

Chapter 12 of the IFC has significant amendments to the entire Chapter 12 as outlined below:

Entire Chapter 12 – Energy Systems is hereby DELETED and REPLACED with the following:

Colored text is as follows: **BLACK**: 2018 IFC CHAPTER 12; **GREEN**: PHOENIX FIRE AMENDMENTS; **BLUE**: SUN CITY FIRE DISTRICT AMENDMENTS; **ORANGE**: REVISED PHOENIX FIRE AMENDMENTS.

SECTION 1201 GENERAL

1201.1 Scope.

The provisions of this chapter shall apply to the installation, operation and maintenance of energy systems used for generating or storing energy. It shall ~~not~~ apply to equipment associated with the generation, control, transformation, transmission, or distribution of energy installations that is under the exclusive control of an electric utility or lawfully designated agency.

1201.2 Electrical wiring and equipment.

Electrical wiring and equipment used in connection with energy systems shall be installed and maintained in accordance with Chapter 12 and NFPA 70.

1201.3 Mixed system installation.

Where *approved*, the aggregate kWh energy in a fire area shall not exceed the maximum quantity specified for any of the energy systems in this chapter. Where required by the *fire code official*, a hazard mitigation analysis shall be provided and *approved* in accordance with Section 104.7.2 to evaluate any potential adverse interaction between the various energy systems and technologies.

SECTION 1202 DEFINITIONS

1202.1 Definitions.

The following terms are defined in Chapter 2:

BATTERY SYSTEM, STATIONARY STORAGE.

BATTERY TYPES.

LEAD-ACID BATTERY.

CAPACITOR ARRAY.

CAPACITOR ENERGY STORAGE SYSTEM.

CRITICAL CIRCUIT.

EMERGENCY POWER SYSTEM.

ENERGY MANAGEMENT SYSTEM.

FUEL CELL POWER SYSTEM, STATIONARY.

STANDBY POWER SYSTEM.

STATIONARY BATTERY ARRAY.

STATIONARY FUEL CELL POWER SYSTEM.

SECTION 1203 EMERGENCY AND STANDBY POWER SYSTEMS

1203.1 General.

Emergency power systems and standby power systems required by this code or the International Building Code shall comply with Sections 1203.1.1 through 1203.1.9.

1203.1.1 Stationary generators.

Stationary emergency and standby power generators required by this code shall be listed in accordance with UL 2200. *Associated Flammable or Combustible Liquid Tanks shall also comply with Chapters 50 and 57.*

1203.1.2 Fuel line piping protection.

Fuel lines supplying a generator set inside a high-rise building shall be separated from areas of the building other than the room the generator is located in by an *approved* method, or an assembly that has a fire-resistance rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1, the required fire-resistance rating shall be reduced to 1 hour.

1203.1.3 Installation.

Emergency power systems and standby power systems shall be installed in accordance with the International Building Code, NFPA 70, NFPA 110 and NFPA 111.

1203.1.4 Load transfer.

Emergency power systems shall automatically provide secondary power within 10 seconds after primary power is lost, unless specified otherwise in this code. Standby power systems shall automatically provide secondary power within 60 seconds after primary power is lost, unless specified otherwise in this code.

1203.1.5 Load duration.

Emergency power systems and standby power systems shall be designed to provide the required power for a minimum duration of 2 hours without being refueled or recharged, unless specified otherwise in this code.

1203.1.6 Uninterruptable power source.

An uninterrupted source of power shall be provided for equipment where required by the manufacturer's instructions, the listing, this code or applicable referenced standards.

1203.1.7 Interchangeability.

Emergency power systems shall be an acceptable alternative for installations that require standby power systems.

1203.1.8 Group I-2 occupancies.

In Group I-2 occupancies located in flood hazard areas established in Section 1612.3 of the International Building Code and where new or replacement essential electrical systems are installed and where new essential electrical system generators are installed, the systems and generators shall be located and installed in accordance with ASCE 24. Where connections for hook up of temporary generators are provided, the connections shall be located at or above the elevation required in ASCE 24.

1203.1.9 Maintenance.

Existing installations shall be maintained in accordance with the original approval and Section 1203.4.

1203.2 Where required.

Emergency and standby power systems shall be provided where required by Sections 1203.2.1 through 1203.2.18.

1203.2.1 Ambulatory care facilities.

Essential electrical systems for ambulatory care facilities shall be in accordance with Section 422.6 of the International Building Code.

1203.2.2 Elevators and platform lifts.

Standby power shall be provided for elevators and platform lifts as required in Sections 606.2, 1009.4.1, and 1009.5.

1203.2.3 Emergency responder radio coverage systems.

Standby power shall be provided for emergency responder radio coverage systems as required in Section 510.4.2.3. The standby power supply shall be capable of operating the emergency responder radio coverage system for a duration of not less than 24 hours.

1203.2.4 Emergency voice/alarm communication systems.

Emergency power shall be provided for emergency voice/alarm communication systems as required in Section 907.5.2.2.5. The system shall be capable of powering the required load for a duration of not less than 24 hours, as required in NFPA 72.

1203.2.5 Exit signs.

Emergency power shall be provided for exit signs as required in Section 1013.6.3. The system shall be capable of powering the required load for a duration of not less than 90 minutes.

1203.2.6 Gas detection systems.

Emergency power shall be provided for gas detection systems where required by Sections 1203.2.9 and 1203.2.16. Standby power shall be provided for gas detection systems where required by Section 916.5.

1203.2.7 Group I-2 occupancies.

Essential electrical systems for Group I-2 occupancies shall be in accordance with Section 407.11 of the International Building Code.

1203.2.8 Group I-3 occupancies.

Power-operated sliding doors or power-operated locks for swinging doors in Group I3 occupancies shall be operable by a manual release mechanism at the door. Emergency power shall be provided for the doors and locks.

Exceptions:

1. Emergency power is not required in facilities where provisions for remote locking and unlocking of occupied rooms in Occupancy Condition 4 are not required as set forth in the International Building Code.
2. Emergency power is not required where remote mechanical operating releases are provided.

1203.2.9 Hazardous materials.

Emergency and standby power shall be provided in occupancies with hazardous materials as required in the following sections:

1. Sections 5004.7 and 5005.1.5 for hazardous materials.
2. Sections 6004.2.2.8 and 6004.3.4.2 for highly toxic and toxic gases.
3. Section 6204.1.11 for organic peroxides.

1203.2.10 High-rise buildings.

Standby power and emergency power shall be provided for high-rise buildings as required in Section 403 of the International Building Code and shall be in accordance with Section 1203.

1203.2.11 Horizontal sliding doors.

Standby power shall be provided for horizontal sliding doors as required in Section 1010.1.4.3. The standby power supply shall have a capacity to operate not fewer than 50 closing cycles of the door.

1203.2.12 Hydrogen fuel gas rooms.

Standby power shall be provided for hydrogen fuel gas rooms as required by Section 5808.7.

1203.2.13 Laboratory suites.

Standby or emergency power shall be provided in accordance with Section 5004.7 where laboratory suites are located above the sixth story above grade plane or located in a story below grade plane.

1203.2.14 Means of egress illumination.

Emergency power shall be provided for means of egress illumination in accordance with Sections 1008.3 and 1104.5.1.

1203.2.15 Membrane structures.

Standby power shall be provided for auxiliary inflation systems in permanent membrane structures in accordance with Section 2702 of the International Building Code. Auxiliary inflation systems shall be provided in temporary air-supported and air-inflated membrane structures in accordance with Section 3103.10.4.

1203.2.16 Semiconductor fabrication facilities.

Emergency power shall be provided for semiconductor fabrication facilities as required in Section 2703.15.

1203.2.17 Smoke control systems.

Standby power shall be provided for smoke control systems as required in Section 909.11.

1203.2.18 Underground buildings.

Emergency and standby power shall be provided in underground buildings as required in Section 405 of the International Building Code and shall be in accordance with Section 1203.

1203.2.19 Connected facilities.

Power and lighting facilities or the *fire command center* and elevators specified in Sections 403.4.8.2 and 403.6 of the *International Building Code*, as applicable, and electrically powered fire pumps required to maintain pressure, shall be transferable to the standby source. Standby power shall be provided for at least one elevator to serve all floors and be transferable to any elevator.

1203.3 Critical circuits.

Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196. Electrical circuit protective systems shall be installed in accordance with their listing requirements.

1203.4 Maintenance.

Emergency and standby power systems shall be maintained in accordance with NFPA 110 and NFPA 111 such that the system is capable of supplying service within the time specified for the type and duration required.

1203.4.1 Group I-2.

In Group I-2 occupancies, emergency and standby power systems shall be maintained in accordance with NFPA 99.

1203.4.2 Schedule.

Inspection, testing and maintenance of emergency and standby power systems shall be in accordance with an *approved* schedule established upon completion and approval of the system installation.

