components and connections as can reasonably be accomplished consistent with the design of the battery system.

- Comment: Secondary power should not be required for battery system controls and safety functions. Battery systems are designed to power such controls and functions after the battery is shut down. Alternating current cannot be used to power battery controls and functions operating on direct current.

  Response: The rule has been revised to forego secondary power for battery system controls and safety functions when the battery systems is designed to keep these controls and safety functions in operation for 30 minutes after battery shut-down. Secondary power is required for all external fire protection systems and other safety features.

- Comment: Adopt NFPA 855 with respect to the design of the battery system enclosures.

  Response: The design requirements for battery system enclosures largely track those of NFPA Standard 855. As noted above, NFPA 855 is still in development.

- Comment: Is a sprinkler system required in all circumstances? Can chemical flame retardant systems be used, or the need for a sprinkler system eliminated entirely based on test results for the battery system?

  Response: Current data indicates that water-based fire extinguishing systems are most effective at suppressing or extinguishing a battery system fire. Consideration would be given to approving a non-water system if use of such a system is reflected in the battery system listing. The listing would be based on approved test results demonstrating the efficacy of the non-water system in suppressing or extinguishing a battery system fire.

  As the rule states, test results would guide the Fire Department in determining whether to increase or reduce fire safety requirements, including the requirement of a fire extinguishing system.

- Comment: A gas detection should be required only if UL 9540A test results indicate that off-gassing of flammable or toxic vapors occurs during battery failure.

  Response: Agreed, as to lithium-ion battery systems. Table 2 of the rule has been revised to clarify that such systems may not be required based on the hazards disclosed by UL9540A testing. All other battery technologies require gas detection systems because of their potential to generate such vapors during normal operation.

- Comment: Does the rule allow stationary storage battery storage enclosures (such as shipping containers) to be stacked? What separation distance must be maintained?

  Response: The Fire Department has determined to consider these issues on a case-by-case basis, as part of the installation approval process, or through a certificate of approval process.

While the desire to stack containers is understandable in an urban environment, enclosure design requirements (including deflagration venting and purge systems) and the need for firefighter access to each container, make stacking more complicated than simply lifting them and placing them on top of each other. The Fire Department will consider any such proposal on its merits through plan submission. Like other fire safety requirements, this review will be informed by the UL9540a test results.

Alternatively, a manufacturer seeking to market a structure to facilitate stacking of stationary storage enclosures could apply for a certificate of approval for such a product.

Similarly, separation distances will need to be determined based on enclosure design, battery system test results and firefighter access requirements.

- Comment: What type of noncombustible roof surface would be acceptable for a rooftop stationary storage battery system installation? Would a noncombustible mat be acceptable? Consider inclusion of a reference to Class A rating.

  Response: Section 608-01(g)(1)(D)(*1*) of the rule is intended to ensure that the roof is resistant, for a distance of five feet from the installation, to the heat released by the battery system both during normal operation and in the event of a fire. The rule refers to the "building roof covering or roofing system," but the placement of a heat resistant material underneath the installation, such as suitable pavers, would be an acceptable alternative, assuming the roof can support the additional weight. The adequacy of a noncombustible mat would depend on its heat resistance properties and the anticipated heat release from the battery.

  Accordingly, the rule has been revised to allow "other approved material" to be placed underneath the rooftop battery system installation, provided that it is noncombustible. Reference to a Class A rating has not been included as a Class A rating is not necessarily fully noncombustible.

- Comment: Is vehicle impact protection (such as bollards) required if the battery system cabinet or battery system enclosure is sufficiently strong to withstand a vehicle impact?

  Response: This feature of a battery system cabinet would be considered in connection with the application for a certificate of approval and addressed in the terms and conditions of approval. For battery system enclosures, this feature would be considered in connection with a plan review or upon written request of the enclosure designer.

- Comment: How are permits obtained? Do they overlap with DOB permits?

  Response: The permits issued by the Department of Buildings (DOB) are issued to authorize construction work. Fire Code permits are not issued to authorize construction work. In the present context, they would be issued to authorize the operation of a stationary storage battery system after the system has been designed, installed and, if applicable, passed an acceptance inspection. Fire Department permits are designed to

inform the Fire Department's firefighting force of the presence of a hazard at a premises, and are typically associated with a periodic inspection by the Fire Department of the permitted installation.

- Comment: What is general supervision and what does general supervision entail?

  Response: "General supervision" is a defined term in the Fire Code (see FC202). In the present context, it refers to the person holding a Fire Department Certificate of Fitness who is responsible for the battery system installation. A person providing general supervision does not have to be present on the premises when the installation is in operation, but is responsible for ensuring that it is designed, installed, operated and maintained in accordance with the Fire Code and other applicable laws, rules and regulations.

  As the responsible party, the Certificate of Fitness holder should inspect a battery system as often as necessary to ensure that it is continuing to operate in a safe and lawful manner. Minimum inspection frequencies are typically set forth in the Fire Code, Fire Department rules, industry standards and/or manufacturer's instructions.

- Comment: A Certificate of Fitness holder selected by the owner should be the one person responsible for battery system operation, monitoring and emergency response. Owners and manufacturers should not have ongoing responsibility for battery systems.

  Response: In New York City, property owners are legally responsible for the maintaining their property in a safe condition. As discussed above, however, the battery system installer is likely the party that will obtain a Certificate of Fitness and assume day-to-day responsibility for the proper installation, operation and maintenance of a stationary storage battery system.

