



AGENDA

COMMITTEE OF THE WHOLE WORKSESSION

TUESDAY, FEBRUARY , 2024

6:30 PM

CITY HALL LARGE CONFERENCE ROOM #119

1. Fire Department:

- a. Recommend adoption of Ordinance to Amend the [Kentwood Fire Prevention Code](#) to regulate energy systems.

PUBLIC COMMENT.

The City of Kentwood does not discriminate on the basis of disability in the admission or access to, or treatment or employment in, its programs or activities. The Human Resources Director, 4900 Breton Ave., SE has been designated to coordinate compliance with the non-discrimination requirements contained in Section 35.107 of the Department of Justice regulations. Information concerning the provisions of the American with Disabilities Act, and the rights provided thereunder, are available from the ADA coordinator.



MEMORANDUM

To: Mayor Kepley and Commissioners

From: Nancy M. Shane

Re: Amendment to Kentwood Fire Prevention Code for Energy Systems

Date: February 6, 2024

Action Requested: It is requested that the Committee of the Whole recommend to the City Commission adoption of an amendment to the Kentwood Fire Prevention Code to regulate energy systems and add related sections.

Background: Plans that include energy storage systems have been submitted to the Kentwood Fire Department for review. Some include large battery systems and alternatives to traditional energy sources. The current Fire Prevention Code does not sufficiently regulate these systems, making it difficult to enforce safety provisions.

The City of Kentwood adopted the 2015 International Fire Code (IFC), with amendments, as the Kentwood Fire Prevention Code. This is a companion code to the Michigan Building Code. Codes are typically updated every three years, but Michigan failed to adopt a 2018 code and it is unknown when the 2021 Michigan Building Code will be adopted. The 2015 IFC does not provide specific regulatory provisions for energy systems but the 2021 IFC does. Due to the Michigan-building code amendments that directly impact the fire code, we must wait for the state code before we can amend and adopt the 2021 IFC.

To allow Kentwood fire inspectors to enforce these regulations within the City of Kentwood, we are proposing to incorporate the 2021 IFC provisions into the Kentwood Fire Prevention Code. A similar process was followed in 2018 when marijuana processing regulations were added. The City Attorney has reviewed the proposed ordinance amendment. We request approval of the attached amendment to the City of Kentwood Code of Ordinances.

**CITY COMMISSION
CITY OF KENTWOOD
KENT COUNTY, MICHIGAN**

Commissioner _____, supported by Commissioner _____, moved the adoption of the following ordinance:

ORDINANCE NO. -24

AN ORDINANCE TO AMEND CHAPTER 22, ARTICLE 4, SECTION 22-104 OF THE CODE OF ORDINANCES, CITY OF KENTWOOD, MICHIGAN, TO ADD A NEW SECTION 917; ADD A NEW CHAPTER 12, SECTIONS 1201 THROUGH 1207, INCLUSIVE; AMEND CHAPTER 22 IN ITS ENTIRETY; ADD A NEW CHAPTER 40, SECTIONS 4001 THROUGH 4006, INCLUSIVE; AND ADD NEW REFERENCED STANDARDS TO CHAPTER 80

THE CITY OF KENTWOOD ORDAINS:

Section 1. Amendment of Section 22-104 to Add a New Section 917. That Chapter 22, Article 4, Section 22-104 of the Code of Ordinances, City of Kentwood, Michigan, is amended to add a new Section 917 to Chapter 9, Fire Protection and Life Safety Systems, to read as follows:

**SECTION 917
GAS DETECTION SYSTEMS**

917.1 Gas detection systems. Gas detection systems required by this code shall comply with Sections 917.2 through 917.11.

917.2 Permits. A construction permit is required for the installation of or modification to gas detection systems. Maintenance performed in accordance with this code is not considered a modification and shall not require a permit.

917.2.1 Construction documents. Documentation of the gas detection system design and equipment to be used that demonstrates compliance with the requirements of this code shall be provided with the application for permit.

917.3 Equipment. Gas detection system equipment shall be designed for use with the gases being detected and shall be installed in accordance with manufacturer's instructions.

917.4 Power connections. Gas detection systems shall be permanently connected to the building electrical power supply or shall be permitted to be cord connected to an unswitched receptacle using an *approved* restraining means that secures the plug to the receptacle.

917.5 Emergency and standby power. Standby or emergency power shall be provided or the gas detection system shall initiate a trouble signal at an *approved* location if the power supply is interrupted.

917.6 Sensor locations. Sensors shall be installed in *approved* locations where leaking gases are expected to accumulate.

917.7 Gas sampling. Gas sampling shall be performed continuously. Sample analysis shall be processed immediately after sampling, except as follows:

1. For HPM gases, sample analysis shall be performed at intervals not exceeding 30 minutes.
2. For toxic gases that are not HPM, sample analysis shall be performed at intervals not exceeding 5 minutes, in accordance with Section 6004.2.2.7.
3. Where a less frequent or delayed sampling interval is *approved*.

917.8 System activation. A gas detection alarm shall be initiated where any sensor detects a concentration of gas exceeding the following thresholds:

1. For flammable gases, a gas concentration exceeding 25 percent of the lower flammability limit (LFL).
2. For nonflammable gases, a gas concentration exceeding one-half of the IDLH, unless a different threshold is specified by the section of this code requiring a gas detection system.

Upon activation of a gas detection alarm, alarm signals or other required responses shall be as specified by the section of this code requiring a gas detection system. Audible and visible alarm signals associated with a gas detection alarm shall be distinct from fire alarm and carbon monoxide alarm signals.

917.9 Signage. Signs shall be provided adjacent to gas detection system alarm signaling devices that advise occupants of the nature of the signals and actions to take in response to the signal.

917.10 Fire alarm system connections. Gas sensors and gas detection systems shall not be connected to fire alarm systems unless *approved* and connected in accordance with the fire alarm equipment manufacturer's instructions.

917.11 Inspection, testing and sensor calibration. Inspection and testing of gas detection systems shall be conducted not less than annually. Sensor calibration shall be confirmed at the time of sensor installation and calibration shall be performed at the frequency specified by the sensor manufacturer.

Section 2. Amendment of Section 22-104 to Add a New Chapter 12. That Chapter 22, Article 4, Section 22-104 of the Code of Ordinances, City of Kentwood, Michigan, is amended to add a new Chapter 12, Sections 1201 through 1207, inclusive, to read as follows:

CHAPTER 12 ENERGY SYSTEMS

SECTION 1201 GENERAL

1201.1 Scope. The provisions of this chapter shall apply to the installation, operation, maintenance, repair, retrofitting, testing, commissioning and decommissioning 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 this chapter, Section 605 and NFPA 70.

1201.3 Mixed system installation. Where *approved*, the aggregate nameplate kWh energy of all energy storage systems 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

Battery system, stationary storage. A rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls and associated electrical equipment designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Battery Types. For the purposes of this code, certain types are defined as follows:

Flow battery. A type of storage battery that includes chemical components dissolved in two different liquids. Ion exchange, which provides the flow of electrical current, occurs through the membrane while both liquids circulate in their respective spaces.

Lead-acid battery. A storage battery that is comprised of lead electrodes immersed in a solution of water and sulphuric acid electrolyte.

Lithium metal polymer battery. A storage battery that is similar to the lithium ion battery except that it has a lithium metal anode in the place of the traditional carbon or graphite anode.

Lithium-ion battery. A storage battery with lithium ions serving as the charge carriers of the battery. The electrolyte is a polymer mixture of carbonates with an inorganic salt and can be in a liquid or a gelled polymer form. Lithiated metal oxide is typically a cathode and forms of carbon or graphite typically form the anode.

Nickel-cadmium (Ni-Cd) battery. An alkaline storage battery in which the positive active material is nickel oxide, the negative electrode contains cadmium and the electrolyte is a solution of water and potassium hydroxide.

Nickel-metal hydride (Ni-MH). An alkaline storage battery in which the positive active material is nickel oxide, the negative electrode is an intermetallic compound and the electrolyte is usually potassium hydroxide.

Stationary storage battery. A group of electrochemical cells interconnected to supply a nominal voltage of DC power to a suitably connected electrical load, designed for service in a permanent location.

Capacitor energy storage system. A stationary, rechargeable energy storage system consisting of capacitors, chargers, controls and associated electrical equipment designed to provide electrical power to a building or facility. The system is typically used to provide standby or emergency power, an uninterruptable power supply, load shedding, load sharing or similar capabilities.

Critical circuit. A circuit that requires continuous operation to ensure safety of the structure and occupants.

Emergency power system. A source of automatic electric power of a required capacity and duration to operate required life safety, fire alarm, detection and ventilation systems in the event of a failure of the primary power. Emergency power systems are required for electrical loads where interruption of the primary power could result in loss of human life or serious injuries.

Energy storage management system. An electronic system that protects energy storage systems from operating outside their safe operating parameters and disconnects electrical power to the ESS or places it in a safe condition if potentially hazardous temperatures or other conditions are detected.

Energy storage systems (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Energy storage system, electrochemical. An energy storage system that stores energy and produces electricity using chemical reactions. It includes, among others, battery ESS and capacitor ESS.

Energy storage system, mobile. An energy storage system capable of being moved and utilized for temporary energy storage applications, and not installed as fixed or stationary electrical equipment. The system can include integral wheels for transportation or be loaded on a trailer and unloaded for charging, storage and deployment.

Energy storage system, stationary. An energy storage system installed as fixed or stationary electrical equipment in a permanent location.

Energy storage system, walk-in unit. A prefabricated building that contains energy storage systems. It includes doors that provide walk-in access for personnel to maintain, test and service the equipment, and is typically used in outdoor and mobile ESS applications.

Energy storage system cabinet. A cabinet containing components of the energy storage system that is included in the [UL 9540](#) listing for the system. Personnel are not able to enter the enclosure other than reaching in to access components for maintenance purposes.

Energy storage system commissioning. A systematic process that provides documented confirmation that an energy storage system functions according to the intended design criteria and complies with applicable code requirements.

Energy storage systems decommissioning. A systematic process that provides documentation and procedures that allow an energy storage system to be safely de-energized, disassembled, readied for shipment or storage, and removed from the premises in accordance with applicable code requirements.

Fuel cell power system, stationary. A stationary energy generation system that converts the chemical energy of a fuel and oxidant to electric energy (DC or AC electricity) by an electrochemical process.

Field-fabricated fuel cell power system. A *stationary fuel cell power system* that is assembled at the job site and is not a pre-engineered or prepackaged factory-assembled fuel cell power system.

Pre-engineered fuel cell power system. A *stationary fuel cell power system* consisting of components and modules that are produced in a factory, and shipped to the job site for assembly.

Prepackaged fuel cell power system. A *stationary fuel cell power system* that is factory assembled as a single, complete unit and shipped as a complete unit for installation at the job site.

Portable generator. A mobile internal combustion engine-driven device that provides temporary electrical power. This includes hand portable, wheeled, trailer mounted, and motor vehicle-mounted generator sets. It does not include generators in permanent, fixed installations.

Standby power system. A source of automatic electric power of a required capacity and duration to operate required building, hazardous materials or ventilation systems in the event of a failure of the primary power. Standby power systems are required for electrical loads where interruption of the primary power could create hazards or hamper rescue or fire-fighting operations.

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.

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 one of the following methods:

1. A fire-resistant pipe-protection system that has been tested in accordance with UL 1489. The system shall be installed as tested and in accordance with the manufacturer's installation instructions, and shall have a 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 rating shall be reduced to 1 hour.
2. 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.
3. Other *approved methods*.

