

WAC 51-54A-1207 Electrical energy storage systems.

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 not exceeding thresholds in Section 1207.11.4 shall comply with Section 1207.11 through 1207.11.9.

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
Sodium nickel chloride batteries	70 kWh
Nickel-cadmium batteries (Ni-Cd), Nickel Metal Hydride (Ni-MH), and Nickel Zinc (Ni-Zn) batteries	70 kWh
Nonelectrochemical ESS ^d	70 kWh
Other battery technologies	10 kWh
Other electrochemical ESS technologies	3 kWh
Zinc manganese dioxide batteries (Zn-MnO ₂)	70 kWh

For SI: 1 kilowatt-hour = 3.6 megajoules.

^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.

^b Shall include vanadium, zinc-bromine, polysulfide-bromide and other flowing electrolyte-type technologies.

^c Fifty gallons of lead-acid battery electrolyte shall be considered equivalent to 70 kWh.

^d Covers nonelectrochemical technologies such as flywheel and thermal ESS.

1207.1.1.1 Utilities and industrial applications. This section shall not apply to capacitors and capacitor equipment for electric utilities and industrial facilities used in applications such as flexible ac transmission (FACTS) devices, filter capacitor banks, power factor correction, and standalone capacitor banks for voltage correction and stabilization.

1207.1.1.2 Mobile ESS. Mobile ESS deployed at an electric utility substation or generation facility for 90 days or less shall not add to the threshold values in Table 1207.1.1 for the stationary ESS installation if both of the following conditions apply:

1. The mobile ESS complies with Section 1207.10.

2. The mobile ESS is only being used during periods in which the facility's stationary ESS is being tested, repaired, retrofitted, or replaced.

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 documentation of the listings of each ESS and associated equipment.

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.

11. A fire safety and evacuation plan in accordance with Section 404.

1207.1.3.1 Utilities applicability. Plans and specifications associated with ESS owned and operated by electric utilities as a component of the electric grid that are considered critical infrastructure documents in accordance with the provisions of the North American Electric Reliability Corporation and other applicable governmental laws and regulations shall be made available to the fire code official for viewing based on the requirements of the applicable governmental laws and regulations.

1207.1.4 Hazard mitigation analysis. Failure modes and effects analysis (FMEA) or other *approved* hazard mitigation analysis shall be provided in accordance with Section 104.8.2 under any of the following conditions:

1. Where ESS technologies not specifically identified in Table 1207.1.1 are provided.

2. More than one ESS technology is provided in a single fire 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.

4. Where flammable gases can be produced under abnormal conditions.

5. Where required by the fire code official to address a potential hazard with an ESS installation that is not addressed by existing requirements.

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 electrochemical ESS unit.

2. A mechanical failure of a nonelectrochemical ESS unit.

3. Failure of any battery (energy) management system or fire protection system within the ESS equipment that is not covered by the product listing failure mode effects analysis (FMEA).

4. Failure of any required protection system external to the ESS including, but not limited to, ventilation (HVAC), exhaust ventilation, smoke detection, fire detection, gas detection, or fire suppression 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 involving the ESS will allow occupants or the general public to evacuate to a safe location.

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 the duration of the test. The test report shall be provided to the fire code official for review and approval in accordance with Section 104.8.2.

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 dispatch within 15 minutes 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.

1207.2.1 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.

- EXCEPTIONS: 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.
1. Lead-acid and nickel-cadmium battery systems less than 50 VAC, 60 VDC that are in telecommunications facilities for installations of communications equipment under the exclusive control of communications utilities and located outdoors or in building spaces or walk-in units used exclusively for such installations that are in compliance with NFPA 76 shall be permitted to have a commissioning plan in compliance with recognized industry practices in lieu of complying with Section 1207.2.1.
 2. Lead-acid and nickel-cadmium battery systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utilities, and located in building spaces or walk-in units used exclusively for such installations shall be permitted to have a commissioning plan in compliance with applicable governmental laws and regulations in lieu of developing a commissioning plan in accordance with Section 1207.2.1.