  If the installer is capable of serving as a subject matter expert, manufacturer involvement will not be required. However, it is anticipated that with these new technologies, limited manufacturer involvement in the form of an making a subject matter expert available will be necessary, and will need to be addressed as part of the ongoing business relationships among the various parties.

- Comment: Public utilities should be exempted from regulation, as they are in the forthcoming 2021 International Fire Code and NFPA Standard 855.

  Response: The stationary storage battery systems to be used by public utilities present the same fire safety concerns as those at used by any other business. They will be installed or (in the case of mobile systems) placed in locations throughout the City, like any other battery system.

  Accordingly, the same concerns warrant regulation of stationary storage systems designed, installed, operated and maintained by public utilities. The Fire Department will work with public utilities to address any issues unique to public utilities.

The entire rule is underlined, indicating that it is a new rule.

Guidance with respect to the interpretation of the Fire Code and Fire Department rules may be obtained using the Public Inquiry Form on the Fire Department's website, http://www1.nyc.gov/site/fdny/about/resources/code-and-rules/nyc-fire-code.page.

Section 1. Chapter 6 of Title 3 of the Rules of the City of New York is amended by adding a new section, §608-01, to read as follows:

§608-01 Outdoor Stationary Storage Battery Systems

(a) **Scope.** This section governs the design, installation, operation and maintenance of outdoor *stationary storage battery systems* for all energy storage uses, including *stationary storage battery systems* installed on a mobile trailer (or other form of mobile installation). This section does not govern the design, installation, operation and maintenance of:

(1) indoor *stationary storage battery systems*;

(2) *stationary storage battery systems* specifically designed and used for an emergency, standby or uninterruptible power supply; and

(3) outdoor *stationary storage battery systems* with an aggregate rated energy capacity of not more than 250 kWh that are a component of individual *motor vehicle* charging stations and used for the purpose of *motor vehicle* charging.

(b) **Definitions.** The following terms shall, for purposes of this section and as used elsewhere in the *rules*, have the meanings shown herein:

Flow battery. A storage battery that stores and generates an electrical current by ion exchange through a membrane separating liquid electrolytes.

Lead acid battery. A storage battery that is comprised of lead electrodes immersed in sulfuric acid electrolyte, including vented (flooded) or valve regulated lead acid (VRLA) batteries, as those terms are defined in FC602.1.

Lithium-ion (Li-ion) battery. A lithium-ion battery, as that term is defined in FC602.1.

Nickel cadmium (Ni-Cd) battery. A *nickel cadmium battery*, as that term is defined in FC602.1.

Nickel metal hydride (NiMH) battery. An alkaline storage battery in which the positive active material is nickel oxide, the negative active material is a hydrogen-absorbing alloy, and the electrolyte is potassium hydroxide.

Stationary storage battery system. A rechargeable electrochemical energy storage system, consisting of one or more interconnected storage batteries, inverters and other electrical equipment, designed as a stationary installation (or mounted to a trailer for mobile use) to provide electrical power. *Stationary storage battery systems* typically include associated fire protection, explosion mitigation, ventilation and/or exhaust systems.

Storage battery unit. A storage battery system in the configuration in which it was tested and *listed* to Underwriters Laboratories Standard 9540 (UL Standard 9540), including any cabinet or other enclosure.

(c) **General Provisions**

(1) **Applicability.** This section supplements FC608 by addressing *stationary storage battery system*s that are installed outdoors for energy storage uses. Rooftop installations are deemed outdoor installations solely for purposes of this section. The design and installation of *stationary storage battery systems* shall also comply with the requirements of the *Department of Buildings*.

(2) **Battery system size thresholds.** *Stationary storage battery systems* are classified by size as small, medium or large for each type of battery technology, as set forth in Table 1 of this section. The size of the *stationary storage battery system* is based on the energy storage/generating capacity of such system, as rated by the manufacturer, and includes any and all storage battery units operating as a single system. Table 1 is not applicable to multiple battery systems operating independently at a single premises, which are subject to R608-01(c)(9).

Table 1
Stationary Storage Battery System Size Thresholds

Battery Technology	**Aggregate Rated Energy Capacity**		
	Small	**Medium**	**Large**
Lead Acid Battery	>2 kWh and ≤70 kWh	>70 kWh and ≤ 500 kWh	> 500 kWh
Ni-Cd Battery	>2 kWh and ≤70 kWh	>70 kWh and ≤ 500 kWh	> 500 kWh
NiMH Battery	>2 kWh and ≤70 kWh	>70 kWh and ≤ 500 kWh	> 500 kWh
Li-ion Battery	>2 kWh and ≤20 kWh	>20 kWh and ≤ 250 kWh	> 250 kWh
Flow Battery	>2 kWh and ≤20 kWh	>20 kWh and ≤ 500 kWh	> 500 kWh

(3) **Battery system compliance requirements.** *Stationary storage battery systems* shall comply with all requirements of this section applicable to the type of installation, as specified in Table 2.