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* where new 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 1203.2.19.

1203.2.1 Ambulatory care facilities. Essential electrical systems for ambulatory care facilities shall be in accordance with Section 422 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 604 and 1009.

1203.2.3 Emergency responder communication coverage systems. Standby power shall be provided for inbuilding, two-way emergency responder communication coverage systems as required in Section 510. The standby power supply shall be capable of operating the in-building, two-way emergency responder communication coverage system at 100-percent system operation capacity for a duration of not less than 12 hours.

1203.2.4 Emergency voice/alarm communication systems. Standby power shall be provided for emergency voice/alarm communication systems in accordance with NFPA 72.

1203.2.5 Exhaust ventilation. Standby power shall be provided for mechanical exhaust ventilation systems as required in Section 1207.6.1.2.1. The system shall be capable of powering the required load for a duration of not less than 2 hours.

1203.2.6 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.

1203.2.7 Gas detection systems. Emergency power shall be provided for gas detection systems where required by Sections 1203.2.10 and 1203.2.17. Standby power shall be provided for gas detection systems where required by Sections 917.5 and 1207.6.1.2.4.

1203.2.8 Group I-2 occupancies. In Group I-2 occupancies, the essential electrical system for electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of Chapter 27 of the International Building Code and NFPA 99.

1203.2.9 Group I-3 occupancies. Power-operated sliding doors or power-operated locks for swinging doors in Group I-3 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.

1203.2.10 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.

1203.2.11 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.

1203.2.12 Special purpose horizontal sliding doors. In other than Group H occupancies, special-purpose horizontal sliding door assemblies permitted to be a component of a *means of egress* in accordance with Exception 6 to Section 1010.1.2 shall comply with all of the following criteria:

1. The doors shall be power operated and shall be capable of being operated manually in the event of power failure.

2. The doors shall be openable by a simple method without special knowledge or effort from the egress side or sides.
3. The force required to operate the door shall not exceed 30 pounds (133 N) to set the door in motion and 15 pounds (67 N) to close the door or open it to the minimum required width.
4. The door shall be openable with a force not to exceed 15 pounds (67 N) when a force of 250 pounds (1100 N) is applied perpendicular to the door adjacent to the operating device.
5. The door assembly shall comply with the applicable *fire protection rating* and, where rated, shall be self-closing or automatic closing by smoke detection in accordance with Section 716 of the *International Building Code*, shall be installed in accordance with NFPA 80 and shall comply with Section 716 of the *International Building Code*.
6. The door assembly shall have an integrated standby power supply.
7. The door assembly power supply shall be electrically supervised.
8. The door shall open to the minimum required width within 10 seconds after activation of the operating device.
9. The standby power supply shall have a capacity to operate not fewer than 50 closing cycles of the door.

1203.2.13 Hydrogen fuel gas rooms. Standby power shall be provided for hydrogen fuel gas rooms as required by Section 5808.7.

1203.2.14 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.

1203.2.15 Means of egress illumination. Emergency power shall be provided for *means of egress* illumination in accordance with Sections 1008.3 and 1104.5.1.

1203.2.16 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.

1203.2.17 Semiconductor fabrication facilities. Emergency power shall be provided for semiconductor fabrication facilities as required in Section 2703.15.

1203.2.18 Smoke control systems. Standby power shall be provided for smoke control systems as required in Section 909.11.

1203.2.19 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.

1203.3 Critical circuits. Required critical circuits shall be protected using one of the following methods:

1. Cables used for survivability of required critical circuits shall be *listed* in accordance with UL 2196 and shall have a *fire-resistance rating* of not less than 1 hour.
2. Electrical circuit protective systems shall have a *fire-resistance rating* of not less than 1 hour. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
3. Construction having a *fire-resistance rating* of not less than 1 hour.

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 and ambulatory care facilities. In Group I-2 occupancies and ambulatory care facilities, 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 and ambulatory care facilities. In Group I-2 occupancies and ambulatory care facilities, 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 PORTABLE GENERATORS

1204.1 Portable generators. The use, operation and maintenance of portable generators shall comply with this section.

1204.2 Listing. Portable generators manufactured after January 1, 2021, shall be *listed* and *labeled* in accordance with UL 2201.

1204.3 Operation and maintenance. Portable generators shall be operated and maintained in accordance with the manufacturer's instructions.

1204.4 Grounding. Portable generators shall be grounded in accordance with NFPA 70.

1204.5 Operating locations. Portable generators shall be operated only outdoors a minimum of 5 feet (1524 mm) from any building openings such as windows and doors or air intakes. Portable generators shall not be operated within buildings or enclosed areas. Additional separation shall be provided for tents, membrane structures and outdoor assembly events as specified in Chapter 31.

1204.6 Cords and wiring. Extension cords and temporary wiring used to connect portable generators shall be in accordance with Section 605 and shall be provided with GFCI protection.

1204.7 Connections to premise wiring. Connections to a premise wiring system shall comply with all of the following:

1. Power shall not be provided in a manner that "backfeeds" receptacles or the premise wiring system.
2. Connection to a premise served by commercial power shall be made through a *listed* transfer switch installed, used and maintained in accordance with NFPA 70.
3. Connection to buildings not served by commercial power shall comply with NFPA 70.

1204.8 Refueling. Portable generators shall not be refueled while operating.

1204.9 Storage and repair. Storage and repair of fuel-fired portable generators shall comply with Section 313.

1204.10 Fire extinguisher. A *listed* portable fire extinguisher complying with Section 906 with a minimum rating of 2-A:20-B:C shall be provided not more than 50 feet (15 240 mm) from the portable generator.

SECTION 1205 SOLAR PHOTOVOLTAIC POWER SYSTEMS

1205.1 General. Solar photovoltaic (PV) systems shall be installed in accordance with the *International Building Code* or *International Residential Code*. The electrical portion of solar PV systems shall be installed in accordance with NFPA 70. Rooftop-mounted solar photovoltaic systems shall be installed in accordance with Sections 1205.2 through 1205.4.3. Ground-mounted solar photovoltaic systems shall comply with Section 1205.5.

1205.2 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Sections 1205.2.1 through 1205.3.3. 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.

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.
2. Roof access, pathways and spacing requirements need not be provided where the *fire code official* has determined that rooftop operations will not be employed.
3. Building-integrated photovoltaic (BIPV) systems where the BIPV systems are *approved*, integrated into the finished roof surface and are *listed* in accordance with a national test standard developed to address Section 690.12(B)(2) of NFPA 70. The removal or cutting away of portions of the BIPV system during fire-fighting operations shall not expose a fire fighter to electrical shock hazards.

1205.2.1 Solar photovoltaic (PV) systems for Group R-3 buildings. Solar photovoltaic (PV) systems for Group R-3 buildings shall comply with Sections 1205.2.1.1 through 1205.2.3.

Exceptions:

1. These requirements shall not apply to structures designed and constructed in accordance with the *International Residential Code*.
2. These requirements shall not apply to roofs with slopes of 2 units vertical in 12 units horizontal (16.7-percent slope) or less.

1205.2.1.1 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.

1205.2.1.2 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 (914 mm) wide is required on both sides of a horizontal ridge.

1205.2.1.3 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.

1205.2.2 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.

1205.2.3 Building-integrated photovoltaic (BIPV) systems. Where building-integrated photovoltaic (BIPV) systems are installed in a manner that creates areas with electrical hazards to be hidden from view, markings shall be provided to identify the hazardous areas to avoid. The markings shall be reflective and be visible from grade.

Exception: BIPV systems *listed* in accordance with Section 690.12(B)(2) of NFPA 70, where the removal or cutting away of portions of the BIPV system during fire-fighting operations have been determined to not expose a fire fighter to electrical shock hazards.

1205.3 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 1205.3.1 through 1205.3.3.

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 1205.2.1.1 through 1205.2.1.3 are a suitable alternative.

1205.3.1 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).

1205.3.2 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.

1205.3.3 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. 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.
3. Smoke ventilation options between array sections shall be one of the following:
 - 3.1. A pathway not less than 8 feet (2438 mm) wide.
 - 3.2. 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.

1205.4 Buildings with rapid shutdown. Buildings with rapid shutdown solar photovoltaic systems shall have permanent labels in accordance with Sections 1205.4.1 through 1205.4.3.

1205.4.1 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 $\frac{3}{8}$ inch (10 mm) in black on a yellow background. The remaining characters shall be uppercase with a minimum height of $\frac{3}{16}$ inch (5 mm) in black on a white background. The label shall be in accordance with Figure 1205.4.1(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 $\frac{3}{8}$ 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 1205.4.1(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.

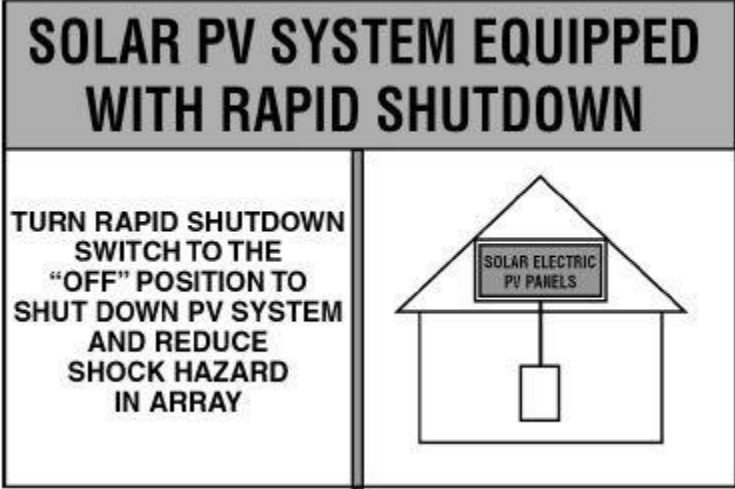


FIGURE 1205.4.1(1)
LABEL FOR SOLAR PV SYSTEMS THAT REDUCE SHOCK HAZARD WITHIN ARRAY AND SHUT DOWN CONDUCTORS LEAVING ARRAY

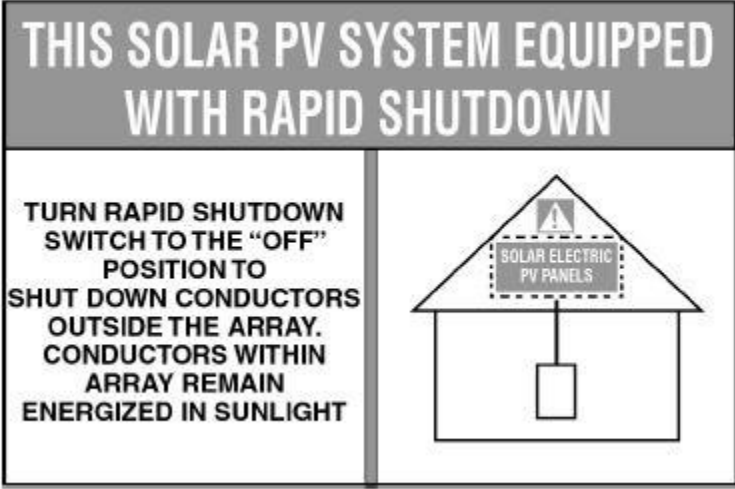


FIGURE 1205.4.1(2)

LABEL FOR SOLAR PV SYSTEMS THAT ONLY SHUT DOWN CONDUCTORS LEAVING THE ARRAY

1205.4.1.1 Diagram. The labels in Section 1205.4.1 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.

1205.4.1.2 Location. The rapid shutdown label in Section 1205.4.1 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.

1205.4.2 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 1205.4.1 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.