1203.4.3 Records.

Records of the inspection, testing and maintenance of emergency and standby power systems shall include the date of service, name of the servicing technician, a summary of conditions noted and a detailed description of any conditions requiring correction and what corrective action was taken. Such records shall be maintained.

1203.4.4 Switch maintenance.

Emergency and standby power system transfer switches shall be included in the inspection, testing and maintenance schedule required by Section 1203.4.2. Transfer switches shall be maintained free from accumulated dust and dirt. Inspection shall include examination of the transfer switch contacts for evidence of deterioration. When evidence of contact deterioration is detected, the contacts shall be replaced in accordance with the transfer switch manufacturer's instructions.

1203.5 Operational inspection and testing.

Emergency power systems, including all appurtenant components, shall be inspected and tested under load in accordance with NFPA 110 and NFPA 111. Exception: Where the emergency power system is used for standby power or peak load shaving, such use shall be recorded and shall be allowed to be substituted for scheduled testing of the generator set, provided that appropriate records are maintained.

1203.5.1 Group I-2.

In Group I-2 occupancies, emergency and standby power systems shall be inspected and tested under load in accordance with NFPA 99.

1203.5.2 Transfer switch test.

The test of the transfer switch shall consist of electrically operating the transfer switch from the normal position to the alternate position and then return to the normal position. 1203.6 Supervision of maintenance and testing. Routine maintenance, inspection and operational testing shall be overseen by a properly instructed individual.

SECTION 1204 SOLAR PHOTOVOLTAIC POWER SYSTEMS

1204.1 General.

Solar photovoltaic systems shall be installed in accordance with Sections 1204.2 through 1204.5, and the International Building Code or International Residential Code. The electrical portion of solar PV systems shall be installed in accordance with NFPA 70.

1204.1.1 Permits.

Permits shall be obtained from Sun City Fire & Medical Department for solar voltaic systems in accordance with Section 105.7.2.1.

Exception: Solar Voltaic Systems with a 3 kW or less alternating current nameplate rating that are not tied into the utility companies power grid system.

1204.1.2 Marking.

Marking is required on interior and exterior direct-current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects.

1204.1.2.1 Materials.

The materials used for marking shall be reflective, weather resistant and suitable for the environment. Marking as required in Sections 1204.1.2 through 1204.1.6 shall have capitalized letters with a minimum height of 3/8 inch (9.5 mm) white on red background.

1204.1.2.2 Marking Content.

The marking shall contain the words "WARNING: PHOTVOLTAIC POWER SOURCE".

1204.1.2.3 Main Service Disconnect.

The marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location where the disconnect is operated.

1204.1.3 Location of Marking.

Marking shall be placed on DC conduit installed on the interior and exterior, raceways, enclosures and cable assemblies every 10 feet (3048 mm) within 1 foot (305 mm) of turns or bends and within 1 foot (035 mm) above and below penetrations of roof ceiling assemblies, walls or barriers.

1204.2 Access and pathways.

Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 1204.2.1 through 1204.3.3. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions, such as vent pipes, conduit or mechanical equipment.

Residential structures shall be designed so that each photovoltaic array is no greater than 150 feet (45720mm) by 150 feet (45,720 mm) in either axis.

Exceptions:

1. Detached, nonhabitable Group U structures including, but not limited to, detached garages serving Group R-3 buildings, parking shade structures, carports, solar trellises and similar structures.

1204.2.1 Solar photovoltaic systems for Group R-3 buildings.

Solar photovoltaic systems for Group R-3 buildings shall comply with Sections 1204.2.1.1 through 1204.2.1.3.

1204.2.1.1 Roof Access Points.

Roof access points shall be located in areas that do not require the placement of ground ladders over openings such as windows or doors and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires or signs.

1204.2.1.1 Pathways to ridge.

Not fewer than two 36 inch- wide (914 mm) pathways on separate roof planes, from lowest roof edge to ridge, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, not fewer than one 36-inch-wide (914 mm) pathway from lowest roof edge to ridge shall be provided on the same roof plane as the photovoltaic array, on an adjacent roof plane or straddling the same and adjacent roof planes.

1204.2.1.2 Residential buildings with hip roof layouts.

Panels /modules installed on residential buildings with hip roof layouts shall be located in a manner that provides a 36-inch-wide (914 mm) clear access pathway from eave to the ridge on each roof slope where panels/modules are located. The access pathway shall be located at a structurally strong location on the building capable of supporting the live load of firefighters accessing the roof.

1204.2.1.2 Setbacks at ridge.

For photovoltaic arrays occupying 33 percent or less of the plan view total roof area, a setback of not less than 18 inches (457 mm) wide is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total roof area, a setback of not less than 36 inches (457 mm) wide is required on both sides of a horizontal ridge.

1204.2.1.3 Residential buildings with a single ridge.

Panels/modules installed on residential buildings with a single ridge shall be located in a manner that provides two 3-foot wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels/nodes are located.

1204.2.1.3 Alternative setbacks at ridge.

Where an automatic sprinkler system is installed within the dwelling in accordance with Section 903.3.1.3, setbacks at the ridge shall conform to one of the following: 1. For photovoltaic arrays occupying 66 percent or less of the plan view total roof area, a setback of not less than 18 inches (457 mm) wide is required on both sides of a horizontal ridge. 2. For photovoltaic arrays occupying more than 66 percent of the plan view total roof area, a setback of not less than 36 inches (914 mm) wide is required on both sides of a horizontal ridge.

1204.2.1.4 Residential buildings with roof hips and valleys. Panels/modules installed on residential buildings with roof hips and valleys shall be located no closer than 18 inches (457 mm) to a hip or valley where panels/modules are to be placed on both sides of the hip or valley. Where panels are to be located on only one side of a hip or valley that is of equal length, the panels shall be permitted to be placed directly adjacent to the hip or valley.

Exception: These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

1204.2.1.5 Residential building smoke ventilation. Panels/modules installed on residential buildings shall be located no higher than 36 inches (914 mm) below the ridge in order to allow for fire department smoke ventilation openings.

1204.2.2 Emergency escape and rescue openings.

Panels and modules installed on Group R-3 buildings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway of not less than 36 inches (914 mm) wide shall be provided to the emergency escape and rescue opening.

1204.3 Other than Group R-3 buildings.

Access to systems for buildings, other than those containing Group R-3 occupancies, shall be provided in accordance with Sections 1204.3.1 through 1204.3.3.

Exception: Where it is determined by the *fire code official* that the roof configuration is similar to that of a Group R-3 occupancy, the residential access and ventilation requirements in Sections 1204.2.1.1 through 1204.2.1.3 are a suitable alternative.

1204.3.1 Perimeter pathways.

There shall be a minimum 6-foot-wide (1829 mm) clear perimeter around the edges of the roof.

Exception: Where either axis of the building is 250 feet (76 200 mm) or less, the clear perimeter around the edges of the roof shall be permitted to be reduced to a minimum width of 4 feet (1219 mm).

1204.3.2 Interior pathways.

Interior pathways shall be provided between array sections to meet the following requirements:

1. Pathways shall be provided at intervals not greater than 150 feet (45 720 mm) throughout the length and width of the roof.
2. A pathway not less than 4 feet (1219 mm) wide in a straight line to roof standpipes or ventilation hatches.
3. A pathway not less than 4 feet (1219 mm) wide around roof access hatches, with not fewer than one such pathway to a parapet or roof edge.
4. The pathway shall be over areas capable of supporting the live load of firefighters accessing the roof.
5. The centerline axis pathways shall be provided in both axes of the roof. Centerline axis pathways shall run where the roof structure is capable of supporting the live load of firefighters accessing the roof.

1204.3.3 Smoke ventilation.

The solar installation shall be designed to meet the following requirements:

1. Where nongravity-operated smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide shall be provided bordering all sides.
2. Smoke ventilation options between array sections shall be one of the following:
 - 2.1. A pathway not less than 8 feet (2438 mm) wide.
 - 2.2. Where gravity-operated dropout smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide on not fewer than one side.
 - 2.3. A pathway not less than 4 feet (1219 mm) wide bordering 4-foot by 8-foot (1219 mm by 2438 mm) venting cutouts every 20 feet (6096 mm) on alternating sides of the pathway.
3. Arrays shall be no greater than 150 feet (45,720 mm) by 150 feet (45,720 mm) in distance in either axis in order to create opportunities for fire department smoke ventilation operations.

1204.4 Ground mounted photovoltaic panel systems.

Ground mounted photovoltaic panel systems shall comply with Section 1204.1 and this section. Setback requirements shall not apply to ground-mounted, free-standing photovoltaic arrays. A clear, brush-free area of 10 feet (3048 mm) shall be required for ground mounted photovoltaic arrays.