Table 2
Stationary Storage Battery System Compliance Requirements

Section	Compliance Requirement	Small	Medium	Large
(c)	**General Provisions**			
(c)(4)	Permit	No	Yes	Yes
(c)(5)	Supervision (Certificate of Fitness)	Yes	Yes	Yes
(c)(6)	Obligations of Owner and Operator	Yes	Yes	Yes
(c)(7)	Listing and Full-Scale Testing Standards			
(c)(7)(A)	• Listing			
	o *Lead Acid Battery*	Yes	Yes	Yes
	o *Ni-Cd or NiMH Battery*	Yes	Yes	Yes
	o *Li-Ion Battery*	Yes	Yes	Yes
	o *Flow Battery*	Yes	Yes	Yes
(c)(7)(B)	• Full-Scale Testing			
	o *Lead Acid Battery*	No	No	No[g]
	o *Ni-Cd Battery*	No	No	No[g]
	o *NiMH Battery*	No	No	No[g]
	o *Li-Ion Battery*	Yes	Yes	Yes
	o *Flow Battery*	No	No	No[g]
(c)(8)	• Manufacturer's Requirements	Yes	Yes	Yes
(c)(9)	• Multiple Battery System Approval	No[a]	Yes	Yes
(c)(10)	• Mobile Battery Systems/Equipment Approval	Yes[b]	Yes[b]	Yes[b]
(d)	• Equipment Approval	Yes[b]	Yes[b]	Yes[b,h]
(e)	• Installation Approval	No	No[f]	Yes
(f)	• Commissioning and Decommissioning	No[c]	Yes	Yes
(g)	**General Design and Installation Requirements**			
(g)(1)	• Location and Construction	Yes	Yes	Yes
(g)(2)	• Remote Monitoring	Yes	Yes	Yes
(g)(3)	• Electrical Components	Yes	Yes	Yes
(g)(3)(C)	o Secondary Power	No	Yes	Yes
(h)	**Enclosure Design and Installation Requirements**			
(h)(1)	• Human Occupancy Prohibited	N/A	Yes	Yes
(h)(2)	• Racks	N/A	Yes	Yes
(h)(3)	• Fire Extinguishing System	No[d]	No[d]	Yes
(h)(4)	• Explosion Mitigation	No[d]	No[d]	Yes
(h)(5)	• Fire Detection	No[d]	Yes	Yes
(h)(6)	• Gas Detection			

	o *Lead Acid Battery*	Yes[e]	Yes	Yes
	o *Ni-Cd and NiMH Battery*	Yes[e]	Yes	Yes
	o *Li-Ion Battery*	No	No[d]	No[d]
	o *Flow Battery*	Yes[e]	Yes	Yes
(h)(7)	• Detector Alarm Notification	No[d]	Yes	Yes
(h)(8)	• Ventilation System	No[d]	No[d]	Yes
(h)(9)	• Smoke/Gas Purge System	No[d]	No[d]	Yes

(i)	**Operational and Maintenance Requirements**			
(i)(1)	• Remote Monitoring of Battery Management System and Reporting	Yes	Yes	Yes
(i)(2)	• Central Station Monitoring of Fire Protection System	N/A[d]	Yes	Yes
(i)(3)	• Remote Monitoring at Constantly Attended On-Site Location	No	No	No
(i)(4)	• Technical Assistance	Yes	Yes	Yes
(i)(5)	• Emergency Management	Yes	Yes	Yes
(i)(6)	• Signage	Yes	Yes	Yes
(i)(7)	• Maintenance			
(i)(7)(A)	o Periodic Inspection	No	Yes	Yes
	o Restoration to Service After Serious Failure	Yes	Yes	Yes
(i)(7)(B)	o Replacement Components	Yes	Yes	Yes
(i)(7)(C)	o Combustible Waste	Yes	Yes	Yes
(i)(7)(D)	o Storage of Combustible Materials	Yes	Yes	Yes
(j)	**Recordkeeping**	Yes	Yes	Yes

a. Except for multiple small battery systems installed in a single enclosure or as part of a single installation.

b. Except for battery systems tested and *listed* by a nationally recognized testing laboratory with installation conditions, as set forth in R608-01(c)(7)(C), or other *approved listing* based on *approved* test data.

c. Except for: (1) notifying the *Department* of the *certificate of fitness* responsible for supervision of the installation; and (2) coordination of removal and transportation of small battery systems experiencing abnormal temperature or gas emission readings, as set forth in R608-01(f)(3)(C).

d. Unless required as a condition of equipment approval based on full-scale testing. The *Department* will assess the results of the full-scale testing to determine whether there are any hazards that are not resolved or mitigated by the equipment or installation design and, if the installation is approved, prescribe appropriate safeguards.

e. Required for equipment approval, as an element of the storage battery unit design, not as part of a battery system enclosure.

f. Limited post-installation review by inspection unit for *Department* permit issuance only.

g. *Approved* test data is required for explosion mitigation measures. If no other *approved* test data is available, test data from UL Test Method 9540A testing will be required.

h. Except project-specific installation designs. Large installations that utilize full-scale tested and *Department*-approved *storage battery units* in non-standard configurations or other project-specific designs may be field-tested in accordance with UL Standard 9540 or other *approved* standard.

(4) **Permit.** When required by Table 2 of this section, a *permit* is required to maintain and operate a *stationary storage battery system*.

(5) **Supervision.** A *stationary storage battery system* shall be operated and maintained under the *general supervision* of a person holding a *certificate of fitness*, who shall:

(A) be trained and knowledgeable in the installation and operation of the battery system, such as a person engaged in the design or installation of such systems;

(B) possess the manufacturer's installation and operating specifications for each battery system and any associated fire protection systems;

(C) immediately report any emergency condition affecting a battery system to the *Department*; and

(D) provide technical assistance about the stationary storage battery system installation to the *Department* in accordance with R608-01(i), and, in coordination with the battery management system monitoring facility, identify a subject matter expert (such as a representative of the manufacturer) who can provide technical assistance about the battery's design and performance in the event of an emergency condition affecting the battery system.