1205.4.3 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

1205.5 Ground-mounted photovoltaic panel systems. Ground-mounted photovoltaic panel systems shall be installed in accordance with this section. Setback requirements shall not apply to ground-mounted, free-standing photovoltaic arrays.

1205.5.1 Vegetation control. A clear, brush-free area of 10 feet (3048 mm) shall be required around the perimeter of the ground-mounted photovoltaic arrays. A maintained vegetative surface or a noncombustible base, *approved by the fire code official*, shall be installed and maintained under the photovoltaic arrays and associated electrical equipment installations.

SECTION 1206 STATIONARY FUEL CELL POWER SYSTEMS

1206.1 General. *Stationary fuel cell power systems* in new and existing occupancies shall comply with this section.

Exception: The temporary use of a fuel cell-powered electric vehicle to power a Group R-3 or R-4 building while parked shall comply with Section 1206.14.

1206.2 Permits. Permits shall be obtained for *stationary fuel cell power systems*.

1206.3 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 as follows.

3.1 **Technical assistance.** To determine the acceptability of technologies, processes, products, facilities, materials and uses attending the design, operation or use of a building or premises subject to inspection by the *fire code official*, the *fire code official* is authorized to require the *owner* or *owner's* authorized agent to provide, without charge to the jurisdiction, a technical opinion and report. The opinion and report shall be prepared by a qualified engineer, specialist, laboratory or fire safety specialty organization acceptable to the *fire code official* and shall analyze the fire safety properties of the design, operation or use of the building or premises and the facilities and appurtenances situated thereon, to recommend necessary changes. The *fire code official* is authorized to require design submittals to be prepared by, and bear the stamp of, a *registered design professional*.

3.2 The report shall be prepared by and bear the stamp of a *registered design professional* and shall include:

- 3.2.1. A fire risk evaluation.
- 3.2.2. An evaluation demonstrating that modules and components in the fuel cell power system comply with applicable requirements in CSA FC 1.
- 3.2.3. Documentation of the fuel cell power system's compliance with applicable NFPA 2 and NFPA 853 construction requirements.

1206.4 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.

1206.5 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.

Exception: The temporary use of a fuel cell-powered electric vehicle to power a Group R-3 or R-4 building while parked shall comply with Section 1206.14.

1206.6 Indoor installations. *Stationary fuel cell power systems* installed in indoor locations shall comply with Sections 1206.6 through 1206.6.2. For purposes of this section, an indoor location includes a roof and 50 percent or greater enclosing walls.

1206.6.1 Listed. *Stationary fuel cell power systems* installed indoors shall be specifically *listed* and *labeled* for indoor use.

1206.6.2 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*.

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.

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.

1206.7 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.

1206.8 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.

1206.9 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.

1206.10 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*.

1206.11 Ventilation and exhaust. Ventilation and exhaust for stationary fuel cell power systems shall be provided in accordance with NFPA 853.

1206.12 Fire protection. Fire protection systems for stationary fuel cell power system installations shall be provided in accordance with NFPA 853.

1206.13 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).

1206.13.1 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.

1206.14 Group R-3 and R-4 fuel cell vehicle energy storage system use. The temporary use of the *dwelling unit owner* or occupant's fuel cell-powered electric vehicle to power a Group R-3 or R-4 dwelling while parked in an attached or detached garage or outside shall comply with the vehicle manufacturer's instructions and NFPA 70.

SECTION 1207 ELECTRICAL ENERGY STORAGE SYSTEMS (ESS)

1207.1 General. The provisions in this section are applicable to stationary and mobile electrical energy storage systems (ESS).

Exception: ESS in Group R-3 and R-4 occupancies shall comply with Section 1207.11.

1207.1.1 Scope. ESS having capacities exceeding the values shown in Table 1207.1.1 shall comply with this section.

**TABLE 1207.1.1
ENERGY STORAGE SYSTEM (ESS) THRESHOLD QUANTITIES**

TECHNOLOGY	ENERGY CAPACITY ^a
Capacitor ESS	3 kWh
Flow batteries ^b	20 kWh
Lead-acid batteries, all types	70 kWh ^c
Lithium-ion batteries	20 kWh

Nickel metal hydride (Ni-MH)	70 kWh
Nickel-cadmium batteries (Ni-Cd)	70 kWh
Other battery technologies	10 kWh
Other electrochemical ESS technologies	3 kWh

For SI: 1 kilowatt hour = 3.6 megajoules.

1. a. Energy capacity is the total energy capable of being stored (nameplate rating), not the usable energy rating. For units rated in amp-hours, kWh shall equal rated voltage times amp-hour rating divided by 1,000.
2. b. Shall include vanadium, zinc-bromine, polysulfide-bromide and other flowing electrolyte-type technologies.
3. c. Fifty gallons of lead-acid battery electrolyte shall be considered equivalent to 70 kWh.

1207.1.2 Permits. Permits shall be obtained for ESS as follows:

1. Construction permits shall be obtained for stationary ESS installations and for mobile ESS charging and storage installations covered by Section 1207.10.1. A construction permit is required to install energy storage systems regulated by this section.
2. Operational permits shall be obtained for stationary ESS installations and for mobile ESS deployment operations covered by Section 1207.10.3. An operational permit is required for stationary and mobile energy storage systems regulated by this section.

1207.1.2.1 Communication utilities. Operational permits shall not be required for lead-acid and nickel cadmium battery systems at facilities under the exclusive control of communications utilities that comply with NFPA 76 and operate at less than 50 voltage alternating current (VAC) and 60 voltage direct current (VDC).

1207.1.3 Construction documents. The following information shall be provided with the permit application:

1. Location and layout diagram of the room or area in which the ESS is to be installed.
2. Details on the hourly *fire-resistance ratings* of assemblies enclosing the ESS.
3. The quantities and types of ESS to be installed.
4. Manufacturer’s specifications, ratings and listings of each ESS.
5. Description of energy (battery) management systems and their operation.
6. Location and content of required signage.
7. Details on fire suppression, smoke or fire detection, thermal management, ventilation, exhaust and *deflagration* venting systems, if provided.
8. Support arrangement associated with the installation, including any required seismic restraint.
9. A commissioning plan complying with Section 1207.2.1.
10. A decommissioning plan complying with Section 1207.2.3.

1207.1.4 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. Where ESS technologies not specifically identified in Table 1207.1 are provided.
2. More than one ESS technology is provided in a room or enclosed area where there is a potential for adverse interaction between technologies.
3. Where allowed as a basis for increasing maximum allowable quantities. See Section 1207.5.2.

1207.1.4.1 Fault condition. The hazard mitigation analysis shall evaluate the consequences of the following failure modes. Only single failure modes shall be considered.

1. A thermal runaway condition in a single ESS rack, module or unit.
2. Failure of any battery (energy) management system.
3. Failure of any required ventilation or exhaust system.
4. Voltage surges on the primary electric supply.
5. Short circuits on the load side of the ESS.
6. Failure of the smoke detection, fire detection, fire suppression or gas detection system.
7. Required spill neutralization not being provided or failure of a required secondary containment system.

1207.1.4.2 Analysis approval. The *fire code official* is authorized to approve the hazardous mitigation analysis provided that the consequences of the hazard mitigation analysis demonstrate:

1. Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated separations identified in Section 1207.7.4.
2. Fires in occupied work centers will be detected in time to allow occupants within the room or area to safely evacuate.
3. Toxic and highly toxic gases released during fires will not reach concentrations in excess of the IDLH level in the building or adjacent *means of egress* routes during the time deemed necessary to evacuate occupants from any affected area.
4. Flammable gases released from ESS during charging, discharging and normal operation will not exceed 25 percent of their lower flammability limit (LFL).
5. Flammable gases released from ESS during fire, overcharging and other abnormal conditions will be controlled through the use of ventilation of the gases, preventing accumulation, or by *deflagration* venting.

1207.1.4.3 Additional protection measures. Construction, equipment and systems that are required for the ESS to comply with the hazardous mitigation analysis, including but not limited to those specifically described in Section 1207, shall be installed, maintained and tested in accordance with nationally recognized standards and specified design parameters.

1207.1.5 Large-scale fire test. Where required elsewhere in Section 1207, large-scale fire testing shall be conducted on a representative ESS in accordance with UL 9540A. The testing shall be conducted or witnessed and reported by an *approved* testing laboratory and show that a fire involving one ESS will not propagate to an adjacent ESS, and where installed within buildings, enclosed areas and

walk-in units will be contained within the room, enclosed area or walk-in unit for a duration equal to the *fire-resistance rating* of the room separation specified in Section 1207.7.4. The test report shall be provided to the *fire code official* for review and approval in accordance with Section 104.7.2.

1207.1.6 Fire remediation. Where a fire or other event has damaged the ESS and ignition or re-ignition of the ESS is possible, the system *owner*, agent or lessee shall take the following actions, at their expense, to mitigate the hazard or remove damaged equipment from the premises to a safe location.

1207.1.6.1 Fire mitigation personnel. Where, in the opinion of the *fire code official*, it is essential for public safety that trained personnel be on-site to respond to possible ignition or re-ignition of a damaged ESS, the system owner, agent or lessee shall immediately dispatch one or more fire mitigation personnel to the premise, as required and approved, at their expense. These personnel shall remain on duty continuously after the fire department leaves the premise until the damaged energy storage equipment is removed from the premises, or earlier if the *fire code official* indicates the public safety hazard has been abated.

1207.1.6.2 Duties. On-duty fire mitigation personnel shall have the following responsibilities:

1. Keep a diligent watch for fires, obstructions to *means of egress* and other hazards.
2. Immediately contact the fire department if their assistance is needed to mitigate any hazards or extinguish fires.
3. Take prompt measures for remediation of hazards in accordance with the decommissioning plan per Section 1207.2.3.
4. Take prompt measures to assist in the evacuation of the public from the structures.

1207.2 Commissioning, decommissioning, operation and maintenance.

Commissioning, decommissioning, operation and maintenance shall be conducted in accordance with this section.

1207.2.1 Commissioning. Commissioning of newly installed ESS and existing ESS that have been retrofitted, replaced or previously decommissioned and are returning to service shall be conducted prior to the ESS being placed in service in accordance with a commissioning plan that has been *approved* prior to initiating commissioning. The commissioning plan shall include the following:

1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
2. A listing of the specific ESS and associated components, controls and safety-related devices to be tested, a description of the tests to be performed and the functions to be tested.

3. Conditions under which all testing will be performed, which are representative of the conditions during normal operation of the system.
4. Documentation of the owner's project requirements and the basis of design necessary to understand the installation and operation of the ESS.
5. Verification that required equipment and systems are installed in accordance with the *approved* plans and specifications.
6. Integrated testing for all fire and safety systems.
7. Testing for any required thermal management, ventilation or exhaust systems associated with the ESS installation.
8. Preparation and delivery of operation and maintenance documentation.
9. Training of facility operating and maintenance staff.
10. Identification and documentation of the requirements for maintaining system performance to meet the original design intent during the operation phase.
11. Identification and documentation of personnel who are qualified to service, maintain and decommission the ESS, and respond to incidents involving the ESS, including documentation that such service has been contracted for.
12. A decommissioning plan for removing the ESS from service, and from the facility in which it is located. The plan shall include details on providing a safe, orderly shutdown of energy storage and safety systems with notification to the code officials prior to the actual decommissioning of the system. The decommissioning plan shall include contingencies for removing an intact operational ESS from service, and for removing an ESS from service that has been damaged by a fire or other event.