1204.5 Buildings with rapid shutdown.

Buildings with rapid shutdown solar photovoltaic systems shall have permanent labels in accordance with Sections 1204.5.1 through 1204.5.3.

1204.5.1 Rapid shutdown type.

The type of solar photovoltaic system rapid shutdown shall be labeled with one of the following:

1. For solar photovoltaic systems that shut down the array and the conductors leaving the array, a label shall be provided. The first two lines of the label shall be uppercase characters with a minimum height of 3/8 inch (10 mm) in black on a yellow background. The remaining characters shall be uppercase with a minimum height of 3/16 inch (5 mm) in black on a white background. The label shall be in accordance with Figure 1204.5.1(1) and state the following:

**SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN.
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN
PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY.**

2. For photovoltaic systems that only shut down conductors leaving the array, a label shall be provided. The first two lines of the label shall be uppercase characters with a minimum height of 3/8 inch (10 mm) in white on a red background and the remaining characters shall be capitalized with a minimum height of 3/16 inch (5 mm) in black on a white background. The label shall be in accordance with Figure 1204.5.1(2) and state the following:

**THIS SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN.
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN
CONDUCTORS OUTSIDE THE ARRAY.
CONDUCTORS WITHIN ARRAY REMAIN ENERGIZED IN SUNLIGHT.**

1204.5.1.1 Diagram.

The labels in Section 1204.5.1 shall include a simple diagram of a building with a roof. Diagram sections in red signify sections of the solar photovoltaic system that are not shut down when the rapid shutdown switch is turned off.

1204.5.1.2 Location.

The rapid shutdown label in Section 1204.5.1 shall be located not greater than 3 feet (914 mm) from the service disconnecting means to which the photovoltaic systems are connected and shall indicate the location of all identified rapid shutdown switches if not at the same location.

1204.5.2 Buildings with more than one rapid shutdown type.

Solar photovoltaic systems that contain rapid shutdown in accordance with both Items 1 and 2 of Section 1204.5.1 or solar photovoltaic systems where only portions of the systems on the building contain rapid shutdown, shall provide a detailed plan view diagram of the roof showing each different photovoltaic system and a dotted line around areas that remain energized after the rapid shutdown switch is operated.

1204.5.3 Rapid shutdown switch.

A rapid shutdown switch shall have a label located not greater than 3 feet (914 mm) from the switch that states the following:
RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

SECTION 1205 STATIONARY FUEL CELL POWER SYSTEMS

1205.1 General.

Stationary fuel cell power systems in new and existing occupancies shall comply with this section.

1205.2 Permits.

Permits shall be obtained for stationary fuel cell power systems as set forth in Section 105.7.10.

1205.3 Equipment.

Stationary fuel cell power systems shall comply with the following:

1. Prepackaged fuel cell power systems shall be listed and labeled in accordance with CSA FC 1.
2. The modules and components in a *pre-engineered fuel cell power system* shall be listed and labeled in accordance with CSA FC 1 and interconnected to complete the assembly of the system at the job site in accordance with the manufacturer's instructions and the module and component listings.
3. Field-fabricated fuel cell power systems shall be *approved* based on a review of the technical report provided in accordance with Section 104.7.2. The report shall be prepared by and bear the stamp of a registered design professional and shall include:
 - 3.1. A fire risk evaluation.
 - 3.2. An evaluation demonstrating that modules and components in the fuel cell power system comply with applicable requirements in CSA FC 1.
 - 3.3. Documentation of the fuel cell power system's compliance with applicable NFPA 2 and NFPA 853 construction requirements.

1205.4 Installation.

Stationary fuel cell power systems shall be installed and maintained in accordance with NFPA 70 and NFPA 853, the manufacturer's installation instructions, and the listing. Stationary fuel cell power systems fueled by hydrogen shall be installed and maintained in accordance with NFPA 2 and NFPA 70, the manufacturer's installation instructions and the listing.

1205.5 Residential use.

Stationary fuel cell power systems shall not be installed in Group R-3 and R-4 buildings, or dwelling units associated with Group R-2 buildings unless they are specifically listed for residential use.

1205.6 Indoor installations.

Stationary fuel cell power systems installed in indoor locations shall comply with Sections 1205.6 through 1205.6.2. For purposes of this section, an indoor location includes a roof and 50 percent or greater enclosing walls.

1205.6.1 Listed.

Stationary fuel cell power systems installed indoors shall be specifically listed and labeled for indoor use.

1205.6.2 Separation.

Rooms containing stationary fuel cell power systems shall be separated from the following occupancies by fire barriers or horizontal assemblies, or both, constructed in accordance with the International Building Code.

- a. Group B, F, M, S and U occupancies by 1-hour fire resistance rated construction.
- b. Group A, E, I and R occupancies by 2-hour fire resistance rated construction.

Exception: Stationary fuel cell power systems with an aggregate rating less than 50 kW shall not be required to be separated from other occupancies provided that the systems comply with Section 9.3 of NFPA 853.

1205.7 Vehicle impact protection.

Where stationary fuel cell power systems are subject to impact by a motor vehicle, vehicle impact protection shall be provided in accordance with Section 312.

1205.8 Outdoor installation.

Stationary fuel cell power systems located outdoors shall be separated by not less than 5 feet (1524 mm) from the following:

1. Lot lines.
2. Public ways.
3. Buildings.
4. Stored combustible materials.
5. Hazardous materials.
6. High-piled stock.
7. Any portion of a designated means of egress system.
8. Other exposure hazards.

1205.9 Fuel supply.

The design, location and installation of the fuel supply for stationary fuel cell power systems shall comply with Chapter 53, Chapter 58 and the International Fuel Gas Code, based on the particular fuel being supplied to the system.

1205.10 Manual shutoff.

Access to a manual shutoff valve shall be provided for the fuel piping within 6 feet (1829 mm) of any fuel storage tank serving the fuel cell and within 6 feet (1829 mm) of the power system. If the fuel tank and the stationary fuel cell power system are less than 12 feet (3658 mm) apart, a single shutoff valve shall be permitted. If the stationary fuel cell power system is located indoors, the shutoff valve shall be located outside of the room in which the system is installed, unless otherwise *approved* by the *fire code official*.

1205.11 Ventilation and exhaust.

Ventilation and exhaust for stationary fuel cell power systems shall be provided in accordance with NFPA 853.

1205.12 Fire suppression.

Fire suppression for stationary fuel cell power system installations shall be provided in accordance with NFPA 853.

1205.13 Gas detection systems.

Stationary fuel cell power systems shall be provided with a gas detection system. Detection shall be provided in *approved* locations in the fuel cell power system enclosure, the exhaust system or the room that encloses the fuel cell power system. The system shall be designed to activate at a flammable gas concentration of not more than 25 percent of the lower flammable limit (LFL).

1205.13.1 System activation.

The activation of the gas detection system shall automatically:

1. Close valves between the gas supply and the fuel cell power system.
2. Shut down the fuel cell power system.
3. Initiate local audible and visible alarms in *approved* locations.

SECTION 1206 ELECTRICAL ENERGY STORAGE SYSTEMS

1206.1 Scope.

The provisions in this section are applicable to energy storage systems designed to provide electrical power to a building, facility or equipment associated with the generation, control, transformation, transmission, or distribution of energy installations that is under the exclusive control of an electric utility or lawfully designated agency. These systems are used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities. **Energy storage system in Group R-3 and R-4 occupancies in accordance with 1206.2.1 and 1206.4.** (R-1 and R-2 occupancies shall comply with Commercial Requirements). *Approved signage* is required for all installations.

1206.1.1 Permits.

Permits shall be obtained from **Building Dept. and Fire Dept.** for the construction and operation of stationary storage battery systems with a capacity of more than 3 kWh in accordance with Section 105.7.2.

1206.1.2 Operational Permits. An Operational Annual Permit is required to operate a Battery Energy Storage System (BESS) regulated by IFC Section 1206 in accordance with the adopted Operational Permit Fee Schedule. (SCFD Bd Approval 8-22/23)

1206.2 Stationary storage battery systems.

Stationary storage battery systems having capacities exceeding the values shown in Table 1206.2 shall comply with Section 1206.2.1 through 1206.2.13.6, as applicable. *Approved signage is required for all installations*

SUN CITY FIRE DISTRICT 2018 IFC AMENDMENTS (as amended 1-17-2023)

**TABLE 1206.2
BATTERY STORAGE SYSTEM THRESHOLD QUANTITIES.**

BATTERY TECHNOLOGY	CAPACITY(a)
Flow batteries(b)	20 kWh
Lead acid, all types	70 kWh
Lithium, all types	20 kWh
Nickel cadmium (Ni-Cd)	70 kWh
Sodium, all types	20 kWhc
Other battery technologies	10 kWh

For SI: 1 kilowatt hour = 3.6 megajoules.