(6) **Obligations of owner and operator.** Both the owner of the premises at which the *stationary storage battery system* has been installed, and the business responsible for the battery system's operation, if any, are responsible for compliance with all battery system installation, operational and maintenance requirements, including the lawful and proper removal and disposal of the battery system.

(7) **Listing and full-scale testing standards.** The following standards are applicable to the *listing* and full-scale testing of *stationary storage battery systems*. The *Department* may accept battery systems *listed* and tested to later editions of these standards when necessary to address evolving standards applicable to a rapidly developing technology.

(A) **Listing.** All *stationary storage battery systems* shall be tested and *listed* by a nationally recognized testing laboratory to the following standards:

(*1*) Underwriters Laboratories (UL) Standard 1741 (2010 edition), entitled "Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources;"

(*2*) Underwriters Laboratories (UL) Standard 1973 (2018 edition), entitled "Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications;" and

(*3*) Underwriters Laboratories (UL) Standard 9540 (2016 edition), entitled "Energy Storage Systems and Equipment."

(B) **Full-scale testing.** When full-scale testing is required by this section, *stationary storage battery systems* shall be tested to Underwriters Laboratories (UL) Test Method 9540A (2018 edition), entitled "Safety Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems," or other *approved* standard or test data.

(C) **Listing with installation conditions.** Upon approval by the *Department* and the *Department of Buildings* of a *listing* standard that is used to establish *listings* with installation conditions based upon test data, such *approved listing* standard shall replace the existing listing and testing standards set forth in R608-01. The *approved listing* standard and *listings* shall supersede the equipment approval process set forth in R608-01 and, to the extent addressed in such *approved listing*, the required separation distances.

(8) **Manufacturer's requirements**. *Stationary storage battery systems* shall be designed, installed, operated and maintained in compliance with the manufacturer's specifications.

(9) **Multiple battery systems**. Installation of more than one *stationary storage battery system* on a single premises requires *Department* review and approval and is subject to such additional or alternative requirements as the *Department* may impose in the interests of public safety. Multiple small *stationary storage battery systems* are not subject to this requirement if they:

(A) are not part of a single installation or installed in a single enclosure; and

(B) operate independently of each other and are not interconnected with other small, medium or large battery systems.

(10) **Mobile battery systems**. *Stationary storage battery systems* installed on a trailer or otherwise designed to be moveable for use at multiple locations shall be designed, installed, operated and maintained in compliance with the provisions of this section, including equipment approval, except as follows:

(A) Installation approval (R608-01(e)) is not required. The equipment approval application submitted to the *Department* pursuant to R608-01(d) shall include information and documentation relating to the design of the trailer and the installation of the battery system. Any limitations on the use of mobile battery systems will be addressed through conditions on the equipment approval.

(B) Compliance with commissioning and decommissioning requirements (R608-01(f)) is not required, except that decommissioning of a malfunctioning battery system shall be coordinated with the *Department* in accordance with R608-01(f)(3)(C).

(d) **Equipment Approval.** When required by Table 2 of this section, the design of each *storage battery unit* shall be approved by the *Department*. The manufacturer of the *storage battery unit* shall obtain a *certificate of approval* for such unit in accordance with FC112, R112-01 and this section. The application for such equipment approval shall include the following information and documentation and such other information and documentation as the *Department* may require:

(1) Any application filed with the *Department of Buildings*; and

(2) The manufacturer's specifications and ratings, listing documents (including failure mode/effects analysis and, when required, complete UL Test Method 9540A test data or other *approved* data) for, and photographs of:

(A) each type of storage battery unit;

(B) the cabinet, container or other enclosure, and, if the installation consists of more than one storage battery unit, the arrangement of the storage batteries, including any rack storage (with seismic support criteria) and aisle dimensions;

(C) battery management system (BMS) operation;

(D) any fire extinguishing system intrinsic to the unit or enclosure;

(E) any fire detection and gas detection systems intrinsic to the unit or enclosure; and

(F) any ventilation and/or exhaust system intrinsic to the unit or enclosure.

(e) **Installation Approval**. When required by Table 2 of this section, the design of each *stationary storage battery system* installation shall be approved by the *Department*. The *owner* shall obtain *Department* approval of the design and installation documents in accordance with this section. The application for installation approval shall include the

following information and documentation and such other information and documentation as the *Department* may require:

(1) Any application filed with the *Department of Buildings*;

(2) The *Department* equipment approval for each *battery system unit* (or a separate application for such equipment approval);

(3) A site plan containing the following information:

(A) Exact location of the *stationary storage battery system* installation; including location of access panel or enclosure entrance(s);

(B) Surrounding public streets, fire apparatus access roads and pedestrian walkways;

(C) All buildings and structures on the premises (or within 100 feet, whichever is less), identified by occupancy group and construction type, and any measures to mitigate the impact of storage battery or battery system on adjoining buildings or structures or other site-specific hazard mitigation, including those required by a UL Standard 9540 hazard mitigation analysis.

(D) Any walls or fencing enclosing the installation or the premises on which it is located.

(E) All transportation and utility infrastructure, including electrical power lines, within 250 feet of the installation.

(F) Location and content of signage.

(G) Location and type of other *stationary storage battery systems* located on the premises or within 50 feet of the proposed installation (if 50 feet extends to other premises, as determined by visual inspection of the outdoor space or reasonable inquiry of the owner).