Exception: Commissioning shall not be required for lead-acid and nickel-cadmium battery systems at facilities under the exclusive control of communications utilities that comply with NFPA 76 and operate at less than 50 VAC and 60 VDC. A decommissioning plan shall be provided and maintained where required by the *fire code official*.

1207.2.1.1 Initial acceptance testing. During the commissioning process an ESS shall be evaluated for proper operation in accordance with the manufacturer's instructions and the commissioning plan prior to final approval.

1207.2.1.2 Commissioning report. A report describing the results of the system commissioning, including the results of the initial acceptance testing required in Section 1207.2.1.1, shall be provided to the *fire code official* prior to final inspection and approval and maintained at an *approved* on-site location.

1207.2.2 Operation and maintenance. An operation and maintenance manual shall be provided to both the ESS *owner* or their authorized agent and the ESS operator before the ESS is put into operation and shall include the following:

1. Manufacturer's operation manuals and maintenance manuals for the entire ESS, or for each component of the system requiring maintenance, that clearly identify the required routine maintenance actions.
2. Name, address and phone number of a service agency that has been contracted to service the ESS and its associated safety systems.

3. Maintenance and calibration information, including wiring diagrams, control drawings, schematics, system programming instructions and control sequence descriptions, for all energy storage control systems.
4. Desired or field-determined control set points that are permanently recorded on control drawings at control devices or, for digital control systems, in system programming instructions.
5. A schedule for inspecting and recalibrating all ESS controls.
6. A service record log form that lists the schedule for all required servicing and maintenance actions and space for logging such actions that are completed over time and retained on-site.

The ESS shall be operated and maintained in accordance with the manual and a copy of the manual shall be retained at an approved on-site location.

1207.2.2.1 Ongoing inspection and testing. Systems that monitor and protect the ESS installation shall be inspected and tested in accordance with the manufacturer's instructions and the operation and maintenance manual. Inspection and testing records shall be maintained in the operation and maintenance manual.

1207.2.3 Decommissioning. The code official shall be notified prior to the decommissioning of an ESS. Decommissioning shall be performed in accordance with the decommissioning plan that includes the following:

1. A narrative description of the activities to be accomplished for removing the ESS from service, and from the facility in which it is located.
2. A listing of any contingencies for removing an intact operational ESS from service, and for removing an ESS from service that has been damaged by a fire or other event.

1207.3 Equipment. ESS equipment shall be in accordance with Sections 1207.3.1 through 1207.3.9.

1207.3.1 Energy storage system listings. ESS shall be *listed* in accordance with UL 9540.

Exception: Lead-acid and nickel-cadmium battery systems installed in facilities under the exclusive control of communications utilities, and operating at less than 50 VAC and 60 VDC in accordance with NFPA 76, are not required to be *listed*.

1207.3.2 Equipment listing. Chargers, inverters and energy storage management systems shall be covered as part of the UL 9540 listing or shall be *listed* separately.

1207.3.3 Utility interactive systems. 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.

1207.3.4 Energy storage management system. Where required by the ESS listing, an *approved* energy storage management system that monitors and balances cell voltages, currents and temperatures within the manufacturer's specifications shall be

provided. The system shall disconnect electrical connections to the ESS or otherwise place it in a safe condition if potentially hazardous temperatures or other conditions such as short circuits, over voltage or under voltage are detected.

1207.3.5 Enclosures. Enclosures of ESS shall be of noncombustible construction.

1207.3.6 Repairs. Repairs of ESS shall only be done by qualified personnel. Repairs with other than identical parts shall be considered retrofitting and comply with Section 1207.3.7. Repairs shall be documented in the service records log.

1207.3.7 Retrofits. Retrofitting of an existing ESS shall comply with the following:

1. A construction permit shall be obtained in accordance with Section 105.
2. New batteries, battery modules, capacitors and similar ESS components shall be *listed*.
3. Battery management and other monitoring systems shall be connected and installed in accordance with the manufacturer's instructions.
4. The overall installation shall continue to comply with UL 9540 listing requirements, where applicable.
5. Systems that have been retrofitted shall be commissioned in accordance with Section 1207.2.1.
6. Retrofits shall be documented in the service records log.

1207.3.7.1 Retrofitting lead acid and nickel cadmium. Section 1207.3.7 shall not apply to retrofitting of lead-acid and nickel-cadmium batteries with other 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.

1207.3.8 Replacements. Replacements of ESS shall be considered new ESS installations and shall comply with the provisions of Section 1207 as applicable to new ESS. The ESS being replaced shall be decommissioned in accordance with Section 1207.2.3.

1207.3.9 Reused and repurposed equipment. Equipment and materials shall only be reused or reinstalled as permitted in Section 104.7.1. Storage batteries previously used in other applications, such as electric vehicle propulsion, shall not be reused in applications regulated by Chapter 12 unless *approved* by the *fire code official* and unless the equipment is refurbished by a battery refurbishing company *approved* in accordance with UL 1974.

1207.4 General installations requirements. Stationary and mobile ESS shall comply with the requirements of Sections 1207.4.1 through 1207.4.12.

1207.4.1 Electrical disconnects. Where the ESS disconnecting means is not within sight of the main electrical service disconnecting means, placards or directories shall be

installed at the location of the main electrical service disconnecting means indicating the location of stationary storage battery system disconnecting means in accordance with NFPA 70.

Exception: Electrical disconnects for lead-acid and nickel-cadmium battery systems at facilities under the exclusive control of communications utilities and operating at less than 50 VAC and 60 VDC shall be permitted to have electrical disconnects signage in accordance with NFPA 76.

1207.4.2 Working clearances. Access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment in accordance with NFPA 70 and the manufacturer's instructions.

1207.4.3 Fire-resistance-rated separations. Rooms and other indoor areas containing ESS shall be separated from other areas of the building in accordance with Section 1207.7.4. ESS shall be permitted to be in the same room with the equipment they support.

1207.4.4 Seismic and structural design. Stationary ESS 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.

1207.4.5 Vehicle impact protection. Where ESS are subject to impact by a motor vehicle, including fork lifts, vehicle impact protection shall be provided in accordance with Section 312.

1207.4.6 Combustible storage. Combustible materials shall not be stored in ESS rooms, areas or walk-in units. Combustible materials in occupied work centers covered by Section 1207.4.10 shall be stored at least 3 feet (914 mm) from ESS cabinets.

1207.4.7 Toxic and highly toxic gases. ESS that have the potential to release toxic and highly toxic gas during charging, discharging and normal use conditions shall be provided with a hazardous exhaust system in accordance with Section 502.8 of the *International Mechanical Code*.

1207.4.8 Signage. *Approved* signs shall be provided on or adjacent to all entry doors for ESS rooms or areas and on enclosures of ESS 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 ESS technology present.
3. "ENERGIZED ELECTRICAL CIRCUITS."
4. Where water-reactive electrochemical ESS are present, the signage shall include "APPLY NO WATER."

5. Current contact information, including phone number, for personnel authorized to service the equipment and for fire mitigation personnel required by Section 1207.1.6.1.

Exception: Existing electrochemical ESS shall be permitted to include the signage required at the time they were installed.

1207.4.9 Security of installations. Rooms, areas and walk-in units in which electrochemical ESS are located shall be secured against unauthorized entry and safeguarded in an *approved* manner. Security barriers, fences, landscaping and other enclosures shall not inhibit the required air flow to or exhaust from the electrochemical ESS and its components.

1207.4.10 Occupied work centers. Electrochemical ESS located in rooms or areas occupied by personnel not directly involved with maintenance, service and testing of the systems shall comply with the following:

1. Electrochemical ESS located in occupied work centers shall be housed in locked noncombustible cabinets or other enclosures to prevent access by unauthorized personnel.
2. Where electrochemical ESS are contained in cabinets in occupied work centers, the cabinets shall be located within 10 feet (3048 mm) of the equipment that they support.
3. Cabinets shall include signage complying with Section 1207.4.8.

1207.4.11 Open rack installations. Where electrochemical ESS are installed in a separate equipment room and only authorized personnel have access to the room, they shall be permitted to be installed on an open rack for ease of maintenance.

1207.4.12 Walk-in units. Walk-in units shall be entered only for inspection, maintenance and repair of ESS units and ancillary equipment, and shall not be occupied for other purposes.

1207.5 Electrochemical ESS protection. The protection of electrochemical ESS shall be in accordance with Sections 1207.5.1 through 1207.5.8 where required by Sections 1207.7 through 1207.10.

**TABLE 1207.5
MAXIMUM ALLOWABLE QUANTITIES OF ELECTROCHEMICAL ESS**

TECHNOLOGY	MAXIMUM ALLOWABLE QUANTITIES ^a
STORAGE BATTERIES	
Flow batteries ^b	600 kWh
Lead-acid, all types	Unlimited

Lithium-ion	600 kWh
Nickel metal hydride (Ni-MH)	Unlimited
Nickel-cadmium (Ni-Cd)	Unlimited
Other battery technologies	200 kWh
CAPACITORS	
All types	20 kWh
OTHER ELECTROCHEMICAL ESS	
All types	20 kWh

For SI: 1 kilowatt hour = 3.6 megajoules.

1. a. For electrochemical ESS units rated in amp-hours, kWh shall equal rated voltage times the amp-hour rating divided by 1,000.
2. b. Shall include vanadium, zinc-bromine, polysulfide-bromide and other flowing electrolyte-type technologies.

1207.5.1 Size and separation. Electrochemical ESS shall be segregated into groups not exceeding 50 kWh (180 megajoules). Each group shall be separated a minimum of 3 feet (914 mm) from other groups and from walls in the storage room or area. The storage arrangements shall comply with Chapter 10.

1. Lead-acid and nickel-cadmium battery systems in facilities under the exclusive control of communications utilities and operating at less than 50 VAC and 60 VDC in accordance with NFPA 76.
2. The *fire code official* is authorized to approve larger capacities or smaller separation distances based on large-scale fire testing complying with Section 1207.1.5.

1207.5.2 Maximum allowable quantities. *Fire areas* within rooms, areas and walk-in units containing electrochemical ESS shall not exceed the maximum allowable quantities in Table 1207.5.

Exceptions:

1. Where approved by the fire code official, rooms, areas and walk-in units containing electrochemical ESS that exceed the amounts in Table 1207.5 shall be permitted based on a hazardous mitigation analysis in accordance with Section 1207.1.4 and large-scale fire testing complying with Section 1207.1.5.
2. Lead-acid and nickel-cadmium battery systems installed in facilities under the exclusive control of communications utilities, and operating at less than 50 VAC and 60 VDC in accordance with NFPA 76.
3. Dedicated-use buildings in compliance with Section 1207.7.1.

1207.5.2.1 Mixed electrochemical energy systems. Where rooms, areas and walk-in units contain different types of electrochemical energy technologies, the total aggregate quantities of the systems shall be determined based on the sum of percentages of each technology type quantity divided by the maximum allowable

quantity of each technology type. The sum of the percentages shall not exceed 100 percent of the maximum allowable quantity.

1207.5.3 Elevation. Electrochemical ESS 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 is located below the lowest *level of exit discharge*.

Exceptions:

1. Lead-acid and nickel-cadmium 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.

1207.5.4 Fire detection. An *approved* automatic smoke detection system or radiant energy-sensing fire detection system complying with Section 907.2 shall be installed in rooms, indoor areas and walk-in units containing electrochemical ESS.

An *approved* radiant energy-sensing fire detection system shall be installed to protect open parking garage and rooftop installations. Alarm signals from detection systems shall be transmitted to a central station, proprietary or remote station service in accordance with NFPA 72, or where *approved* to a constantly attended location.