- a. For batteries rated in amp-hours, kWh shall equal rated voltage times amp- hour rating divided by 1000.
- b. Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte-type technologies.
- c. 70 kWh for sodium-ion technologies.

1206.2.1 Permits.

Permits shall be obtained [from Building Dept. and Fire Dept.](#) for the construction and operation of stationary storage battery systems [with a capacity of more than 3 kWh](#) in accordance with Section 105.7.2.

1206.2.2 Construction documents.

The following information shall be provided with the permit application:

1. Location and layout diagram of the room in which the stationary storage battery system is to be installed.
2. Details on hourly fire-resistance-rated assemblies.
3. Quantities and types of storage batteries and battery systems.
4. Manufacturer’s specifications, ratings and listings of storage batteries and battery systems.
5. Details on energy management systems.
6. Location and content of signage.
7. Details on fire-extinguishing, smoke detection and ventilation systems.
8. Rack storage arrangement, including seismic support criteria

1206.2.3 Hazard mitigation analysis.

A failure modes and effects analysis (FMEA) or other *approved* hazard mitigation analysis shall be provided in accordance with Section 104.7.2 under any of the following conditions:

1. Battery technologies not specifically identified in Table 1206.2 are provided.
2. More than one stationary storage battery technology is provided in a room or indoor area where there is a potential for adverse interaction between technologies.
3. Where allowed as a basis for increasing maximum allowable quantities in accordance with Section 1206.2.9.
4. *Where required by the fire code official.*

1206.2.3.1 Fault condition.

The hazard mitigation analysis shall evaluate the consequences of the following failure modes, and others deemed necessary by the *fire code official*. Only single-failure modes shall be considered.

1. Thermal runaway condition in a single-battery storage rack, module, or array.
2. Failure of any energy management system.
3. Failure of any required ventilation system.

4. Voltage surges on the primary electric supply.
5. Short circuits on the load side of the stationary battery storage system.
6. Failure of the smoke detection, fire-extinguishing, or gas detection system.
7. Spill neutralization not being provided or failure of the secondary containment system.
8. **Failure of temperature control.**

1206.2.3.2 Analysis approval.

The *fire code official* is authorized to approve the hazardous mitigation analysis provided that the hazard mitigation analysis demonstrates all of the following:

1. Fires or explosions will be contained within unoccupied battery storage rooms for the minimum duration of the fire-resistance-rated walls identified in Table 509.1 of the International Building Code.
2. Fires and explosions in battery cabinets in occupied work centers will be detected in time to allow occupants within the room to evacuate safely.
3. Toxic and highly toxic gases released during fires and other fault conditions shall not reach concentrations in excess of Immediately Dangerous to Life or Health (IDLH) levels in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area.
4. Flammable gases released from batteries during charging, discharging and normal operation shall not exceed ~~25~~ **10** percent of their lower flammability limit (LFL).
5. Flammable gases released from batteries during fire, overcharging and other abnormal conditions shall not create an explosion hazard that will injure occupants or emergency responders.

1206.2.3.3 Additional protection measures.

Construction, equipment, and systems that are required for the stationary storage battery system to comply with the hazardous mitigation analysis, including but not limited to those specifically described in Section 1206.2, shall be installed, maintained, and tested in accordance with nationally recognized standards and specified design parameters.

1206.2.3.4 Large scale fire testing.

Where required in section 1206, large scale fire testing shall be conducted on a representative stationary storage battery system in accordance with UL 9540A. The testing shall be conducted or witnessed and reported by an *approved* testing laboratory. The test report shall be provided to the *fire code official* for review and approval in accordance with Section 104.7.2.

1206.2.3.5 Fire remediation.

Where a fire or other event has damaged a stationary storage battery system and ignition or re-ignition of the stationary storage battery system is possible, the *fire code official* may require the system owner, agent, or lessee, take actions, at their expense, to mitigate the hazard or remove the damaged equipment from the premise to a safe location.

1206.2.3.6 Forensic analysis.

The *fire code official* may also require a forensic analysis of the cause of failure by an independent laboratory *approved* by the *fire code official* in accordance with Section 104.10.2.

1206.2.4 Seismic and structural design.

Stationary storage battery systems shall comply with the seismic design requirements in Chapter 16 of the International Building Code and shall not exceed the floor-loading limitation of the building.

1206.2.5 Vehicle impact protection.

Where stationary storage battery systems are subject to impact by a motor vehicle, including forklifts, vehicle impact protection shall be provided in accordance with Section 312.

1206.2.6 Combustible storage.

Combustible Any materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets or enclosures. Combustible materials in occupied work centers covered by Section 1206.2.8.5 shall not be stored less than 3 feet (915 mm) from battery cabinets.

1206.2.7 Testing, maintenance, and repair.

Storage batteries and associated equipment and systems shall be tested and maintained in accordance with the manufacturer's instructions. Any storage batteries or system components used to replace existing units shall be compatible with the battery charger, energy management systems, other storage batteries and other safety systems. Introducing other types of storage batteries into the stationary storage battery system or other types of electrolytes into flow battery systems shall be treated as a new installation and require approval by the *fire code official* before the replacements are introduced into service.

1206.2.8 Location and construction.

Rooms and areas containing stationary storage battery systems shall be designed, located and constructed in accordance with Sections 1206.2.8.1 through 1206.2.8.7.4.

1206.2.8.1 Location.

Stationary storage battery systems shall not be located in the following areas:

1. Where the floor is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access,
2. Where the floor level is located below the lowest level of exit discharge.

Exceptions:

1. Lead acid and nickel cadmium stationary storage battery systems less than 50 VAC and 60 VDC installed in facilities under the exclusive control of communications utilities in accordance with NFPA 76.
2. Where approved, installations shall be permitted in underground vaults complying with NFPA 70, Article 450, Part III.
3. Where approved by the *fire code official*, installations shall be permitted on higher and lower floors.
4. Installations on noncombustible rooftops of buildings exceeding 75 feet (22 860 mm) in height that do not obstruct fire department rooftop operations, where approved by the *fire code official*.

1206.2.8.2 Separation.

Rooms containing stationary storage battery systems shall be separated from other areas of the building in accordance with Section 509.1 of the International Building Code. Battery systems shall be allowed to be in the same room with the equipment they support.

1206.2.8.3 Stationary battery arrays.

Storage batteries, prepackaged stationary storage battery systems, and pre-engineered stationary storage battery systems shall be segregated into stationary battery arrays not exceeding 50 kWh (180 megajoules) each. Each stationary battery array shall be spaced not less than 3 feet (914 mm) from other stationary battery arrays and from walls in the storage room or area. The storage arrangements shall comply with Chapter 10.

Exceptions:

1. Lead acid and nickel cadmium storage battery arrays.
2. Listed pre-engineered stationary storage battery systems and prepackaged stationary storage battery systems shall not exceed 250 kWh (900 megajoules) each where approved by the *fire code official*.
3. The *fire code official* is authorized to approve listed, pre-engineered and prepackaged battery arrays with larger capacities or smaller battery array spacing if large-scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving one array will not propagate to an adjacent array, and be contained within the room for a duration equal to the fire-resistance rating of the room separation specified in Table 509 of the International Building Code.

1206.2.8.4 Separate rooms.

Where stationary batteries are installed in a separate equipment room that can be accessed only by authorized personnel, they shall be permitted to be installed on an open rack for ease of maintenance.

1206.2.8.5 Occupied work centers.

Where stationary storage batteries are located in an occupied work center, they shall be housed in a noncombustible cabinet or other enclosure to prevent access by unauthorized personnel.

1206.2.8.5.1 Cabinets.

Where stationary batteries are contained in cabinets in occupied work centers, the cabinet enclosures shall be located within 10 feet (3048 mm) of the equipment that they support.

1206.2.8.6 Signage.

Approved signs shall be provided on or adjacent to all entry doors for battery storage rooms or areas and on enclosures of battery storage cabinets and walk-in units located outdoors, on rooftops or in open parking garages. Signs designed to meet both the requirements of this section and NFPA 70 shall be permitted. The signage shall include the following or equivalent:

1. "Energy Storage System", "Battery Storage System", "Capacitor Energy Storage System". or the equivalent.
2. The identification of the electrochemical battery energy storage system technology present, e.g., "Energized Electrical Circuits".
3. If water reactive electrochemical battery energy storage system are present the signage shall include "APPLY NO WATER"
4. Current contact information, including phone number, for personnel authorized to service the equipment and fire mitigation personnel shall be permanently affixed to the sign.

Exception: Existing stationary storage battery systems shall be permitted to include the signage required at the time it was installed.

1206.2.8.6.1 Electrical disconnects.

Where the stationary storage battery system disconnecting means is not within sight of the main service disconnecting means, placards or directories shall be installed at the location of the main service disconnecting means indicating the location of stationary storage battery system disconnecting means in accordance with NFPA 70.