(H) Emergency shutdown procedures, including the location of the *stationary storage battery system* emergency shut down control; and

(4) A commissioning and decommissioning plan, including disposal procedures, in accordance with R608-01(f).

(f) **Commissioning and decommissioning.** *Stationary storage battery systems* shall be commissioned (installed and activated for use) and decommissioned (deactivated from use and removed from the premises) in accordance with the following procedures:

(1) **Commissioning.** *Stationary storage battery systems* shall be installed by trained and knowledgeable persons in accordance with manufacturer's specifications. Upon completion of the installation, the *certificate of fitness* holder assuming responsibility for supervision of the battery system shall authorize it to be activated, after confirming that the battery system is in good working order and operating in accordance with manufacturer's specifications.

(2) **Decommissioning.** The *certificate of fitness* holder supervising a *stationary storage battery system* shall be responsible for its decommissioning. The deactivation, de-energizing, dismantling and removal of the *stationary storage battery system* shall be conducted by trained and knowledgeable persons in accordance with manufacturer's specifications. The *owner*, manufacturer, installer, hazardous materials carrier or other party responsible for removal, transportation and/or disposal of the *stationary storage battery system* shall ensure that the battery system is lawfully decommissioned, transported and disposed of in accordance with *USDOT* hazardous materials regulations and other applicable laws, rules and regulations. The *owner*, manufacturer or installer of *stationary storage battery systems* shall have an emergency management plan or protocol that includes procedures for notifications and technical assistance in accordance with R608-01(i)(4) and (5) and all other actions necessary for mitigation and decommissioning (or restoration to normal operation).

(3) **Notice to Department**. Notice of the commissioning and decommissioning of *stationary storage battery systems* shall be given to the *Department*, and the removal of a malfunctioning system coordinated with the *Department*, as follows:

(A) **Small battery systems.** The *owner* or *certificate of fitness* holder shall notify the *Department* of the commissioning or decommissioning of a small *stationary storage battery system*, by emailing to tech.mgt@fdny.nyc.gov no later than two (2) business days after installation, the battery type, manufacturer and rated energy capacity, and the name and *certificate of fitness* number of the *certificate of fitness* holder who will be, or is no longer, responsible for supervision of the system.

(B) **Medium and large battery systems.** The *owner* shall notify the *Department* of the commissioning or decommissioning of a medium or large *stationary storage battery system* and give *Department* representatives the opportunity to attend the commissioning or decommissioning to monitor the process; familiarize themselves with a commissioned battery system's installation and operation; and/or confirm the proper decommissioning of a battery system in accordance with the *approved* decommissioning plan. The *owner* shall notify the *Department* by emailing the date, location, type and size of the battery system installation to tech.mgt@fdny.nyc.gov not later than two (2) business days prior to the scheduled action. No confirmation is required and the

scheduled action can proceed in the *Department*'s absence. If the action is rescheduled, amended notice shall be given to the *Department* in as timely a manner as circumstances allow.

(C) **Decommissioning of malfunctioning battery system**. The removal and transportation of any battery system that has given abnormal temperature or gas emission readings as a result of physical damage, exposure to fire or other actual or potential cause of damage, shall be coordinated with the Hazardous Materials Unit of the *Department's* Bureau of Operations, who may send representatives to monitor the decommissioning process. The Hazardous Materials Unit shall be notified two (2) business days prior to the scheduled action, or in as timely a manner as circumstances allow, by calling the *Department* Communications Office in the borough in which the battery system is located.

(g) **General Design and Installation Requirements.** When required by Table 2 of this section, *stationary storage battery systems* shall be designed and installed in accordance with the following requirements:

(1) **Location and construction.** *Stationary storage battery systems* shall be located and constructed in accordance with the following requirements:

(A) **Outdoor location.** *Stationary storage battery systems* shall be located outdoors. This includes rooftops when authorized by this section. Medium and large battery systems shall not be installed in enclosed areas without direct access from a public street, or fire apparatus access road, unless full-scale testing demonstrates intrinsic safety, or hazard mitigation measures that the *Department* determines to be appropriate for the particular location are provided.

(B) **Fire Department access and water supply.** Where feasible, a direct, unobstructed pathway shall be provided from the battery system installation to the public street or fire apparatus access road on which the premises fronts. *Stationary storage battery systems* located more than 250 feet from a hydrant shall be provided with a private hydrant or other *approved* water supply for firefighting operations in accordance with FC508.

(C) **Separation distances**. *Stationary storage battery systems* shall be located a minimum of 10 feet from the following exposures, except where lesser or greater distances are required by the equipment approval or installation approval based on full-scale testing data that indicate that a battery system fire will or will not adversely impact one or more of the following exposures:

(*1*) Lot lines;

(*2*) Public streets, fire apparatus access road, public walkways and other public ways;

(*3*) Any vehicle parking;

(*4*) Any building entrance, openable window, or ventilation intake;

(*5*) Any exit discharge or other means of egress from a building or outdoor area;

(*6*) Any outdoor hazardous materials or combustible materials storage facility or area;

(*7*) Any outdoor storage facility or area for high-piled combustible materials or other combustible items;

(*8*) Overhead power lines or other aboveground electrical installation, measured from the boundary of the utility easement or, if there is no easement, from the vertical plane of the installation at its widest point; and

(*9*) Any public utility or transportation infrastructure.