1207.5.4.1 System status. Where required by the *fire code official*, visible annunciation shall be provided on cabinet exteriors or in other *approved* locations to indicate that potentially hazardous conditions associated with the ESS exist.

1207.5.5 Fire suppression systems. Rooms and areas within buildings and walk-in units containing electrochemical ESS shall be protected by an automatic fire suppression system designed and installed in accordance with one of the following:

1. An *automatic sprinkler system* designed and installed in accordance with Section 903.3.1.1 with a minimum density of 0.3 gpm/ft² (1.14 L/min) based on the *fire area* or 2,500 square-foot (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 complying with Section 1207.1.5.
3. The following alternative automatic fire-extinguishing systems designed and installed in accordance with Section 904, provided that the installation is *approved by the fire code official* based on large-scale fire testing complying with Section 1207.1.5:
 - 3.1.NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*.
 - 3.2.NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*.
 - 3.3.NFPA 750, *Standard on Water Mist Fire Protection Systems*.
 - 3.4.NFPA 2001, *Standard on Clean Agent Fire-Extinguishing Systems*.
 - 3.5.NFPA 2010, *Standard for Fixed Aerosol Fire-Extinguishing Systems*.

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.

1207.5.5.1 Water-reactive systems. Electrochemical ESS that utilize water-reactive materials shall be protected by an *approved* alternative automatic fire extinguishing system in accordance with Section 904, where the installation is *approved* by the *fire code official* based on large-scale fire testing complying with Section 1207.1.5.

1207.5.6 Maximum enclosure size. Outdoor walk-in units housing ESS shall not exceed 53 feet by 8 feet by 9.5 feet high (16 154 mm x 2438 mm x 2896 mm), not including bolt-on HVAC and related equipment, as *approved*. Outdoor walk-in units exceeding these limitations shall be considered indoor installations and comply with the requirements in Section 1207.7.

1207.5.7 Vegetation control. Areas within 10 feet (3048 mm) on each side of outdoor ESS shall be cleared of combustible vegetation and other combustible growth. Single specimens of trees, shrubbery or cultivated ground cover such as green grass, ivy, succulents or similar plants used as ground cover shall be permitted to be exempt provided that they do not form a means of readily transmitting fire.

1207.5.8 Means of egress separation. ESS located outdoors and in open parking garages shall be separated from any *means of egress* as required by the *fire code official* to ensure safe egress under fire conditions, but in no case less than 10 feet (3048 mm).

Exception: The fire code official is authorized to approve a reduced separation distance if large-scale fire testing complying with Section 1207.1.5 is provided that shows that a fire involving the ESS will not adversely impact occupant egress.

1207.6 Electrochemical ESS technology-specific protection. Electrochemical ESS installations shall comply with the requirements of this section in accordance with the applicable requirements of Table 1207.6.

**TABLE 1207.6
ELECTROCHEMICAL ESS TECHNOLOGY-SPECIFIC REQUIREMENTS**

COMPLIANCE REQUIRED ^b		BATTERY TECHNOLOGY				OTHER ESS AND BATTERY TECHNOLOGIES ^b	CAPACITOR ESS ^b
Feature	Section	Lead-acid	Ni-Cd and Ni-MH	Lithium-ion	Flow		
Exhaust ventilation	1207.6.1	Yes	Yes	No	Yes	Yes	Yes

Explosion control	1207.6.3	Yes ^a	Yes ^a	Yes	No	Yes	Yes
Safety caps	1207.6.4	Yes	Yes	No	No	Yes	Yes
Spill control and neutralization	1207.6.2	Yes ^c	Yes ^c	No	Yes	Yes	Yes
Thermal runaway	1207.6.5	Yes ^d	Yes	Yes ^e	No	Yes ^e	Yes

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 is provided in accordance with Section 104.7.2 that provides justification why the protection is not necessary based on the technology used.

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

d. Not required for vented-type (i.e., flooded) 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.

1207.6.1 Exhaust ventilation. Where required by Table 1207.6 or elsewhere in this code, exhaust ventilation of rooms, areas and walk-in units containing electrochemical ESS shall be provided in accordance with the *International Mechanical Code* and Section 1207.6.1.1 or 1207.6.1.2.

1207.6.1.1 Ventilation based on LFL. The exhaust ventilation system shall be designed to limit the maximum concentration of flammable gas to 25 percent of the lower flammable limit (LFL) of the total volume of the room, area or walk-in unit during the worst-case event of simultaneous charging of batteries at the maximum charge rate, in accordance with nationally recognized standards.

1207.6.1.2 Ventilation based on exhaust rate. Mechanical exhaust ventilation shall be provided at a rate of not less than 1 ft³/min/ft² (5.1 L/sec/m²) of floor area of the room, area or walk-in unit. The ventilation shall be either continuous or shall be activated by a gas detection system in accordance with Section 1207.6.1.2.4.

1207.6.1.2.1 Standby power. Mechanical exhaust ventilation shall be provided with a minimum of 2 hours of standby power in accordance with Section 1203.2.5.

1207.6.1.2.2 Installation instructions. Required mechanical exhaust ventilation systems shall be installed in accordance with the manufacturer's installation instructions and the *International Mechanical Code*.

1207.6.1.2.3 Supervision. Required mechanical exhaust ventilation systems shall be supervised by an *approved* central station, proprietary or remote station service in accordance with NFPA 72, or shall initiate an audible and visible signal at an *approved* constantly attended on-site location.

1207.6.1.2.4 Gas detection system. Where required by Section 1207.6.1.2, rooms, areas and walk-in units containing ESS shall be protected by an *approved* continuous gas detection system that complies with Section 917 and with the following:

1. The gas detection system shall be designed to activate the mechanical ventilation system when the level of flammable gas in the room, area or walk-in unit exceeds 25 percent of the LFL.
2. The mechanical ventilation system shall remain on until the flammable gas detected is less than 25 percent of the LFL.
3. The gas detection system shall be provided with a minimum of 2 hours of standby power in accordance with Section 1203.2.5.
4. Failure of the gas detection system shall annunciate a trouble signal at an approved central station, proprietary or remote station service in accordance with NFPA 72, or shall initiate an audible and visible trouble signal at an approved constantly attended on-site location.

1207.6.2 Spill control and neutralization. Where required by Table 1207.6 or elsewhere in this code, areas containing free-flowing liquid electrolyte or hazardous materials shall be provided with spill control and neutralization in accordance with this section.

1207.6.2.1 Spill control. Spill control shall be provided to prevent the flow of liquid electrolyte or hazardous materials to adjoining rooms or areas. The method shall be capable of containing a spill from the single largest battery or vessel.

1207.6.2.2 Neutralization. An *approved* method that is capable of neutralizing spilled liquid electrolyte from the largest battery or vessel to a pH between 5.0 and 9.0 shall be provided.

1207.6.2.3 Communications utilities. The requirements of Section 1207.6.2 shall apply only when the aggregate capacity of multiple vessels exceeds 1,000 gallons (3785 L) for lead-acid and nickel-cadmium battery systems operating at less than 50 VAC and 60 VDC that are located at facilities under the exclusive control of communications utilities, and those facilities comply with NFPA 76 in addition to applicable requirements of this code.

1207.6.3 Explosion control. Where required by Table 1207.6 or elsewhere in this code, explosion control complying with Section 911 shall be provided for rooms, areas or walk-in units containing electrochemical ESS technologies.

Exceptions:

1. Where approved, explosion control is permitted to be waived by the fire code official based on large-scale fire testing complying with Section 1207.1.5 that demonstrates that flammable gases are not liberated from electrochemical ESS cells or modules where tested in accordance with UL 9540A.
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 ESS technology to be used does not have the potential to release flammable gas concentrations in excess of 25 percent of the LFL anywhere in the room, area, walk-in unit or structure under thermal runaway or other fault conditions.

1207.6.4 Safety caps. Where required by Table 1207.6 or elsewhere in this code, vented batteries and other ESS shall be provided with flame-arresting safety caps.

1207.6.5 Thermal runaway. Where required by Table 1207.6 or elsewhere in this code, batteries and other ESS shall be provided with a *listed* device or other *approved* method to prevent, detect and minimize the impact of thermal runaway.

1207.7 Indoor installations. Indoor ESS installations shall be in accordance with Sections 1207.7.1 through 1207.7.4.

**TABLE 1207.7
INDOOR ESS INSTALLATIONS**

COMPLIANCE REQUIRED		DEDICATED-USE BUILDINGS ^a	NONDEDICATED-USE BUILDINGS ^b
Feature	Section		
Dwelling units and sleeping units	<u>1207.7.3</u>	NA	Yes
Elevation	<u>1207.5.3</u>	Yes	Yes
Fire suppression systems	<u>1207.5.5</u>	Yes ^c	Yes
Fire-resistance-rated separations	<u>1207.7.4</u>	Yes	Yes
General installation requirements	<u>1207.4</u>	Yes	Yes
Maximum allowable quantities	<u>1207.5.2</u>	No	Yes
Size and separation	<u>1207.5.1</u>	Yes	Yes
Smoke and automatic fire detection ^e	<u>1207.5.4</u>	Yes ^d	Yes
Technology specific protection	<u>1207.6</u>	Yes	Yes

NA = Not Allowed.

a. See Section 1207.7.1.

b. See Section 1207.7.2.

c. Where approved by the fire code official, fire suppression systems are permitted to be omitted in dedicated-use buildings located more than 100 feet (30.5 m) from buildings, lot lines, public ways, stored combustible materials, hazardous materials, high-piled stock and other exposure hazards.

d. Where approved by the fire code official, alarm signals are not required to be transmitted to a central station, proprietary or remote station service in accordance with NFPA 72, or a constantly attended location where local fire alarm annunciation is provided and trained personnel are always present.

e. Lead-acid and nickel-cadmium battery systems installed in Group U buildings and structures less than 1,500 square feet (139 m²) under the exclusive control of communications utilities, and operating at less than 50 VAC and 60 VDC in accordance with NFPA 76, are not required to have an approved automatic smoke or fire detection system.

1207.7.1 Dedicated-use buildings. For the purpose of Table 1207.7, dedicated-use ESS buildings shall be classified as Group F-1 occupancies and comply with all the following:

1. The building shall only be used for ESS, electrical energy generation and other electrical grid-related operations.
2. Occupants in the rooms and areas containing ESS are limited to personnel that operate, maintain, service, test and repair the ESS and other energy systems.
3. No other occupancy types shall be permitted in the building.

4. Administrative and support personnel shall be permitted in areas within the buildings that do not contain ESS, provided that:
 - 4.1. The areas do not occupy more than 10 percent of the building area of the story in which they are located.
 - 4.2. A means of egress is provided from the incidental use areas to the public way that does not require occupants to traverse through areas containing ESS or other energy system equipment.

1207.7.2 Nondedicated-use buildings. For the purpose of Table 1207.7, nondedicated-use buildings include all buildings that contain ESS and do not comply with Section 1207.7.1 dedicated-use building requirements.

1207.7.3 Dwelling units and sleeping units. ESS shall not be installed in *sleeping units* or in *habitable spaces* of *dwelling units*.

1207.7.4 Fire-resistance-rated separations. Rooms and areas containing ESS shall include *fire-resistance-rated* separations as follows:

1. In dedicated-use buildings, rooms and areas containing ESS shall be separated from areas in which administrative and support personnel are located.
2. In nondedicated-use buildings, rooms and areas containing ESS shall be separated from other areas in the building.

