

Seattle Fire Department Permit Conditions

6401-Install

Site Address: _____

Inspector: _____

Installation of Energy Storage System

NOTICE

This permit shall be kept on the premises designated herein at all times and shall be readily available for inspection by the fire code official. (SFC 105.3.5)

(INDOOR)

1. Energy storage systems having capacities exceeding the values in Table 1207.1.3 shall comply with these conditions.

**TABLE 1207.1.3
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 |
| Non-electrochemical 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.

2. 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.

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9. A commissioning plan complying with Section 1207.2.1 of the SFC.
 10. A decommissioning plan complying with Section 1207.2.3 of the SFC.
 11. A fire safety and evacuation plan in accordance with Section 404 of the SFC.(SFC 1207.1.5)
3. Electrochemical energy storage systems shall not be located in areas where the floor is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, or where the floor level is below the finished floor of 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 uninterruptable power supplies and labeled in accordance with UL 1778, utilized for standby power applications, and limited to not more than 10% 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. (SFC 1207.5.3)
4. A commissioning plan shall be provided prior to commissioning and 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. (SFC 1207.2.1)

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13. A commissioning report describing the results of the system commissioning, including the results of the initial acceptance testing shall be provided prior to final inspection and approval and be maintained on-site. (SFC 1207.2.1.2)
5. An operation and maintenance manual shall be provided on site 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. (SFC 1207.2.2)
6. Energy storage systems shall be listed in accordance with UL 9540. (SFC 1207.3.1)
7. Chargers, inverters and energy storage management systems shall be covered as part of the UL 9540 listing or shall be listed separately. (SFC 1207.3.2)
8. 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. (SFC 1207.3.3)
9. 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. (SFC 1207.3.4)
10. Where energy storage systems are subject to impact by a motor vehicle, including forklifts, vehicle impact protection shall be provided in accordance with SFC Section 312. (SFC 1207.4.5)
11. Where energy storage systems are installed in a separate equipment room that can be accessed only by authorized personnel, they shall be permitted to be installed on an open rack for ease of maintenance. (SFC 1207.4.11)
12. Where energy storage systems are located in an occupied work center, they shall be housed in a noncombustible cabinet or other enclosure to prevent access by unauthorized personnel. (SFC 1207.4.10)
13. Where energy storage systems are contained in cabinets in occupied work centers, the cabinet enclosures shall be located within 10 feet (3048 mm) of the equipment that they support. (SFC 1207.4.10)

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14. 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. (SFC 1207.4.1)
15. Combustible materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets, or enclosures. Combustible materials shall not be stored less than 3 feet (915 mm) from battery cabinets in occupied work centers where personnel are located and they are not directly involved with the maintenance, service and testing of the ESS system . (SFC 1207.4.6 & 1207.4.10)
16. Approved signs shall be provided on or adjacent to all entry doors for ESS rooms or areas and 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 SFC Section 1207.1.8.1. (SFC 1207.4.8)
17. *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 1207.1.6 and large-scale fire testing complying with Section 1207.1.7.
 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. (SFC 1207.5.2)

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 |
| Sodium nickel chloride | 600 kWh |
| Nickel-cadmium (Ni-Cd), Nickel metal hydride (NI-MH) and nickel zinc (Ni-Zn) | Unlimited |

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| | |
|---|-----------|
| 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.

RETROFITTING

1. Retrofitting of an existing ESS shall comply with the following:
 1. A permit shall be obtained.
 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.
 6. Retrofits shall be documented in the service records log. (SFC 1207.3.7)
2. 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 designed in accordance with IEEE C2, 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. (SFC 1207.3.7.1)

REPLACEMENTS

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

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(OUTDOOR)

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

**TABLE 12.07.8
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 |

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.

- 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. (SFC 1207.8.1)
- 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. (SFC 1207.8.2)
- ESS located outdoors shall be separated by a minimum of 10 feet (3048 mm) from the following exposures:
 - Lot lines.
 - Public ways.
 - Buildings.
 - Stored combustible materials.
 - Hazardous materials.
 - High-piled stock.
 - Other exposure hazards.

Exceptions:

- 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.

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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. (SFC 1207.8.3)
5. 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 Administrative Rule 12.01.22.
 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. (SFC 1207.8.4)
6. Rooftop and open parking garage battery system installations shall comply with SFC Sections 1207.9.1 through 1207.9.6. (SFC 1207.9)