(D) **Rooftop locations.** *Stationary storage battery systems* may be located on a building rooftop, subject to the following requirements:

(*1*) The building roof covering or roofing system, or other *approved* material placed underneath the rooftop battery system installation, shall be noncombustible for a distance of five (5) feet from such installation.

(*2*) Rooftop battery system installations, including structural, electrical or other associated equipment, shall not obstruct the rooftop access and clear path required by FC504.4 for buildings 100 feet or less in height. Rooftop battery systems may be installed underneath solar panels, subject to the access and clearance requirements set forth in R608-01(g)(1)(D).

(*3*) There shall be access to the rooftop from a building stairway, or other means of rooftop access authorized by the *Building Code*. A safe, unobstructed path must be provided from the bulkhead door or other point of entry to the entrance(s) to the battery system enclosure or to the service/access panel (if any).

(*4*) Any dunnage or other structural support for the battery system installation shall have a minimum one (1) hour fire rating for small and medium battery systems and two (2) hours for large battery systems.

(*5*) On rooftops of buildings provided with a standpipe, a minimum of two (2) standpipe hose outlets shall be provided within the building bulkhead, in accordance with FC912, at an *approved* distance from the *stationary storage battery system* installation sufficient to ensure safety of firefighting operations. On rooftops of buildings that do not have a standpipe, an *approved* water supply source shall be provided for firefighting operations. If a standpipe is provided for the battery system installation, the fire department connections shall be identified by durable signage or markings conspicuously posted at street level in accordance with FC912.

(*6*) Rooftop installations shall comply with the separation distances set forth in R608-01(g)(1)(c) for means of egress; hazardous materials or combustible materials storage facility or area; overhead power lines or other aboveground electrical installation; public utility or transportation infrastructure; and other *stationary storage battery system* installations.

(*7*) Rooftop installations shall be located a reasonable distance (but not less than 10 feet) from the bulkhead entrance door or other rooftop access location pursuant to R608-01(g)(1)(D)(3).

(8) Valve-regulated lead-acid (VRLA) and flow batteries may not be installed on rooftops unless the applicant demonstrates to the satisfaction of the *Department* that the hazardous materials used in such systems can be safely stored and used on a rooftop, and the application adequately addresses leak detection, spill containment and the movement of such *hazardous materials* through the building.

(E) **Physical Protection.** *Stationary storage battery system* installations shall be protected from damage in accordance with the following requirements:

(*1*) **Temperature.** The storage battery or battery system shall be designed for operation throughout the entire expected range of ambient temperature, in accordance with manufacturers' specifications, or provided with appropriate protection from damage from extreme ambient temperatures.

(*2*) **Vehicle impact protection**. Where the battery system is subject to impact by a motor vehicle or other motorized equipment, such as a

fork lift or other powered industrial trucks, vehicle impact protection shall be provided in accordance with FC312.

(*3*) **Security**. The battery system installation shall be secured against unauthorized entry. All battery system enclosures shall be securely locked and, where appropriate, safeguarded by a chain link fence or other *approved* barrier.

(2) **Remote monitoring.** All *stationary storage battery systems* shall be designed to transmit data regarding battery system status and temperature to a remote monitoring facility.

(3) **Electrical components.** The electrical components of *stationary storage battery systems* shall be designed and installed in accordance with the following requirements:

(A) **Compliance with testing standard.** The electrical components of the battery system shall comply with UL Standard 9540.

(B) **Operating conditions.** The electrical components of the battery system shall be designed to operate safely during normal battery system operating conditions.

(C) **Secondary power.** A separate source of electrical power shall be provided for battery system controls and safety functions, unless the battery system is designed to power such systems for at least 30 minutes after battery system shut-down. A separate source of electrical power shall be provided for all external battery safety systems, including detection, ventilation and smoke/gas purge systems. Such secondary power can be supplied from any independent power source. If the secondary power supply is an emergency power system designed in accordance with the *Building Code*, it shall be capable of supplying secondary power for a duration of two hours.

(D) **Emergency shut down.** An emergency shut down control (e-stop), in the form of a red button or other *approved* design, designed to shut down all *stationary storage battery system* operations (without affecting the fire protection systems and other safety measures required by this section) shall be provided at the fire department connection, if any, utility connection or other *approved*, conspicuous outdoor location on the premises that is accessible to emergency response personnel and is a reasonable distance (but not less than 10 feet) from the *stationary storage battery system* installation. The shut down control shall be secured in a lock box operable by a *citywide standard key* (2642 key) in accordance with FC506. Signage shall be provided as set forth in R608-01(i)(6).

(h) **Enclosure Design and Installation Requirements.** When required by Table 2 of this section, *stationary storage battery systems* housed in a shipping container or other type of outdoor enclosure (but not a storage battery system housing, except as otherwise provided in R608-01(h)(3)) shall be designed and installed in accordance with the following requirements:

(1) **Human occupancy prohibited.** No *stationary storage battery system* shall be housed in an enclosure used for human occupancy. Access to such an enclosure (whether walk-in or reach-in) shall be provided solely for maintenance purposes, including inspection, testing, servicing and repair of the battery system.

(2) **Racks.** *Stationary storage battery systems* may be installed on open racks within enclosures provided that water-based fire extinguishing, explosion mitigation, ventilation and smoke/gas purge systems are provided within the enclosure in accordance with R608-01(h).

(3) **Fire extinguishing system**. An *approved* dry pipe water fire extinguishing system designed and installed in accordance with NFPA Standard 15 (2007 edition), shall be provided in *stationary storage battery system* enclosures. The fire department connections shall be located at an *approved* distance from the *stationary storage battery system* enclosure as to ensure the safety of firefighting operations. An external fire extinguishing system of such design and installation shall be provided for any large *stationary storage battery system* in an outdoor cabinet or other battery system housing.