Separation shall be provided by 2-hour *fire barriers* constructed in accordance with Section 707 of the *International Building Code* and 2-hour *horizontal assemblies* constructed in accordance with Section 711 of the *International Building Code*, as appropriate.

1207.8 Outdoor installations. Outdoor installations shall be in accordance with Sections 1207.8.1 through 1207.8.3. Exterior wall installations for individual ESS units not exceeding 20 kWh shall be in accordance with Section 1207.8.4.

**TABLE 1207.8
OUTDOOR ESS INSTALLATIONS^a**

COMPLIANCE REQUIRED		REMOTE INSTALLATIONS ^a	INSTALLATIONS NEAR EXPOSURES ^b
Feature	Section		
All ESS installations	1207.4	Yes	Yes
Clearance to exposures	1207.8.3	Yes	Yes
Fire suppression systems	1207.5.5	Yes ^c	Yes
Maximum allowable quantities	1207.5.2	No	Yes
Maximum enclosure size	1207.5.6	Yes	Yes
Means of egress separation	1207.5.8	Yes	Yes
Size and separation	1207.5.1	No	Yes ^d
Smoke and automatic fire detection	1207.5.4	Yes	Yes
Technology-specific protection	1207.6	Yes	Yes

Vegetation control	1207.5.7	Yes	Yes
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- a. See Section 1207.8.1.
- b. See Section 1207.8.2.
- c. Where approved by the fire code official, fire suppression systems are permitted to be omitted.
- d. In outdoor walk-in units, spacing is not required between ESS units and the walls of the enclosure.

1207.8.1 Remote outdoor installations. For the purpose of Table 1207.8, remote outdoor installations include ESS located more than 100 feet (30 480 mm) from buildings, lot lines, public ways, stored combustible materials, hazardous materials, high-piled stock and other exposure hazards.

1207.8.2 Installations near exposures. For the purpose of Table 1207.8, installations near exposures include all outdoor ESS installations that do not comply with Section 1207.8.1 remote outdoor location requirements.

1207.8.3 Clearance to exposures. ESS located outdoors shall be separated by a minimum of 10 feet (3048 mm) from the following exposures:

1. Lot lines.
2. Public ways.
3. Buildings.
4. Stored combustible materials.
5. Hazardous materials.
6. High-piled stock.
7. 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 5 feet (1524 mm) beyond the physical boundary of the ESS installation is provided to protect the exposure.
2. Clearances to buildings are permitted to be reduced to 3 feet (914 mm) where noncombustible exterior walls with no openings or combustible overhangs are provided on the wall adjacent to the ESS and the fire-resistance rating of the exterior wall is a minimum of 2 hours.
3. Clearances to buildings are permitted to be reduced to 3 feet (914 mm) where a weatherproof enclosure constructed of noncombustible materials is provided over the ESS, and it has been demonstrated that a fire within the enclosure will not ignite combustible materials outside the enclosure based on large-scale fire testing complying with Section 1207.1.5.

1207.8.4 Exterior wall installations. ESS 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 ESS units shall not exceed 20 kWh.
2. The ESS shall comply with applicable requirements in Section 1207.
3. The ESS shall be installed in accordance with the manufacturer's instructions and their listing.
4. Individual ESS units shall be separated from each other by at least 3 feet (914 mm).

5. The ESS shall be separated from doors, windows, operable openings into buildings or HVAC inlets by at least 5 feet (1524 mm).

Exception: Where approved, smaller separation distances in Items 4 and 5 shall be permitted based on large-scale fire testing complying with Section 1207.1.5.

1207.9 Special installations. Rooftop and open parking garage ESS installations shall comply with Sections 1207.9.1 through 1207.9.6.

**TABLE 1207.9
SPECIAL ESS INSTALLATIONS**

<u>COMPLIANCE REQUIRED</u>		<u>ROOFTOPS^a</u>	<u>OPEN PARKING GARAGES^b</u>
<u>Feature</u>	<u>Section</u>		
All ESS installations	1207.4	Yes	Yes
Clearance to exposures	1207.9.3	Yes	Yes
Fire suppression systems	1207.9.4	Yes	Yes
Maximum allowable quantities	1207.5.2	Yes	Yes
Maximum enclosure size	1207.5.6	Yes	Yes
Means of egress separation	1207.5.8	Yes	Yes
Open parking garage installations	1207.9.6	No	Yes
Rooftop installations	1207.9.5	Yes	No
Size and separation	1207.5.1	Yes	Yes
Smoke and automatic fire detection	1207.5.4	Yes	Yes
Technology-specific protection	1207.6	Yes	Yes

a. See Section 1207.9.1.

b. See Section 1207.9.2.

1207.9.1 Rooftop installations. For the purpose of Table 1207.9, rooftop ESS installations are those located on the roofs of buildings.

1207.9.2 Open parking garage installations. For the purpose of Table 1207.9, open parking garage ESS installations are those located in a structure or portion of a structure that complies with Section 406.5 of the *International Building Code*.

1207.9.3 Clearance to exposures. ESS located on rooftops and in open parking garages shall be separated by a minimum of 10 feet (3048 mm) from the following exposures:

1. Buildings, except the building on which rooftop ESS 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 5 feet (1524 mm) beyond the physical boundary of the ESS 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 ESS, and it has been demonstrated that a fire within the enclosure will not ignite combustible materials outside the enclosure based on large-scale fire testing complying with Section 1207.1.5.

1207.9.4 Fire suppression systems. ESS 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 ESS enclosure in accordance with Section 1207.5.5. Areas containing ESS 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 1207.5.5.

Exception: A fire suppression system is not required in open parking garages if large-scale fire testing complying with Section 1207.1.5 is provided that shows that a fire will not impact the exposures in Section 1207.9.3.

1207.9.5 Rooftop installations. ESS 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. ESS 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 an ESS 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 ESS shall be the minimum of 10 feet (3048 mm) from the fire service access point on the rooftop.

1207.9.6 Open parking garages. ESS and associated equipment that are located in open parking garages shall comply with all of the following:

1. ESS 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. ESS 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 (1524 mm) from the outer enclosure of the ESS.

1207.10 Mobile ESS equipment and operations. Mobile ESS equipment and operations shall comply with Sections 1207.10.1 through 1207.10.7.7.

**TABLE 1207.10
MOBILE ENERGY STORAGE SYSTEMS (ESS)**

COMPLIANCE REQUIRED		DEPLOYMENT ^a
Feature	Section	
All ESS installations	1207.4	Yes ^b
Fire suppression systems	1207.5.5	Yes ^c
Maximum allowable quantities	1207.5.2	Yes
Maximum enclosure size	1207.5.6	Yes
Means of egress separation	1207.5.8	Yes
Size and separation	1207.5.1	Yes ^d
Smoke and automatic fire detection	1207.5.4	Yes ^e
Technology-specific protection	1207.6	Yes
Vegetation control	1207.5.7	Yes

a. See Section 1207.10.2.

b. Mobile operations on wheeled vehicles and trailers shall not be required to comply with Section 1207.4.4 seismic and structural load requirements.

c. Fire suppression system connections to the water supply shall be permitted to use approved temporary connections.

d. In walk-in units, spacing is not required between ESS units and the walls of the enclosure.

e. Alarm signals are not required to be transmitted to an approved location for mobile ESS deployed 30 days or less.

1207.10.1 Charging and storage. For the purpose of Section 1207.10, charging and storage covers the operation where mobile ESS are charged and stored so they are ready for deployment to another site, and where they are charged and stored after a deployment.

1207.10.2 Deployment. For the purpose of Section 1207.10, deployment covers operations where mobile ESS are located at a site other than the charging and storage site and are being used to provide power.

1207.10.3 Permits. Construction and operational permits shall be provided for charging and storage of mobile ESS and operational permits shall be provided for deployment of mobile ESS as required by Section 1207.1.2.

1207.10.4 Construction documents. *Construction documents* complying with Section 1207.1.3 shall be provided with the construction permit application for mobile ESS charging and storage locations.

1207.10.4.1 Deployment documents. The following information shall be provided with the operation permit applications for mobile ESS deployments:

1. Relevant information for the mobile ESS equipment and protection measures in the *construction documents* required by Section 1207.1.3.
2. Location and layout diagram of the area in which the mobile ESS is to be deployed, including a scale diagram of all nearby exposures.
3. Location and content of signage, including no smoking signs.
4. Description of fencing to be provided around the ESS, including locking methods.
5. Details on fire suppression, smoke and automatic fire detection, system monitoring, thermal management, exhaust ventilation and explosion control, if provided.
6. For deployment, the intended duration of operation, including anticipated connection and disconnection times and dates.
7. Location and description of local staging stops during transit to the deployment site. See Section 1207.10.7.5.
8. Description of the temporary wiring, including connection methods, conductor type and size, and circuit overcurrent protection to be provided.
9. Description of how fire suppression system connections to water supplies or extinguishing agents are to be provided.
10. Contact information for personnel who are responsible for maintaining and servicing the equipment, and responding to emergencies as required by Section 1207.1.6.1.

1207.10.5 Approved locations. Locations where mobile ESS are charged, stored and deployed shall be restricted to the locations established on the construction and operational permits.

1207.10.6 Charging and storage. Installations where mobile ESS are charged and stored shall be treated as permanent ESS indoor or outdoor installations, and shall comply with the following sections, as applicable:

1. Indoor charging and storage shall comply with Section 1207.7.
2. Outdoor charging and storage shall comply with Section 1207.8.
3. Charging and storage on rooftops and in open parking garages shall comply with Section 1207.9.

Exceptions:

1. Electrical connections shall be permitted to be made using temporary wiring complying with the manufacturer's instructions, the UL 9540 listing and NFPA 70.
2. Fire suppression system connections to the water supply shall be permitted to use approved temporary connections.

1207.10.7 Deployed mobile ESS requirements. Deployed mobile ESS equipment and operations shall comply with this section and Table 1207.10.

1207.10.7.1 Duration. The duration of mobile ESS deployment shall not exceed 30 days.

Exceptions:

1. Mobile ESS deployments that provide power for durations longer than 30 days shall comply with Section 1207.10.6.
2. Mobile ESS deployments shall not exceed 180 days unless additional operational permits are obtained.

1207.10.7.2 Restricted locations. Deployed mobile ESS operations shall not be located indoors, in covered parking garages, on rooftops, below grade or under building overhangs.

1207.10.7.3 Clearance to exposures. Deployed mobile ESS shall be separated by a minimum of 10 feet (3048 mm) from the following exposures:

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

Deployed mobile ESS shall be separated by a minimum of 50 feet (15 240 mm) from public seating areas and from tents, canopies and membrane structures with an *occupant load* of 30 or more.

1207.10.7.4 Electrical connections. Electrical connections shall be made in accordance with the manufacturer's instructions and the UL 9540 listing. Temporary wiring for electrical power connections shall comply with NFPA 70. Fixed electrical wiring shall not be provided.

1207.10.7.5 Local staging. Mobile ESS in transit from the charging and storage location to the deployment location and back shall not be parked within 100 feet (30 480 mm) of an occupied building for more than 1 hour during transit, unless specifically *approved* by the *fire code official* when the permit is issued.

1207.10.7.6 Fencing. An *approved* fence with a locked gate or other *approved* barrier shall be provided to keep the general public at least 5 feet (1524 mm) from the outer enclosure of a deployed mobile ESS.

1207.10.7.7 Smoking. Smoking shall be prohibited within 10 feet (3048 mm) of mobile ESS. Signs shall be posted in accordance with Section 310.