1206.2.8.6.2 Cabinet signage.

Battery storage cabinets provided in occupied work centers in accordance with Section 1206.2.8.5 shall have exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system. There shall be signs within the cabinet that indicate the relevant electrical and chemical hazards, as required by Section 1206.2.12.

1206.2.8.6 Outdoor installations.

Stationary storage battery systems located outdoors shall comply with Sections 1206.2.8.7 through 1206.2.8.7.4, in addition to all applicable requirements of Section 1206.2. Installations in outdoor enclosures or containers that can be occupied for servicing, testing, maintenance and other functions shall be treated as battery storage rooms.

Remote outdoor installations include stationary battery systems located more than 100 feet from buildings, property lines, public ways, stored combustible storage, hazardous materials, high piled stock and other exposure hazards.

Installations near exposures include all outdoor stationary battery systems that are not more than 100 feet from buildings, property lines, public ways, stored combustible storage, hazardous materials, high piled stock and other exposure hazards.

Exception: Stationary battery arrays in noncombustible containers shall not be required to be spaced 3 feet (914 mm) from the container walls.

TABLE 1206.2.8.7 OUTDOOR INSTALLATIONS

Compliance Required	Remote Installations	Installations Near Exposures
General Installation Requirements	Yes	Yes
Size and separation	No	Yes (a)
Smoke and automatic fire detection	Yes	Yes
Fire suppression systems	Yes (b)	Yes
Maximum enclosure size	Yes	Yes
Vegetation control	Yes	Yes
Means of egress separation	Yes	Yes
Clearance to exposures	Yes	Yes
Technology specific protection	Yes	Yes

- a. In outdoor walk-in units, spacing is not required between energy storage systems units and the walls of the enclosure.
- b. Where *approved* by the *fire code official*, fire suppression systems are permitted to be omitted.

1206.2.8.7.1 Separation.

Stationary storage battery systems located outdoors shall be separated by a minimum \geq 10 feet (1524 mm) from the following:

1. Lot lines.
2. Public ways.
3. Buildings.
4. Stored combustible materials.
5. Hazardous materials.
6. High-piled stock.
7. Other exposure hazards.

Exception: The *fire code official* is authorized to approve smaller separation distances if largescale fire and fault condition testing conducted or witnessed and reported by an *approved* testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress from adjacent buildings, or adversely impact adjacent stored materials or structures.

1206.2.8.7.2 Means of egress.

Stationary storage battery systems located outdoors shall be separated from any means of egress as required by the *fire code official* to ensure safe egress under fire conditions, but not less than 10 feet (3048 mm).

Exception: The *fire code official* is authorized to approve lesser separation distances if large-scale fire and fault condition testing conducted or witnessed and reported by an *approved* testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress.

1206.2.8.7.3 Security of outdoor areas.

Outdoor areas in which stationary storage battery systems are located shall be secured against unauthorized entry and safeguarded in an *approved* manner.

1206.2.8.7.4 Walk-in units.

Where a stationary storage battery system includes an outer enclosure, the unit shall only be entered for inspection, maintenance and repair of batteries and electronics, and shall not be occupied for other purposes.

1206.2.9 Maximum allowable quantities.

Fire areas within buildings containing stationary storage battery systems exceeding the maximum allowable quantities in Table 1206.2.9 shall comply with all applicable Group H occupancy requirements in this code and the International Building Code.

Exception: Where *approved* by the *fire code official*, areas containing stationary storage batteries that exceed the amounts in Table 1206.2.9 shall be treated as incidental use areas and not Group H occupancies based on a hazardous mitigation analysis in accordance with Section 1206.2.3 and large-scale fire and fault condition testing conducted or witnessed and reported by an *approved* testing laboratory.

**TABLE 1206.2.9
MAXIMUM ALLOWABLE BATTERY QUANTITIES(d)**

<u>BATTERY TECHNOLOGY</u>	<u>MAXIMUM ALLOWABLE QUANTITIES(a)</u>	<u>GROUP H OCCUPANCY</u>
Flow batteries (b)	600 kWh	Group H-2
Lead acid, all types	Unlimited	Not Applicable
Lithium, all types	600 kWh	Group H-2
Nickel cadmium (Ni-Cd)	Unlimited	Not Applicable
Sodium, all types	600 kWh	Group H-2
Other battery technologies	200 kWh	Group H-2 (c)

For SI: 1 kilowatt hour = 3.6 megajoules.

- For batteries rated in amp-hours, Kilowatt-hours (kWh) shall equal rated battery voltage times the amp-hour rating divided by 1,000.
- Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte-type technologies.
- Shall be a Group H-4 occupancy if the *fire code official* determines that a fire or thermal runaway involving the battery technology does not represent a significant fire hazard.

1206.2.9.1 Mixed battery systems.

Where areas within buildings contain different types of storage battery technologies, the total aggregate quantities of batteries shall be determined based on the sum of percentages of each battery type quantity divided by the maximum allowable quantity of each battery type. If the sum of the percentages exceeds 100 percent, the area shall be treated as a Group H occupancy in accordance with Table 1206.2.9.

1206.2.10 Storage batteries and equipment.

The design and installation of storage batteries and related equipment shall comply with Sections 1206.2.10.1 through 1206.2.10.8.

Battery storage systems installations shall comply with the requirements of this Section in accordance with the applicable requirements of Table 1206.2.10

**TABLE 1206.2.10
BATTERY TECHNOLOGY SPECIFIC**

<u>Compliance Required (b)</u>	<u>Battery Technology</u>	<u>Other Battery Storage Systems and Battery Technologies (b)</u>
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	<u>Lead-acid</u>	<u>Ni-Cad & NiMH</u>	<u>Lithium-ion</u>	<u>Flow</u>	
Exhaust ventilation	Yes	Yes	Yes	Yes	Yes
Spill control and neutralization	Yes (c)	Yes (c)	No	Yes	Yes
Explosion control	Yes (a)	Yes (a)	Yes	Yes	Yes
Safety Caps	Yes	Yes	No	Yes	Yes
Thermal runaway	Yes (d)	Yes	Yes (e)	Yes	Yes (e)

a. Not required for lead-acid and nickel cadmium batteries at facilities under the exclusive control of communications utilities that comply with NFPA 76 and operate at less than 50 VAC and 60 VDC.

b. Protection shall be provided unless documentation acceptable to the *fire code official* in accordance with the 2021 *International Fire Code* Section 104.7.2, provides justification why the protection is not necessary based on the technology used.

c. Applicable to vented (i.e., flooded) type nickel cadmium and lead acid batteries.

d. Not required for vented (i.e., flooded) type lead acid batteries.

e. The thermal runaway protection is permitted to be part of a battery management system that has been evaluated with the battery as part of the evaluation to UL 1973.

1206.2.10.1 Listings.

Storage batteries and battery storage systems shall comply with the following:

1. Storage batteries shall be listed in accordance with UL 1973.
2. Prepackaged and pre-engineered stationary storage battery systems shall be listed in accordance with UL 9540.

Exception: Lead-acid batteries are not required to be listed.

1206.2.10.2 Prepackaged and pre-engineered systems.

Prepackaged and pre-engineered stationary storage battery systems shall be installed in accordance with their listing and the manufacturer's instructions.

1206.2.10.3 Energy management system.

An *approved* energy management system shall be provided for battery technologies other than lead-acid and nickel cadmium for monitoring and balancing cell voltages, currents and temperatures within the manufacturer's specifications. The system shall transmit an alarm signal to an *approved, constantly attended* location and to an *approved* annunciator panel if potentially hazardous temperatures or other conditions such as short circuits, over voltage or under voltage are detected.

1206.2.9.1.1 Annunciator panel.

The *approved* annunciator panel shall visibly indicate any hazardous temperature, *gases* or other conditions. The location of the annunciator panel shall be *approved by the fire code official*.

1206.2.10.4 Battery chargers.

Battery chargers shall be compatible with the battery chemistry and the manufacturer's electrical ratings and charging specifications. Battery chargers shall be listed and labeled in accordance with UL 1564 or provided as part of a listed pre-engineered or prepackaged stationary storage battery system.

1206.2.10.5 Inverters.

Inverters shall be listed and labeled in accordance with UL 1741. Only inverters listed and labeled for utility interactive system use and identified as interactive shall be allowed to operate in parallel with the electric utility power system to supply power to common loads.

1206.2.10.6 Safety caps.

Where required by Table 1206.2.10, batteries shall be provided with flame-arresting safety caps.

1206.2.10.7 Thermal runaway.

Where required by Table 1206.2.10 storage batteries shall be provided with a listed device or other *approved* method to prevent, detect and control thermal runaway.