(4) **Explosion mitigation**. Explosion mitigation shall be provided for battery system enclosures in accordance with the following requirements:

(A) Deflagration venting. Deflagration venting shall be provided in accordance with NFPA Standard 68 (2007 edition), based on UL Test Method 9540A or other *approved* test data. Such venting shall be provided and designed to vent upwards or other safe location. Vents shall not face toward any exit discharge path from a nearby building or other pedestrian walkway, or any location from which emergency response personnel may access the enclosure.

(B) **Explosion prevention.** The concentration of combustible vapors during abnormal operation may be controlled in accordance with NFPA Standard 69 (2008 edition) if a hazard mitigation analysis, based on full-scale testing or other *approved* test data, indicates that such mitigation measures will be effective in keeping the target *lower flammability limit (LFL)* within the enclosure at or below 25 percent of the *LFL*.

(5) **Fire detection system.** An *approved* automatic fire detection system shall be installed in battery system enclosures in accordance with FC907. System

activation shall initiate alarm, shut down and hazard mitigation measures in accordance with R608-01(h)(7).

(6) **Gas detection system.** An *approved* gas detection system shall be installed in battery system enclosures in accordance with FC908. The placement of detectors shall be in accordance with manufacturer's specifications. When the level of flammable gas inside the battery system enclosure exceeds 25 percent of the *LFL*, the gas detection system shall initiate alarm, shut down and hazard mitigation measures in accordance with R608-01(h)(7).

(7) **Detector alarm notification.** Activation of a fire or gas detector in a battery system enclosure shall initiate the following notifications and other actions:

(A) Activate a distinct audible and visible alarm signal at the battery system installation or an *approved* constantly attended on-site location.

(B) Transmit an alarm signal to the *fire alarm system* and thereby to an *approved central station*.

(C) Shut down the battery system, if warranted.

(D) Activate all necessary shut down and hazard mitigation measures of the ventilation system.

(8) **Ventilation system.** An automatic mechanical ventilation system shall be provided for the space within the battery system enclosure in accordance with the *Mechanical Code* and the following design requirements. The ventilation system shall be designed to maintain optimal operating conditions for the *stationary storage battery system* in accordance with manufacturer's specifications or Institute of Electrical and Electronics Engineers (IEEE) Standard 1635/ASHRAE Standard 21 (2012 edition), whichever requires a higher level of protection. The ventilation system shall be intrinsically safe for, and/or explosion protected from, any toxic and flammable gases generated by the battery system during normal operating conditions, and shall be designed to limit the maximum concentration of toxic gases inside the battery enclosure to 25 percent of the *permissible exposure limit (PEL)* for such gases, unless full-scale testing demonstrates that the storage battery unit does not generate toxic gas concentrations in excess of 25 percent of *PEL*.

(9) **Smoke/gas purge system.** A manually-operated purge system designed to exhaust heat, smoke and toxic gases generated by the *stationary storage battery system* during abnormal operating conditions, for use by firefighting personnel, shall be provided for a battery system enclosure. The smoke/gas purge system shall be intrinsically safe and/or explosion protected for any such toxic gases and be designed in accordance with the following requirements:

(A) **Manual operation.** The smoke/gas purge system shall be designed to be manually activated. A manual activation switch shall be installed at the fire department connection, if any; otherwise, near the utility connection or other *approved* location on the premises. The activation switch shall be identified by a conspicuously posted and durable sign that reads: "Battery System Emergency Smoke/Gas Purge." The activation switch shall be secured in a lock box operable by a *citywide standard key* (2642 key) in accordance with FC506.

(B) **Exhaust venting.** The smoke/gas purge system shall vent in a manner that will minimize the risk to surrounding buildings and building occupants, pedestrians, and emergency response personnel. Exhaust vents shall not face toward any exit discharge path from a nearby building or other pedestrian walkway, or any location from which emergency response personnel may access the enclosure.

(i) **Operational and Maintenance Requirements.** *Stationary storage battery systems* shall be operated and maintained in accordance with this section.

(1) **Remote monitoring of battery management system and reporting.** The *owner* of a *stationary storage battery system* shall arrange for data transmissions from the battery system's battery management system to be continuously monitored (on a 24/7 basis) by a remote monitoring facility staffed by trained and knowledgeable persons retained by the manufacturer or installer of the battery system. The remote monitoring facility shall, without delay, make the following notifications in the event a battery system installed in New York City exceeds or appears likely to exceed thresholds at which fire, explosion or other serious adverse consequences may result:

(A) Notify the *Department* by calling the Communications Office in the borough in which the battery system is located, to alert the *Department* to the unsafe condition;

(B) Notify the *certificate of fitness* holder responsible for the battery system, in a pre-arranged manner, to alert such individual to be ready to provide technical assistance to the *Department* and/or respond to the incident location in accordance with R608-01(i)(4) and (5); and

(C) Notify the manufacturer of the battery system to make a qualified representative available to provide technical assistance to the *Department* pursuant to R608-01(i)(4).

(2) **Central station monitoring of fire protection systems**. All *fire protection systems* protecting the battery system installation, including any *fire extinguishing system*, and fire and gas detection or other *emergency alarm system* required by this section, shall be monitored by an *approved central station*.