1207.11 ESS in Group R-3 and R-4 occupancies. ESS in Group R-3 and R-4 occupancies shall be installed and maintained in accordance with Sections 1207.11.1 through 1207.11.9. The temporary use of an *owner* or occupant's electric-powered vehicle as an ESS shall be in accordance with Section 1207.11.10.

1207.11.1 Equipment listings. ESS shall be *listed* and *labeled* in accordance with UL 9540. ESS *listed* and *labeled* solely for utility or commercial use shall not be used for residential applications.

Exceptions:

1. Where approved, repurposed unlisted battery systems from electric vehicles are allowed to 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. ESS less than 1 kWh (3.6 megajoules).

1207.11.2 Installation. ESS shall be installed in accordance with the manufacturer's instructions and their listing.

1207.11.2.1 Spacing. Individual units shall be separated from each other by at least 3 feet (914 mm) of spacing unless smaller separation distances are documented to be adequate based on large-scale fire testing complying with Section 1207.1.5.

1207.11.3 Location. ESS shall be installed only 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 406.3.4 of the *International Building Code*.
3. Outdoors on exterior walls located a minimum of 3 feet (914 mm) from doors and windows.
4. Utility closets and storage or utility spaces within *dwelling units* and *sleeping units*.

1207.11.4 Energy ratings. Individual ESS units shall have a maximum rating of 20 kWh. The aggregate rating structure shall not exceed:

1. 40 kWh within utility closets and storage or utility spaces.
2. 80 kWh in attached or detached garages and detached accessory structures.
3. 80 kWh on exterior walls.
4. 80 kWh outdoors on the ground.

1207.11.5 Electrical installation. ESS 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.

1207.11.6 Fire detection. Rooms and areas within *dwelling units, sleeping units* and attached garages in which ESS are installed shall be protected by smoke alarms in accordance with Section 907.2.11. 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.

1207.11.7 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*.

1207.11.8 Ventilation. Indoor installations of ESS that include batteries that produce hydrogen or other flammable gases during charging shall be provided with exhaust ventilation in accordance with Section 1207.6.1.

1207.11.9 Toxic and highly toxic gas. ESS 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.

1207.11.10 Electric vehicle use. The temporary use of an owner or occupant's electric-powered vehicle to power a *dwelling unit or sleeping unit* while parked in an attached or detached garage or outside shall comply with the vehicle manufacturer's instructions and NFPA 70.

Section 3. Amendment of Section 22-104 to Replace Chapter 22. That Chapter 22, Article 4, Section 22-104 of the Code of Ordinances, City of Kentwood, Michigan, is amended to replace Chapter 22 in its entirety to read as follows:

CHAPTER 22 COMBUSTIBLE DUST-PRODUCING OPERATIONS

SECTION 2201 GENERAL

2201.1 Scope. The equipment, processes and operations involving dust explosion hazards and use or handling of *combustible dust* shall comply with the provisions of this chapter.

Exceptions:

1. Storage and use of consumer materials in Group B or R occupancies.
2. Storage and use of commercially packaged materials in Group M occupancies.
3. Materials displayed in original packaging in Group M occupancies and intended as building materials or for personal or household use.

4. Storage of sealed containers of *combustible dust* at facilities not associated with an operation that uses, handles or generates *combustible dust*.
5. Materials stored or used in farm buildings or similar occupancies intended for on-premises agricultural purposes.

2201.2 Permits. Permits shall be required for *combustible dust*-producing operations as set forth in Section 105.6.

SECTION 2202 DEFINITIONS

COMBUSTIBLE DUST. Finely divided solid material which is 420 microns or less in diameter and which, when dispersed in air in the proper proportions, could be ignited by a flame, spark or other source of ignition. Combustible dust will pass through a US No. 40 standard sieve.

DUST COLLECTION SYSTEM. A combination of equipment designed to contain, capture and collect airborne *combustible dusts*.

SECTION 2203 DUST EXPLOSION PREVENTION

2203.1 Critical depth layer. The maximum dust layer on all surfaces, including but not limited to walls, ceilings, beams, equipment, furniture, pipes and ducts, shall not exceed the critical depth layer specified in Table 2203.1. The critical depth layer is permitted to be adjusted for explosion hazard where further evaluated in accordance with one of the following:

1. Section 7.2.1.3 of NFPA 654.
2. Section 4.1.3.3 of NFPA 664 for wood flour.

Accumulated *combustible dust* shall be collected by one of the methods listed in Section 2203.5.

**TABLE 2203.1
CRITICAL DEPTH LAYER**

TYPE OF DUST	CRITICAL DEPTH LAYER (INCHES)
Wood flour	$\frac{1}{8}$
All other dusts	$\frac{1}{32}$

For SI: 1 inch = 25.4 mm.

2203.2 Dust-producing and dust-handling equipment. Dust-producing equipment and dust-handling equipment, including but not limited to vacuums, dust collection systems, dryers, mixers, blenders, separators, conveyors, storage containers, silos or

other similar devices, shall be *listed* and shall be maintained in accordance with the manufacturer's recommended standards.

2203.2.1 Signages and markings. Signages and markings shall be provided in accordance with Sections 2203.2.1.1 through 2203.2.1.3.

2203.2.1.1 Deflagration vent discharge area markings. Where dust collection systems and other equipment, systems or system components are provided with deflagration vents, the area within the deflagration vent's discharge area shall be marked in an *approved* manner.

2203.2.1.2 Caution signs. Signs that read as follows shall be posted near the dust-containing equipment with deflagration vents:

CAUTION: THIS EQUIPMENT CAN
CONTAIN EXPLOSIVE DUST.
KEEP OUTSIDE THE MARKED AREA
WHILE EQUIPMENT IS OPERATING.

2203.2.1.3 Warning signs. Where dust collection systems and other equipment, systems or system components are provided with deflagration vents, vent closures shall be clearly marked as follows:

WARNING: EXPLOSION RELIEF DEVICE.
STAY CLEAR.

2203.3 Dust-collection and dust-conveying systems. Dust collection and dust-conveying systems shall be in accordance with Sections 2203.3.1 through 2203.3.3.

2203.3.1 Dust-collection systems. Dust-collection systems shall be designed to collect dust emissions from dust-producing equipment at the point of generation. Dust-collection systems shall be in accordance with Section 511 of the *International Mechanical Code*.

Exception: *Closed systems* using *listed* equipment and designed in accordance with manufacturer's recommendations and specifications, where cleanouts are provided in accordance with Section 2203.3.3.

Heating, ventilation, and air conditioning (HVAC) systems shall not be used as the means to collect dusts from localized sources.

2203.3.1.1 Location. Dust collectors shall be located outside of buildings.

Exceptions:

1. Dust collectors inside buildings complying with Section 511 of the *International Mechanical Code*.
2. Wet-type dust collectors specifically listed for the type of dust conveyed shall be permitted inside buildings where in accordance with the manufacturer's instructions and specifications.

3. Dust collectors designed to specific NFPA standards listed in Table 2205.1 for the specific type of dust conveyed.

2203.3.1.2 Minimum conveying velocities. The minimum velocities within ducts used as part of the dust collection system shall be in accordance with Table 2203.3.1.2.

**TABLE 2203.3.1.2
MINIMUM CONVEYING VELOCITIES**

TYPE OF PRODUCT	FEET PER MINUTE
Fine light dust such as cotton, lint and wood flour (100 mesh and under)	2,000
Dry dust such as fine rubber molding powder	2,500
Average dust such as sawdust, grinding dust and coal dust	3,500
Heavy dust such as metal turnings, including aluminum and magnesium powder	4,000

For SI: 1 foot per minute = 0.00508 m/s.

2203.3.2 Plastic ducts and conveying systems. Plastic, fiberglass, other nonconductive ducts, duct liners or pipes shall not be used as part of ducts and conveying systems. Ductwork utilizing a combustible lining shall be permitted only in high-impact areas and where *approved*. Flexible hose shall be permitted if designed and installed in accordance with the following requirements:

1. Manufactured of static dissipative construction.
2. Used only for connections and isolation purposes.
3. Limited to 18 inches (457 mm) in length.
4. Properly grounded.

2203.3.3 Cleanouts. Openings in enclosed equipment and conveyors shall be provided to allow access to all parts of the equipment and conveyors to permit inspection, cleaning, maintenance and the effective use of portable fire extinguishers or hose streams. Cleanouts for ducts used as part of the dust-collection system shall be in accordance with the *International Mechanical Code*.

2203.4 Sources of ignition. Sources of ignition shall be controlled in accordance with Sections 2203.4.1 through 2203.4.9.5.

2203.4.1 Classified electrical. Classified electrical shall be in accordance with NFPA 70. Electrical motors and electrical components of the equipment shall not be installed in the dust-laden airstream unless *listed* for Class II, Division 1, locations.

2203.4.2 Static electricity. Bonding and grounding is required to minimize accumulation of static electric charge in the following locations:

1. Dust-producing equipment.
2. Dust-collection system.
3. Pneumatic dust-conveying systems conveying *combustible dust* from one location to another, *combustible dust* conveyors, piping and conductive components. Conveying systems include transport modes such as railcars, hopper cars, boxcars, tank cars and trucks into which or from which commodities or products are pneumatically conveyed.
4. Conveying systems using metallic piping.

2203.4.3 Hot works. Hot work and similar spark-producing operations shall not be conducted in or adjacent to *combustible dust*-producing areas unless precautions have been taken to provide safety. Hot work shall be permitted only in safe, designated areas in accordance with Chapter 35. Hot work is prohibited on equipment that is operating.

2203.4.3.1 Signs. Conspicuous signs with the following warning shall be posted in the vicinity of *combustible dust*-producing areas or in the vicinity of *combustible dust* use:

NO WELDING. THE USE OF WELDING
OR CUTTING EQUIPMENT IN OR NEAR
THIS AREA IS DANGEROUS BECAUSE
OF FIRE AND EXPLOSION HAZARDS.
WELDING AND CUTTING SHALL BE
DONE ONLY UNDER THE SUPERVISION
OF THE PERSON IN CHARGE.

2203.4.4 Hot surfaces and hot equipment. In areas where a dust explosion hazard or dust flash fire hazard exists, the temperature (in degrees Celsius) of external surfaces shall be maintained below 80 percent of the lower of the dust-surface ignition temperature or the dust-cloud ignition temperature for worst-case dusts. External surfaces shall include but are not limited to:

1. Compressors.
2. Steam, water or process piping.
3. Ducts.
4. Conveyors.
5. Process equipment.

Where steam pipes or hot surfaces occur in dust-producing or dust-handling areas, accumulation of dust on the surfaces shall be minimized by an *approved* method.

Exception: Drying apparatus *listed* for the intended use and installed in accordance with the manufacturer's instructions.

2203.4.5 Powered industrial trucks. Powered industrial trucks used in electrically classified areas shall be *listed* for such use.

2203.4.6 Smoking prohibited. Smoking shall be prohibited in or adjacent to dust-producing or dust-handling areas. "No Smoking" signs complying with Section 310 shall

be conspicuously posted in such areas. Smoking shall be permitted only in designated areas.

2203.4.7 Spark-producing devices. Spark-producing devices shall not be located within 20 feet (6096 mm) of areas requiring classified electrical unless separated by a permanent partition.

2203.4.8 Self-heating materials. Materials in silos and other large storage piles of particulates prone to self-heating shall be in accordance with Section 9.4.11 of NFPA 652.

2203.4.9 Open flames and fuel-fired equipment. Open flames and fuel-fired equipment shall be in accordance with Sections 2203.4.9.1 through 2203.4.9.5.