1206.2.10.8 Toxic and highly toxic gas.

Stationary storage battery systems that have the potential to release toxic and highly toxic gas during charging, discharging and normal use conditions shall comply with Section 1206.2.11.3 and Chapter 60.

1206.2.11 Fire protection and life safety systems.

Fire- protection and life safety systems shall be provided in accordance with Sections 1206.2.11.1 through 1206.2.11.7. All alarm, and supervisory signals from the fire protection and life safety systems shall be transmitted to a central station, proprietary or remote station service in accordance with NFPA 72, and to an *approved* annunciator panel.

1206.2.11.1 Fire-extinguishing systems.

Rooms and areas within buildings and walk-in units containing electrochemical battery energy storage systems shall be equipped with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1. Commodity classifications for specific technologies of storage batteries shall be in accordance with Chapter 5 of NFPA 13. If the storage battery types are not addressed in Chapter 5 of NFPA 13, the *fire code official* is authorized to approve the fire-extinguishing system based on full scale fire and fault condition testing conducted or witnessed and reported by an *approved* laboratory.

Exception: Spaces or areas containing stationary storage battery systems used exclusively for telecommunications equipment in accordance with Section 903.2.

1206.2.11.1.1 Fire-extinguishing systems.

Rooms and areas within buildings and walk-in units containing electrochemical battery energy storage systems shall be protected by an automatic fire suppression system designed and installed in accordance with the most stringent of the following:

1. An automatic sprinkler system designed and installed in accordance with Section 903.3.1.1 with a minimum density of 0.6 gpm/ft.² based on the fire area or 2,500 ft.² (232 m²) design area, whichever is smaller.
2. Where *approved*, an automatic sprinkler system designed and installed in accordance with Section 903.3.1.1 with a sprinkler hazard classification based on large scale fire testing.
3. An alternate automatic fire extinguishing system designed and installed in accordance with Section 904, provided the installation is *approved* by the *fire code official* based on large scale fire testing.

Exception: Fire suppression systems for lead acid and nickel cadmium battery systems at facilities under the exclusive control of communications utilities that operate at less than 50 VAC and 60 VDC shall be provided where required by NFPA 76.

1206.11.1.2 Fire department connections.

Fire Department Connections shall be installed in an *approved* location.

1206.11.1.3 Hydrants.

Fire hydrants shall be installed and maintained in accordance with Chapter 5 and Chapter 9.

1206.11.1.4 Alternative fire-extinguishing systems.

Battery systems that utilize water-reactive materials shall be protected by an *approved* alternative automatic fire extinguishing system in accordance with Section 904. The system shall be listed for protecting the type, arrangement, and quantities of storage batteries in the room. The *fire code official* shall be permitted to approve the alternative fire extinguishing system based on full scale fire and fault condition testing conducted or witnessed and reported by an *approved* laboratory.

1206.2.11.2 Smoke detection system.

An *approved automatic smoke detection system* shall be installed in rooms containing *stationary storage battery systems* in accordance with Section 907.2.

1206.2.11.3 Exhaust Ventilation.

Where required by [Table 1206.2.10](#), ventilation of rooms containing stationary storage battery systems shall be provided in accordance with the *International Mechanical Code* and one of the following:

1. The ventilation system shall be designed to limit the maximum concentration of flammable gas to 25 percent of the lower flammability limit, or for hydrogen, 10 percent of the total volume of the room.
2. Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute (cfm) per square foot [0.00508 m³/(s • m²)] of floor area, but not less than 150 cfm (4 m³ /min). The exhaust system shall be designed to provide air movement across all parts of the floor for gases having a vapor density greater than air and across all parts of the vault ceiling for gases having a vapor density less than air.

1206.2.11.3.1 Cabinet ventilation.

Where cabinets located in occupied spaces contain storage batteries that are required by [Table 1206.2.10](#) to be provided with ventilation, the cabinet shall be provided with ventilation in accordance with Section 1206.2.11.3.

1206.2.11.3.2 Supervision.

Required mechanical ventilation systems for rooms and cabinets containing storage batteries shall be supervised by an *approved* central station, proprietary or remote station service or shall initiate an audible and visual signal at an *approved* constantly attended on-site location.

1206.2.11.3.3 Standby power.

[Required Mechanical exhaust ventilation and HVAC systems shall be provided to maintain the desired building environment with a minimum of 6 hours of standby power in accordance with *International Building Code*.](#)

[Separation shall be in accordance with NFPA 70.](#)

[Where the building, or a portion of the building, served by the mechanical exhaust ventilation is intended to remain operational/occupied during a utility power outage, through the use of an electrical standby power system, whether required or optional; the mechanical exhaust ventilation shall be connected to both the normal electrical service and emergency or standby power system for equivalent time periods.](#)

1206.2.11.3.4 Mechanical exhaust ventilation controls.

[Clearly identified separate switches shall be provided to both to activate the mechanical exhaust ventilation system and to shutoff the ventilation system. Control switches shall be located outside of the rooms or building\(s\) containing the storage battery systems in a location *approved* by the *fire code official*.](#)

1206.2.11.4 Gas detection system.

Where required by Section 1206.2.3 or 1206.2.10.8 or 1206.2.12, rooms containing stationary storage battery systems shall be protected by a gas detection system complying with IFC Section 916. The gas detection system shall be designed to activate where the level of flammable gas exceeds 10 percent of the lower flammable limit (LFL), or where the level of toxic or highly toxic gas exceeds one half of the IDLH.

1206.2.11.4.1 System activation.

Activation of the gas detection system shall result in all the following:

1. Initiation of distinct audible and visible alarms in the battery storage room.
2. Transmission of an alarm to an *approved* location.
3. De-energizing of the battery charger.
4. Activation of the mechanical ventilation system, where the system is interlocked with the gas detection system.

Exception: Lead-acid and nickel-cadmium stationary storage battery systems shall not be required to comply with Items 1, 2 and 3.

1206.2.11.5. Spill control and neutralization.

Where required by Table 1206.2.10, approved methods and materials shall be provided for the control and neutralization of spills of electrolyte or other hazardous materials in areas containing stationary storage batteries as follows:

1. For batteries with free-flowing electrolyte, the method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a pH between 5.0 and 9.0.
2. For batteries with immobilized electrolyte, the method and material shall be capable of neutralizing a spill of 3.0 percent of the capacity of the largest cell or block in the room to a pH between 5.0 and 9.0.

1206.2.11.5.1 Spill control barrier.

Each rack of batteries, or group of racks shall be provided with a liquid-tight 4-inch (102 mm) spill control barrier which extends at least 1-inch (25 mm) beyond the battery rack in all directions.

1206.2.11.6 Explosion Control.

Where required by Table 1206.2.10, explosion control, complying with Section 911, NFPA 68 and NFPA 69, shall be provided for rooms, areas or walk-in units containing electrochemical battery energy storage system technologies.

Exceptions:

1. Where approved, explosion control is permitted to be waived by the *fire code official* based on large scale fire testing which demonstrates that flammable gases are not liberated from electrochemical battery energy storage system cells or modules.
2. Where approved, explosion control is permitted to be waived by the *fire code official* based on documentation provided in accordance with Section 104.7 that demonstrates that the electrochemical battery energy storage system technology to be used does not have the potential to release flammable gas concentrations in excess of 25 percent of the lower flammable limit (LFL) anywhere in the room, area, walk-in unit or structure under thermal runaway or other fault conditions.

1206.2.11.7 Emergency energy release.

An *approved* means must be provided to safely release stored energy from the batteries in an emergency situation.

1206.2.12 Specific battery-type requirements.

This section includes requirements applicable to specific types of storage batteries. Stationary storage battery systems with more than one type of storage battery shall comply with requirements applicable to each battery type.

Ventilation, spill control and neutralization, explosion control, safety caps and thermal runaway shall be required in accordance with Table 1206.2.10

1206.2.12.1 Lead-acid storage batteries.

Stationary storage battery systems utilizing lead-acid storage batteries shall comply with Tables 1206.2.9 and 1206.2.10 and the following:

- 1. The signage in Section 1206.2.8.6 shall indicate the room contains lead-acid batteries.

1206.2.12.2 Nickel-cadmium (Ni-Cd) storage batteries.

Stationary storage battery systems utilizing nickel cadmium (Ni-Cd) storage batteries shall comply with Tables 1206.2.9 and 1206.2.10 and the following:

- 1. The signage in Section 1206.2.8.6 shall indicate the room contains lead-acid batteries.

1206.2.12.3 Lithium-ion storage batteries. The signage in Section 1206.2.8.6 shall indicate the type of lithium batteries contained in the room.

1206.2.12.4 Sodium-beta storage batteries. Stationary storage battery systems utilizing sodium-beta storage batteries shall comply with Tables 1206.2.9 and 1206.2.10 and the following:

- 1. The signage in Section 1206.2.8.6 shall indicate the type of sodium batteries in the room and include the instructions, "APPLY NO WATER."