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

- EXCEPTIONS:
1. Lead-acid and nickel-cadmium battery systems less than 50 VAC, 60 VDC in telecommunications facilities for installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations that are in compliance with NFPA 76.
 2. Lead-acid and nickel-cadmium battery systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.
 3. Lead-acid battery systems in uninterruptible power supplies listed and labeled in accordance with UL 1778 and utilized for standby power applications.

1207.3.7.1 Retrofitting lead acid and nickel cadmium. Changing out or retrofitting of lead-acid and nickel-cadmium batteries in the following applications shall be considered repairs where there is no increase in system size or energy capacity greater than 10 percent of the original design.

1. At facilities under the exclusive control of communications utilities that comply with NFPA 76 and operate at less than 50 VAC and 60 VDC.
2. Battery systems used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.
3. Batteries in uninterruptible power supplies listed and labeled in accordance with UL 1778 and used for standby applications only.

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	

Technology	Maximum Allowable Quantities ^a
Flow batteries ^b	600 kWh
Lead-acid, all types	Unlimited
Lithium-ion	600 kWh
Sodium nickel chloride	600 kWh
Nickel-cadmium (Ni-Cd), Nickel metal hydride (Ni-MH) and nickel zinc (Ni-Zn)	Unlimited
Zinc manganese dioxide (Zn-MnO ₂)	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.

^a For electrochemical ESS units rated in amp-hours, kWh shall equal rated voltage times the amp-hour rating divided by 1,000.

^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 mega-joules). Each group shall be separated a minimum of three feet (914 mm) from other groups and from walls in the storage room or area. The storage arrangements shall comply with Chapter 10.

- EXCEPTIONS:
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. Lead-acid and nickel-cadmium systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.
 3. Lead-acid battery systems in uninterruptible power supplies and labeled in accordance with UL 1778, utilized for standby power applications, and limited to not more than 10 percent of the floor area on the floor on which the ESS is located.
 4. 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.

1207.5.3 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. Lead-acid and nickel-cadmium systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.
 3. Lead-acid battery systems in uninterruptible power supplies and labeled in accordance with UL 1778, utilized for standby power applications, and limited to not more than 10 percent of the floor area on the floor on which the ESS is located.
 4. Where approved, installations shall be permitted in underground vaults complying with NFPA 70, Article 450, Part III.
 5. 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.

EXCEPTION: Normally unoccupied, remote stand-alone telecommunications structures with a gross floor area of less than 1500 ft² (139 m²) utilizing lead-acid or nickel-cadmium batteries shall not be required to have a fire detection system installed.

1207.5.4.1 System status. Lead-acid and nickel-cadmium battery systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations shall be allowed to use the process control system to monitor the smoke or radiant energy-sensing fire detectors required in Section 1207.5.4.

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. Automatic sprinkler systems, designed and installed in accordance with Section 903.3.1.1 for ESS units (groups) with a maximum stored energy capacity of 50 kWh, as described in Section 1207.5.1, shall be designed with a minimum density of 0.3 gpm/ft² (1.14 L/min) based over the area of the room or 2,500 square-foot (232 m²) design area, whichever is smaller, unless a lower density is approved based upon large-scale fire testing in accordance with Section 1207.1.5.

2. Automatic sprinkler system designed and installed in accordance with Section 903.3.1.1 for ESS units (groups) exceeding 50 kWh shall use a density 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.

EXCEPTIONS:

1. 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.
2. Lead-acid and nickel-cadmium systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations, shall not be required to have a fire suppression system installed.
3. Lead-acid battery systems in uninterruptible power supplies listed and labeled in accordance with UL 1778, utilized for standby power applications, which is limited to not more than 10 percent of the floor area on the floor on which the ESS is located, shall not be required to have a fire suppression system.