2203.4.9.1 Release of airborne combustible dust. Production, maintenance or repair activities that have the potential to release or force *combustible dust* to become airborne shall not be conducted within 35 feet (11 m) of an open flame or pilot flame.

2203.4.9.2 Space heaters. Fuel-fired space heaters drawing local ambient air shall not be located within electrically classified areas. Space-heating appliances in dust-producing or dust-handling areas shall be located where not subject to the accumulation of deposits of *combustible dust*.

2203.4.9.3 Equipment listing. Fuel-fired process equipment shall be *listed* for its intended use and shall be operated and maintained in accordance with the manufacturer's instructions.

2203.4.9.4 Inspection and preventive maintenance. Inspection and maintenance of fuel-fired process equipment shall include verification that significant *combustible dust* accumulations do not exist within or around the equipment.

2203.4.9.5 Sources of combustion air. In Class II electrically classified locations, heating units shall be provided with a source of combustion air ducted directly from the building exterior or from an unclassified location.

2203.5 Housekeeping. Accumulation of *combustible dust* on surfaces inside buildings shall be maintained below the critical depth layer in Section 2203.1. Pressurized air or similar methods shall not be used to remove dust from surfaces. Accumulated combustible dust shall be collected by one of the following methods:

1. Portable vacuum cleaners *listed* for use in Class II, Group G, Division 1, atmospheres as defined in NFPA 70.
2. Dust collection systems.
3. Other *approved* means that will not place *combustible dust* into suspension in air.

Exception: Forced-air or similar methods shall be permitted to remove dust in accordance with NFPA 652, NFPA 654 or NFPA 664.

2203.6 Standard operational procedures. Dust-producing equipment and all associated equipment, including dust-collection equipment, shall be maintained in accordance with the manufacturer's instructions and specifications and applicable codes. The inspection, testing and maintenance program shall include the following, as applicable:

1. Fire and explosion protection and prevention equipment, as applicable, in accordance with the appropriate NFPA standards.
2. Dust-control equipment.
3. Control of potential ignition sources.
4. Electrical, process and mechanical equipment, including applicable process interlocks.
5. Lubrication of bearings for dust-collection, dust handling and dust-producing equipment.
6. Additional maintenance in accordance with the manufacturer's instructions and specifications for dust-collection, dust-handling and dust-producing equipment.

Records shall be kept of maintenance and repairs performed. The standard operating procedures shall be submitted to the *fire code official* for review and approval. The written standard operating procedures shall be signed by the person responsible for facility operations.

2203.7 Emergency response plan. A written emergency response plan shall be developed for preventing, preparing for and responding to work-related emergencies, including but not limited to fire and explosion. The following information shall be developed into the plan:

1. Identification of dust hazards.
2. Identification and location of all utilities to affected areas.
3. Site plans or floor plans locating utility shutoff controls, including water, gas and power.
4. The potential for explosion.
5. Locations of fire-extinguishing equipment compatible with the hazards present.
6. Any additional information required by the *fire code official*.

2203.8 Training. The plans and procedures required in Sections 2203.5, 2203.6 and 2203.7 shall be *approved* by the *fire code official*. The plans and procedures shall be reviewed annually and updated as required by process changes. Initial and annual refresher training shall be provided to employees who are involved in operating, maintaining and supervising facilities that handle *combustible dust*. Initial and annual refresher training shall include:

1. Workplace hazards.
2. General orientation, plant diagrams and plant safety rules.
3. Process description or flowchart.
4. Equipment operation, safe startup and shutdown, and response to hazard conditions or an incident.
5. The location and use of all related fire and explosion protection and prevention systems.

6. Equipment maintenance requirements and practices, including visual inspections of conveyors and ducts.
 7. Housekeeping requirements, including the maintenance of the critical depth layer in Section 2203.1.
 8. Emergency response plans as required in Section 2203.7.
- The employer shall maintain records of initial and annual training and review.

**SECTION 2204
DUST EXPLOSION SCREENING TESTS**

2204.1 Combustibility and explosivity tests. Where combustibility or explosivity screening tests are required to analyze the *combustible dust* as part of compliance with Section 104.8 and Section 414.1.3 of the *International Building Code*, they shall be in accordance with Section 5.4 of NFPA 652.

2204.2 Samples. Representative samples for the screening test shall be obtained in accordance with Section 5.5 of NFPA 652.

**SECTION 2205
STANDARDS**

2205.1 Specific hazards standards. The *fire code official* is authorized to enforce additional industry- or material-specific provisions of the codes and standards listed in Table 2205.1 to prevent and control dust explosions, as applicable.

**TABLE 2205.1
EXPLOSION PROTECTION STANDARDS**

STANDARD	SUBJECT
NFPA 61	Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
NFPA 68	Standard on Explosion Protection by Deflagration Venting
NFPA 69	Standard on Explosion Prevention Systems
NFPA 70	National Electrical Code
NFPA 77	Recommended Practice on Static Electricity
NFPA 85	Boiler and Combustion System Hazards Code

NFPA 120	Standard for Fire Prevention and Control in Coal Mines
NFPA 484	Standard for Combustible Metals
NFPA 654	Standard for Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids
NFPA 655	Standard for the Prevention of Sulfur Fires and Explosions
NFPA 664	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

2205.1.1 Dust hazard analysis. If a dust hazard analysis (DHA) is required by the *fire code official* for new or existing facilities and operations, it shall be in accordance with NFPA 652. The DHA for existing facilities shall be in accordance with Section 7.1.1 of NFPA 652.

Section 4. Amendment of Section 22-104 to Add a New Chapter 40. That Chapter 22, Article 4, Section 22-104 of the Code of Ordinances, City of Kentwood, Michigan, is amended to add a new Chapter 40, Sections 4001 through 4006, inclusive, to read as follows:

**CHAPTER 40
STORAGE OF DISTILLED SPIRITS AND WINES**

**SECTION 4001
GENERAL**

4001.1 General. The storage of distilled spirits and wines in barrels and casks shall comply with this chapter in addition to other applicable requirements of this code.

4001.1.1 Nonapplicability. Chapter 50 and Chapter 57 are not applicable to the storage of distilled spirits and wines in barrels and casks as identified in Section 5001.1, Exception 10, and Section 5701.2, Item 10.

SECTION 4002 DEFINITIONS

4002.1 Definitions. Words and terms used in this chapter and defined in Chapter 2 shall have the meanings ascribed to them as defined therein.

SECTION 4003 PRECAUTIONS AGAINST FIRE

4003.1 Spill control. Drainage or containment systems shall be provided by means of curbs, scuppers, special drains or other suitable means to prevent the flow of spills throughout the building.

4003.2 Ventilation. For rooms and spaces where distilled spirits and wines in barrels and casks are stored, ventilation shall be provided in accordance with the International Mechanical Code and one of the following:

1. The rooms and spaces shall be ventilated at a rate sufficient to maintain the concentration of vapors within the area at or below 25 percent of the *lower flammable limit* (LFL). This shall be confirmed by sampling the actual vapor concentration under normal operating conditions. The sampling shall be conducted throughout the enclosed storage area, extending to or toward the bottom and the top of the enclosed storage area. The vapor concentration used to determine the required ventilation rate shall be the highest measured concentration during the sampling procedure. The sampling shall be conducted manually or by installation of a continuously monitoring flammable vapor detection system.
2. The rooms and spaces shall be provided exhaust ventilation at a rate of not less than 1 cfm per square foot [$0.00508 \text{ m}^3/(\text{s} \times \text{m}^2)$] of solid floor area. The exhaust ventilation shall be accomplished by natural or mechanical means, with discharge of the exhaust to a safe location outside the building.

4003.3 Sources of ignition. Sources of ignition shall be controlled in accordance with Sections 4003.3.1 through 4003.4.

4003.3.1 Smoking. Smoking shall be prohibited and “No Smoking” signs provided as follows:

1. In rooms or areas where hazardous materials are stored or dispensed or used in open systems in amounts requiring a permit in accordance with Sections 105.5 and 105.6.
2. Within 25 feet (7620 mm) of outdoor storage, dispensing or open-use areas.
3. Facilities or areas within facilities that have been designated as totally “no smoking” shall have “No Smoking” signs placed at all entrances to the facility or area. Designated areas within such facilities where smoking is permitted either permanently or temporarily shall be identified with signs designating that smoking is permitted in these areas only.
4. In rooms or areas where flammable or combustible hazardous materials are stored, dispensed or used.

Signs required by this section shall be in English as a primary language or in symbols allowed by this code and shall comply with Section 310.

4003.3.2 Open flame. Open flames and high-temperature devices shall not be used in a manner that creates a hazardous condition and shall be *listed* for use with the hazardous materials stored or used.

4003.3.3 Industrial trucks. Powered industrial trucks used in areas designated as hazardous (classified) locations in accordance with NFPA 70 shall be *listed* and *labeled* for use in the environment intended in accordance with NFPA 505.

4003.3.4 Electrical. Electrical wiring and equipment shall be installed and maintained in accordance with Section 606 and NFPA 70.

4003.4 Lightning. Structures containing barrel storage should be protected from lightning. The lightning protection equipment shall be installed in accordance with NFPA 70 and NFPA 780.

SECTION 4004 STORAGE

4004.1 Storage. Storage shall be in accordance with this section and Section 315.

4004.2 Empty containers. The storage of empty containers previously used for the storage of *flammable* or *combustible liquids*, unless free from explosive vapors, shall be stored as required for filled containers.

4004.3 Basement storage. Class I liquids shall be allowed to be stored in basements in amounts not exceeding the *maximum allowable quantity per control area* for use-open systems in Table 5003.1.1(1), provided that automatic suppression and other fire protection are provided in accordance with Chapter 9. Class II and IIIA liquids shall also be allowed to be stored in *basements*, provided that automatic suppression and other fire protection are provided in accordance with Chapter 9.

4004.4 Bulk beverage storage areas. There shall be no storage of combustible materials in the bulk beverage storage areas not related to the beverage storage activities.

SECTION 4005 FIRE PROTECTION

4005.1 Automatic sprinkler system. The storage of distilled spirits and wines shall be protected by an *approved automatic sprinkler system* as required by Chapter 9.

 1206.4, 1206.6.2, 1206.11, 1206.12
2010	Standard for Fixed Aerosol Fire-extinguishing Systems.....Table901.6.1, 904.12, 1207.5.5
UL	
1489	Fire Resistant Pipe Protection Systems Carrying Combustible Liquids 1203.1.2
1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources— 1207.3.3, 1207.11.5
1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications and Stationary ApplicationsTable 1207.6
1974	Standard for Evaluation for Repurposing Batteries..... 1207.3.9
2201	Standard for Carbon Monoxide (CO) Emission Rate Of Portable Generators.....1204.2
9540	Standard for Energy Storage Systems and Equipment..... 1207.3.1, 1207.3.2, 1207.3.7, 1207.10.6, 1207.10.7.4, 1207.11.1, 1207.11.5
9540A	Standard for Safety Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems1207.1.5 , 1207.6.3

Section 6. Effective Date. This Ordinance shall be published as required by law and shall become effective ten (10) days following its publication.

YEAS: _____

 NAYS: _____

 ABSENT: _____

ORDINANCE NO. _____ ADOPTED.

Stephen C.N. Kepley, Mayor

Dan Kasunic, Clerk

CERTIFICATION

I, Dan Kasunic, the Clerk of the City of Kentwood, certify that the foregoing is a true and accurate copy of an ordinance adopted by the City Commission of the City of Kentwood at a regular meeting held on _____, 2024.

Dan Kasunic, Clerk