1206.2.12.5 Flow storage batteries.

Stationary storage battery systems utilizing flow storage batteries shall comply with Tables 1206.2.9 and 1206.2.10 and the following:

- 1. The signage required in Section 1206.2.8.6 shall indicate the type of flow batteries in the room.

1206.2.12.6 Other battery technologies.

Stationary storage battery systems utilizing battery technologies other than those described in Sections 1206.2.12.1 through 1206.2.12.5 shall comply with Tables 1206.2.9 and 1206.2.10 and the following:

- 1. Gas detection systems complying with Section 916 shall be provided in accordance with Section 1206.2.11.4 where the batteries have the potential to produce toxic or highly toxic gas in the storage room or cabinet in excess of the permissible exposure limits (PEL) during charging, discharging and normal system operation.
- 2. In addition to the signage required in Section 1206.2.8.6, the marking shall identify the type of batteries present, describe the potential hazards associated with the battery type, and indicate that the room contains energized electrical circuits.

1206.2.13 Special Installations.

Rooftop and open parking garage battery energy storage system installations shall comply with Sections 1206.2.13.1 through 1206.2.13.6. Signage shall comply with section 1206.2.8.6.

TABLE 1206.2.13 SPECIAL INSTALLATIONS

Compliance Required	Rooftops	Open Parking Garages
General Installation Requirements	Yes	Yes
Size and separation	Yes	Yes
Smoke and automatic fire detection	Yes	Yes
Maximum enclosure size	Yes	Yes
Means of egress separation	Yes	Yes
Clearance to exposures	Yes	Yes
Fire suppression systems	Yes	Yes
Technology specific protection	Yes	Yes

1206.2.13.1 Rooftop installations.

For the purpose of Table 1206.2.13, rooftop installations are those located on the roofs of buildings.

1206.2.13.2 Open parking garage installations.

For the purpose of Table 1206.2.13, open parking garage installations are those located in a structure or portion of a structure that complies with Section 406.5 of the *International Building Code*.

1206.2.13.3 Clearance to exposures.

Battery storage systems located on rooftops and in open parking garages shall be separated by a minimum 10 feet (3048 mm) from the following exposures:

1. Buildings, except the building on which rooftop battery energy storage system is mounted
2. Any portion of the building on which a rooftop system is mounted that is elevated above the rooftop on which the system is installed
3. Lot lines
4. Public ways
5. Stored combustible materials
6. Locations where motor vehicles can be parked
7. Hazardous materials
8. Other exposure hazards

Exceptions:

1. Clearances are permitted to be reduced to 3 feet (914 mm) where a 1-hour free standing fire barrier, suitable for exterior use, and extending 5 feet (1524 mm) above and extending 5 feet (1524 mm) beyond the physical boundary of the battery energy storage system installation is provided to protect the exposure.
2. Clearances are permitted to be reduced to 3 feet (914 mm) where a weatherproof enclosure constructed of noncombustible materials is provided over the battery energy storage system and it has been demonstrated that a fire within the enclosure will not ignite combustible materials outside the enclosure.

1206.2.13.4 Fire suppression systems.

Battery storage systems located in walk-in units on rooftops or in walk-in units in open parking garages shall be provided with automatic fire suppression systems within the battery energy storage system enclosure in accordance with Section 1206.2.11.1. Areas containing battery energy storage system other than walk-in units in open parking structures on levels not open above to the sky shall be provided with an automatic fire suppression system complying with Section 1206.2.11.1.

1206.2.13.5 Rooftop installations.

Battery storage systems and associated equipment that are located on rooftops and not enclosed by building construction shall comply with the following:

1. Stairway access to the roof for emergency response and fire department personnel shall be provided either through a bulkhead from the interior of the building or a stairway on the exterior of the building.
2. Service walkways at least 5 feet (1524 mm) in width shall be provided for service and emergency personnel from the point of access to the roof to the system.
3. Battery storage systems and associated equipment shall be located from the edge of the roof a distance equal to at least the height of the system, equipment, or component but not less than 5 feet (1524 mm).

4. The roofing materials under and within 5 feet (1524 mm) horizontally from a battery storage systems or associated equipment shall be noncombustible or shall have a Class A rating when tested in accordance with ASTM E108 or UL 790.
5. A Class I standpipe outlet shall be installed at an *approved* location on the roof level of the building or in the stairway bulkhead at the top level.
6. The battery storage systems shall be the minimum of 10 feet (3048 mm) from the fire service access point on the roof top.

1206.2.13.6 Open parking garages.

Battery storage systems and associated equipment that are located in open parking garages shall comply with all of the following:

1. Battery storage systems shall not be located within 50 feet (15,240 mm) of air inlets for building HVAC systems.
Exception: This distance shall be permitted to be reduced to 25 feet (7620 mm) if the automatic fire alarm system monitoring the radiant-energy sensing detectors de-energizes the ventilation system connected to the air intakes upon detection of fire.
2. Battery storage systems shall not be located within 25 feet (7620 mm) of exits leading from the attached building where located on a covered level of the parking structure not directly open to the sky above.
3. An *approved* fence with a locked gate or other *approved* barrier shall be provided to keep the general public at least 5 feet (1024 mm) from the outer enclosure of the battery energy storage system.

1206.3 Capacitor energy storage systems.

Capacitor energy storage systems having capacities exceeding 3 kWh (10.8 megajoules) shall comply with Sections 1206.3 through 1206.3.2.6.1.

Exception: Capacitors regulated by NFPA 70, Chapter 460, and capacitors included as a component part of other listed electrical equipment are not required to comply with this section.

1206.3.1 Permits.

Permits shall be obtained from the Fire Department for the installation of capacitor energy storage systems in accordance with Section 105.7.3.

1206.3.2 Location and construction.

Rooms and areas containing capacitor energy storage systems shall be designed, located, and constructed in accordance with Sections 1206.3.2 through 1206.3.2.5.

1206.3.2.1 Location.

Capacitor energy storage systems shall not be located in areas where the floor is located more than 75 feet (22,860 mm) above the lowest level of fire department vehicle access, or where the floor level is more than 30 feet (9144 mm) below the finished floor of the lowest level of exit discharge.

1206.3.2.2 Separation.

Rooms containing capacitor energy storage systems shall be separated from the following occupancies by fire barriers or horizontal assemblies, or both, constructed in accordance with the *International Building Code*.

1. Group B, F, M, S and U occupancies by 1-hour fire resistance-rated construction.
2. Group A, E, I and R occupancies by 2-hour fire resistance rated construction.

1206.3.2.3 Capacitor arrays.

Capacitor energy storage systems shall be segregated into capacitor arrays not exceeding 50 kWh (180 megajoules) each. Each array shall be spaced not less than 3 feet (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with Chapter 10.

Exception: Capacitor energy storage systems in noncombustible containers located outdoors shall not be required to be spaced 3 feet (914 mm) from the container walls.

1206.3.2.4 Signage.

Approved signs shall be provided on doors or in locations adjacent to the entrances to capacitor energy storage system rooms and shall include the following or equivalent verbiage and information:

1. "CAPACITOR ENERGY STORAGE ROOM."
2. "THIS ROOM CONTAINS ENERGIZED ELECTRICAL CIRCUITS."
3. An identification of the type of capacitors present and the potential hazards associated with the capacitor type.

1206.3.2.5 Electrical disconnects.

Where the capacitor energy storage system disconnecting means is not within sight of the main service disconnecting means, placards or directories shall be installed at the location of the main service disconnecting means identifying the location of the capacitor energy storage system disconnecting means in accordance with NFPA 70.

1206.3.2.6 Outdoor installation.

Capacitor energy systems located outdoors shall comply with Sections 1206.3.2.6 through 1206.3.2.6.4 in addition to all applicable requirements of Section 1206.3. Installations in outdoor enclosures or containers that can be occupied for servicing, testing, maintenance and other functions shall be treated as capacitor storage rooms.

Exception: Capacitor arrays in noncombustible containers shall not be required to be spaced 3 feet (914 mm) from the container walls.

1206.3.2.6.1 Separation. Capacitor energy systems located outdoors shall be not less than 5 feet (1524 mm) from the following:

1. Lot lines.
2. Public ways.
3. Buildings.
4. Stored combustible materials.
5. Hazardous materials.
7. High-piled stock.
8. Other exposure hazards.

Exception: The *fire code official* is authorized to approve lesser separation distances if large-scale fire and fault condition testing conducted or witnessed and reported by an *approved* testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress from adjacent buildings, or adversely impact adjacent stored materials or structures.

1206.3.2.6.2 Means of egress.

Capacitor energy storage systems located outdoors shall be separated from any means of egress as required by the *fire code official* to ensure safe egress under fire conditions, but not less than 10 feet (3048 mm).