(3) **Constantly attended on-site locations.** Battery systems and *fire protection systems* may be monitored at a constantly attended on-site location, but such monitoring may not substitute for the remote monitoring facility and/or *central station* required by R608-01(i)(1) and (2), unless such substitution is approved in writing by the Technology Management Unit of the *Bureau of Fire Prevention*.

(4) **Technical assistance.** Upon request of the *Department*, both the *certificate of fitness* holder responsible for the battery system and the battery system manufacturer shall make available to the *Department* a representative with technical knowledge of the battery system and its operation. Such representative shall be made available as soon as possible, but in any event within 15 minutes of receipt of the *Department*'s request.

(5) **Emergency management.** Upon request of the *Department*, the *certificate of fitness* holder responsible for the battery system and an authorized representative of the *owner* of the premises upon which the battery system is installed shall respond to the location of the battery installation, as soon as possible but in any event within two (2) hours of notification, to assist the *Department* in addressing a fire or other emergency involving or affecting the battery system, and to take all other actions necessary for mitigation and decommissioning of the battery system, or restoration to normal operation in accordance with R608-01(i)(7).

(6) **Signage.** When required by Table 2 of this section, the following signs (or equivalent markings) shall be durably posted for each *stationary storage battery system*, at the locations indicated:

(A) **Warning signs.** The following warning signs shall be posted on the exterior of medium and large battery systems or battery system enclosure:

(*1*) "Danger: High Voltage," or equivalent signage complying with the requirements of the *Electrical Code*; and

(*2*) Hazard identification sign complying with NFPA Standard 704 (2007 edition).

(B) **Identification, emergency contact and emergency shut-down signs**. The following signs shall be posted at the fire department connection, if any, utility connection or other *approved*, conspicuous outdoor location on the premises that is accessible to emergency response personnel and that is a reasonable distance (but not less than 10 feet) from the *stationary storage battery system* installation. The signage may be posted within a marked, locked box secured by a *citywide standard key* (2642 key). If the location of the signage would not be readily apparent to emergency response personnel, a sign with large lettering (not less than 3 inches high)

shall be posted on or adjacent to the battery installation indicating the location of the following signage:

(*1*) **Permit.** The *permit* for the installation, laminated or otherwise suitably weatherproofed.

(2) **Equipment specifications**. The manufacturer and model number of the battery system and electrical rating (voltage and current).

(*3*) **Installation identification**. The number or other unique identifier used by the battery management system remote monitoring facility to identify the installation, which firefighters or other *Department* representatives can reference in communications with the monitoring facility.

(4) **Monitoring facility contact information**. The telephone number of the battery management system remote monitoring facility.

(5) **Certificate of fitness contact information.** The name and telephone number of the *certificate of fitness* holder responsible for the battery system.

(6) **Emergency shutdown procedures**. Emergency shutdown procedures for the battery energy storage system shall be posted at the battery system emergency shut down (e-stop) control and at any attended on-site location. The emergency shutdown instructions shall clearly indicate "GRID SUPPORT SYSTEM" in large letters (not less than 2 inches high) if immediate shut down of the battery system could disrupt public utility operations.

(7) **Maintenance**. The *owner* shall ensure that *stationary storage battery systems* are periodically inspected, tested, serviced and otherwise maintained in accordance with manufacturer's specifications and the requirements of this section by a person trained and knowledgeable in the specific battery system.

(A) **Periodic inspection.** When required by Table 2 of this section, the battery system shall be inspected by the *certificate of fitness* holder on not less than an annual basis to confirm continued compliance with applicable code, *rule* and *permit* requirements, including checking for the presence of required signage and whether any posted information needs to be updated, and confirming that all required systems are in good working order.

(B) **Restoration to service after serious failure.** Any battery system that undergoes a serious failure, including one that results in a fire, release of flammable or toxic gas, and/or physical damage to system components, shall be removed from service forthwith. The battery system shall not be

restored to service until it has been evaluated by a trained and qualified person, repaired and tested, re-commissioned in accordance with R608-01(f) by a person holding a *certificate of fitness*.

(C) **Replacement components.** Any replacement storage battery units or other battery system components shall be designed for the same storage battery technology and/or chemistry and be compatible with the existing battery system installation. In-kind replacement of existing components (consistent with the *listing* for the *storage battery unit* or *storage battery system*) constitutes maintenance and does not require *Department* review and approval. Replacement of existing components with different battery technologies or chemistries (including the electrolyte chemistry in a flow battery system) or that change the storage/generating capacity or other functionality of a battery system, or other change to *listed* components, constitutes an alteration of the battery system and shall be submitted for *Department* review and approval, and, as applicable, *Department of Buildings* review and approval, in the same manner as an application for a new *stationary storage battery system* installation.

(D) **Combustible waste.** *Stationary storage battery system* installations shall be kept free from the accumulation of combustible waste and combustible vegetation in accordance with FC304.1.

(E) **Storage of combustible materials.** Combustible materials not required for battery system operation shall not be stored in battery system enclosures.

(j) **Recordkeeping Requirements.** A written record of the following information shall be maintained at the premises or other *approved* location by the *certificate of fitness* holder, and, for medium and large battery systems, by the *owner* or operator of the battery system:

(1) Battery system installation and commissioning;

(2) Battery system maintenance, including all inspections, servicing and repair;

(3) Battery system decommissioning and removal;

(4) Installation and maintenance of battery system fire protection systems, including all inspection, testing, servicing and repair; and

(5) Fires or other incidents involving or affecting the battery system.