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					Sodium nickel chloride	Other ESS and Battery Technologies ^b	Capacitor ESS ^b
Feature	Section	Lead-acid	Nickel cadmium (Ni-Cd), nickel metal hydride (Ni-MH) and nickel zinc (Ni-Zn)	Zinc manganese dioxide (ZnMnO ₂)	Lithium-ion	Flow			
Exhaust ventilation	1207.6.1	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Explosion control	1207.6.3	Yes ^a	Yes ^a	Yes	Yes	No	Yes	Yes	Yes
Safety caps	1207.6.4	Yes	Yes	Yes	No	No	No	Yes	Yes
Spill control and neutralization	1207.6.2	Yes ^c	Yes ^c	Yes ^f	No	Yes	No	Yes	Yes
Thermal runaway	1207.6.5	Yes ^d	Yes ^d	Yes ^e	Yes ^e	No	Yes	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 104.8.2 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) 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.

^f Not required for batteries with jelled electrolyte.

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, ESS cabinets, or ESS 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.
 2. Where approved, explosion control is permitted to be waived by the fire code official based on documentation provided in accordance with Section 104.8 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.
 3. Where approved, ESS cabinets that have no debris, shrapnel, or enclosure pieces ejected during large scale fire testing complying with Section 1207.1.5 shall be permitted in lieu of providing explosion control complying with Section 911.
 4. Explosion control is not required for lead-acid and nickel-cadmium battery systems less than 50 VAC, 60 VDC in telecommunication facilities under the exclusive control of communications utilities located in building spaces or walk-in units used exclusively for such installations.
 5. Explosion control is not required for lead-acid and nickel-cadmium systems used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility located in building spaces or walk-in units used exclusively for such installations.
 6. Explosion control is not required for lead-acid battery systems in uninterruptible power supplies listed and labeled in accordance with UL 1778, utilized for standby power applications, and housed in a single cabinet in a single fire area in buildings or walk-in units.

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.

EXCEPTION: Mobile ESS used to temporarily provide power to lead-acid and nickel-cadmium systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.

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.

EXCEPTION: Mobile ESS used to temporarily provide power to lead-acid and nickel-cadmium systems that are used for dc power for control of substations and control or safe shutdown of generating stations under the exclusive control of the electric utility, and located outdoors or in building spaces used exclusively for such installations.

1207.11 ESS in Group R-3 and R-4 occupancies. ESS in Group R-3 and R-4 occupancies shall be in accordance with Sections 1207.11.1 through 1207.11.9.

EXCEPTIONS: 1. ESS listed and labeled in accordance with UL 9540 and marked "For use in residential dwelling units", where installed in accordance with the manufacturer's instructions and NFPA 70.

2. ESS rated less than 1 kWh (3.6 megajoules).

1207.11.1 Equipment listings. ESS shall be listed and labeled in accordance with UL 9540.

EXCEPTIONS: Not adopted.

1207.11.2.1 Spacing. Individual ESS units shall be separated from each other by at least three feet (914 mm) except where 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 406.3.2 of the International Building Code.
3. Outdoors or on the exterior side of exterior walls located a minimum of three feet (914 mm) from doors and windows directly entering the dwelling unit.
4. Enclosed utility closets, basements, storage or utility spaces within dwelling units and sleeping units with finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with not less than 5/8 in. Type X gypsum wallboard.

ESS shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms.

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

1. 40 kWh within utility closets, basements, 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.

ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Sections 1207.1 through 1207.9.

1207.11.6 Fire detection. ESS installed in Group R-3 and R-4 occupancies shall comply with the following:

1. Rooms and areas within dwelling units, sleeping units, basements and attached garages in which ESS are installed shall be protected by smoke alarms in accordance with Section 907.2.11.
2. A listed heat alarm shall be installed in locations where smoke alarms cannot be installed based on their listing.

1207.11.7 Protection from impact. ESS 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 304.5 of the International Mechanical Code.

1207.11.9 Toxic and highly toxic gas. Model code section not adopted.

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 outdoors shall comply with the vehicle manufacturer's instructions and NFPA 70.

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