Exception: The *fire code official* is authorized to approve lesser separation distances if large-scale fire and fault condition testing conducted or witnessed and reported by an *approved* testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress.

1206.3.2.6.3 Security of outdoor areas.

Outdoor areas in which *capacitor energy storage systems* are located shall be secured against unauthorized entry and safeguarded in an *approved* manner.

1206.3.2.6.4 Walk-in units.

Where a capacitor energy storage system includes an outer enclosure, the unit shall only be entered for inspection, maintenance and repair of capacitors and electronics, and shall not be occupied for other purposes.

1206.3.3 Maximum allowable quantities.

Fire areas within buildings containing capacitor energy storage systems that exceed 600 kWh of energy capacity shall comply with all applicable Group H occupancy requirements in this code and the *International Building Code*.

1206.3.4 Capacitors and equipment.

The design and installation of capacitor energy storage systems and related equipment shall comply with Sections 1206.3.4.1 through 1206.3.4.5.

1206.3.4.1 Listing. Capacitors and *capacitor energy storage systems* shall comply with the following:

1. Capacitors shall be listed in accordance with UL 1973.
2. Prepackaged and pre-engineered stationary capacitor energy storage systems shall be listed in accordance with UL 9540.

1206.3.4.2 Prepackaged and pre-engineered systems.

In addition to other applicable requirements of this code, prepackaged and pre-engineered capacitor energy storage systems shall be installed in accordance with their listing and the manufacturer's instructions.

1206.3.4.3 Energy management system.

An *approved* energy management system shall be provided for monitoring and balancing capacitor voltages, currents, and temperatures within the manufacturer's specifications. The system shall transmit an alarm signal to an *approved* location if potentially hazardous temperatures or other conditions such as short circuits, over voltage or under voltage are detected.

1206.3.4.4 Capacitor chargers.

Capacitor chargers shall be compatible with the capacitor manufacturer's electrical ratings and charging specifications. Capacitor chargers shall be listed and labeled in accordance with UL 1564 or provided as part of a listed pre-engineered or prepackaged *capacitor energy storage system*.

1206.3.4.5 Toxic and highly toxic gas.

Capacitor energy storage systems that have the potential to release toxic and highly toxic materials during charging, discharging and normal use conditions shall comply with Chapter 60.

1206.3.5 Fire-extinguishing and detection systems.

Fire extinguishing and smoke detection systems shall be provided in capacitor energy storage system rooms in accordance with Sections 1206.3.5.1 through 1206.3.5.2.

1206.3.5.1 Fire-extinguishing systems.

Rooms containing *capacitor energy storage systems* shall be equipped with an automatic sprinkler system installed in accordance with Section 903.3.1.1. Commodity classifications for specific capacitor technologies shall be in accordance with Chapter 5 of NFPA 13. If the capacitor types are not addressed

in Chapter 5 of NFPA 13, the *fire code official* is authorized to approve the *automatic sprinkler system* based on full-scale fire and fault condition testing conducted by an *approved* laboratory.

1206.3.5.1.1 Alternative fire-extinguishing systems.

Capacitor energy storage systems that utilize water-reactive materials shall be protected by an *approved* alternative *automatic fire-extinguishing system* in accordance with Section 904. The system shall be listed for protecting the type, arrangement, and quantities of capacitors in the room. The *fire code official* shall be permitted to approve the system based on full-scale fire and fault condition testing conducted by an *approved* laboratory.

1206.3.5.2 Smoke detection system.

An *approved* automatic smoke detection system shall be installed in rooms containing *capacitor energy storage systems* in accordance with Section 907.2.

1206.3.5.3 Ventilation.

Where capacitors release flammable gases during normal operating conditions, ventilation of rooms containing capacitor energy storage systems shall be provided in accordance with the *International Mechanical Code* and one of the following:

1. The ventilation system shall be designed to limit the maximum concentration of flammable gas to 25 percent of the lower flammability limit.
2. Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute (cfm) per square foot [$0.00508 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of floor area, but not less than 150 cfm ($4 \text{ m}^3/\text{min}$).

The exhaust system shall be designed to provide air movement across all parts of the floor for gases having a vapor density greater than air and across all parts of the ceiling for gases having a vapor density less than air.

1206.3.5.3.1 Supervision.

Required mechanical ventilation systems for rooms containing capacitor energy storage systems shall be supervised by an *approved* central station, proprietary or remote station service, or shall initiate an audible and visible signal at an *approved*, constantly attended on-site location.

1206.3.5.4 Spill control and neutralization.

Where capacitors contain liquid electrolyte, approved methods and materials shall be provided for the control and neutralization of spills of electrolyte or other hazardous materials in areas containing capacitors as follows:

1. For capacitors with free-flowing electrolyte, the method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a pH between 5.0 and 9.0.
2. For capacitors with immobilized electrolyte, the method and material shall be capable of neutralizing a spill of 3.0 percent of the capacity of the largest cell or block in the room to a pH between 5.0 and 9.0.

1206.3.6 Testing, maintenance, and repair.

Capacitors and associated equipment and systems shall be tested and maintained in accordance with the manufacturer's instructions. Any capacitors or system components used to replace existing units shall be compatible with the capacitor charger, energy management systems, other capacitors, and other safety systems. Introducing different capacitor technologies into the *capacitor energy storage system* shall be treated as a new installation and require approval by the *fire code official* before the replacements are introduced into service.

1206.4 Energy storage system in Group R-3 and R-4 occupancies.

Energy storage systems in Group R-3 and R-4 occupancies shall be installed and maintained in accordance with this section. The temporary use of an owner or occupant's electric powered vehicle as an energy storage system shall be in accordance with this Section.

Exception: Energy Storage Systems in R-3 and R-4 occupancies with a capacity of 3 kWh or less.

1206.4.1 Equipment listings.

Energy storage system shall be listed and labeled for residential use in accordance with UL 9540.

Exceptions:

1. Where *approved*, repurposed unlisted battery systems from electric vehicles may be installed outdoors or in detached dedicated cabinets located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways.
2. Energy storage system less than 1 kWh.

1206.4.2 Installation.

Energy storage system shall be installed in accordance with the manufacturer's instructions and their listing.

1206.4.2.1 Spacing.

Individual units shall be separated from each other by at least 3 feet (914 mm) of spacing unless smaller separation distances are documented and *approved* by the *fire code official* to be adequate based on large scale fire testing.

1206.4.3 Location.

Energy storage system shall only be installed in the following locations:

1. Detached garages and detached accessory structures.
2. Attached garages separated from the dwelling unit living space and sleeping units in accordance with Section 406.3.2 of the *International Building Code*.
3. Outdoors on exterior walls in accordance with 1206.4.3.1
4. Other Locations as *approved* by the *Fire code official*.

1206.4.3.1 Exterior wall installations.

Energy storage system shall be permitted to be installed outdoors on exterior walls of buildings when all of the following conditions are met:

1. The maximum energy capacity of individual energy storage system units shall not exceed 20 kWh.
2. The energy storage system shall comply with applicable requirements in Sections 1206.
3. The energy storage system shall be installed in accordance with the manufacturer's instructions and their listing.
4. Individual energy storage system units shall be separated from each other by not less than 3 feet (914 mm).
5. The energy storage system shall be separated from doors, windows, operable openings into buildings, or HVAC inlets by at least 5 feet (1524 mm).

Exception: Where *approved* by the *fire code official*, smaller separation distances in items 4 and 5 may be permitted based on large scale fire testing

1206.4.4 Energy ratings.

Individual energy storage system units shall have a maximum rating of 20 kwh. The aggregate rating structure shall not exceed:

1. 80 kWh in attached or detached garages and detached accessory structures.
2. 80 kWh on exterior walls.
3. 80 kWh outdoors on the ground.

1206.4.5 Electrical installation.

Energy storage system shall be installed in accordance with NFPA 70. Inverters shall be listed and labeled in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.

1206.4.6 Fire detection.

Rooms and areas within dwellings units, sleeping units and attached garages in which energy storage systems are installed in attached garages shall be protected by smoke alarms in accordance with Section 907.2.10. A heat detector listed and interconnected to the smoke alarms shall be installed in locations within dwelling units, sleeping units and attached garages where smoke alarms cannot be installed based on their listing.

1206.4.7 Protection from impact.

Stationary storage battery systems installed in a location subject to vehicle damage shall be protected by approved barriers. Appliances in garages shall also be installed in accordance with Section 304.3 of the *International Mechanical Code*.

1206.4.8 Ventilation.

Indoor installations of energy storage system that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section 1206.2.11.3.

1206.4.9 Toxic and highly toxic gas.

Energy storage system that have the potential to release toxic or highly toxic gas during charging, discharging and normal use conditions shall not be installed within Group R-3 or R-4 occupancies.
