



FIRE CONSTRUCTION PERMIT SUBMITTAL CHECKLIST

SERVING THE CITIES OF LAKE STEVENS, MILL CREEK, MONROE AND SULTAN

STATIONARY STORAGE BATTERY SYSTEMS

PROJECT INFORMATION

Site address:	Associated Permits:
Project Name / Tenant:	Property Owner:

Electronic file standards

File naming standard: Electronic plans and documents shall be named as specified in bold type under “permitting requirements”. For example, the seating plan must be named “Seating Plan”.

Acceptable file types: Plans, calculations, specifications and supporting documents shall be uploaded as a PDF file.

Document Orientation: All plans must be uploaded in “Landscape” format in the horizontal position. All other documents can be in “Portrait” format.

CODE EDITIONS

- 2018 Washington State Fire and Building Code and as applicable -Lake Stevens Municipal Code 14.84, Monroe Municipal code 15.04.110, Mill Creek Municipal Code 15.04.120, Sultan Municipal Code 15.05.

PERMITTING REQUIREMENTS

A Fire Construction Permit is required to install or modify a ***Stationary storage battery systems*** required by Section 105.7.2 of the 2018 Washington State Fire Code and local code amendments. **The following information is required at time of application for the Fire Construction Permit.**

- ❑ Completed Fire Construction permit submittal application
- ❑ Completed “Stationary storage battery systems submittal checklist”
- ❑ Plans
- ❑ Manufacturer’s cut sheets for batteries, battery rack, and method and materials for control and neutralization of a spill.

PLANS

The following is a list of information required on all plan submittals for review of a “Battery system” permit application. The plan shall be drawn to 1/8”=1’-0” minimum scale. The applicant is required to submit all of this information so an accurate and timely review may be done:

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

Indicate the battery technology and capacity to be installed: (WSFC table 1206.2, 1206.2.9)

<u>BATTERY TECHNOLOGY⁴</u>	<u>CAPACITY INSTALLED</u>	<u>Permit threshold</u>	<u>Maximum quantity^{2,4,5}</u>
Flow Batteries – includes vanadium, zinc-bromine, polysulfide-bromide, other flowing electrolyte-types technologies		20 kWh	600 kWh
Lead Acid, all types		70 kWh	Unlimited
Lithium, all types		20 kWh	600 kWh
Nickel cadmium (Ni-Cd)		70 kWh	Unlimited
Sodium, all types		20 kWh	600 kWh
Other battery types⁵		10 kWh	200 kWh³

1. For batteries rated in amp-hours, kilowatt-hours (kWh) shall equal rated battery voltage times the amp-hour rating divided by 1,000.
2. Occupancies exceeding maximum quantity shall comply with group H-2 requirements
3. Shall be group H-4 occupancy if the fire code official determines that a fire or thermal-runaway involving the battery technology does not represent a significant fire hazard.
4. Where areas within buildings contain different types of storage battery technologies, the total aggregate quantities of batteries shall be determined based on the sum of percentages of each battery type quantity divided by the maximum allowable quantity of each battery type. If the sum of the percentages exceeds 100%, the area shall be treated as a Group H occupancy.
5. For battery technologies not specifically identified on the above chart, or where there is more than one battery technology provided in a room or indoor area where there is a potential for adverse reaction, or where an increase in the maximum quantity of batteries is desired, a **FAILURE MODES AND EFFECTS ANALYSIS (FEMA)** or **HAZARD MITIGATION ANALYSIS** shall be provided in accordance with Section 104.7.2 of 2018 WSFC. (WSFC 1206.2.3)

Hazard mitigation analysis: (WSFC 1206.2.3.1)

The hazard mitigation analysis shall evaluate the consequences of the following failure modes:

- Thermal runaway condition in a single-battery storage rack, module or array
- Failure of any energy management system
- Failure of any required ventilation system
- Voltage surges on the primary electric supply
- Short circuits on the load side of the stationary battery storage system
- Failure of the smoke detection, fire extinguishing or gas detection system
- Spill neutralization not being provided or failure of the secondary containment system

The hazard mitigation analysis shall demonstrate the following: (WSFC 1206.2.3.2)

- Fires or explosions will be contained within occupied battery storage rooms for the minimum duration of the fire-resistance-rated walls identified in Table 509.1 in the WSBC.
- Fires and explosions in battery cabinets in occupied work centers will be detected in time to allow occupants within the room to evacuate safely.
- Toxic and highly toxic gases released during fires and other fault conditions shall not reach concentrations in excess of IDLH levels in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area.
- Flammable gasses released from batteries during charging, discharging and normal operation shall not exceed 25 percent of their lower flammability limit.
- Flammable gases released from batteries during fire, overcharging and other abnormal conditions shall not create an explosion hazard that will injure occupants and specified design parameters.

Battery storage system requirements

Seismic Protection:

- The battery systems shall comply with the seismic design requirements of Chapter 16 of the IBC, and shall not exceed the floor-loading limitation of the building. (WSFC 1206.2.4)

Vehicle impact protection:

- Where stationary battery systems are subject to impact by a vehicle, including motor-vehicles, electric fork lifts, etc. vehicle impact protection shall be provided in accordance with IFC Section 312. (WSFC 1206.2.5)

Location and construction requirements for rooms and areas:

- Stationary storage battery systems shall not be located more than 75 feet above the lowest level of fire department vehicle access, or where the floor level is more than 30 feet below the finished floor of the lowest level of exit discharge. (WSFC 1206.2.8)

Exceptions:

- Lead-acid and nickel-cadmium stationary storage battery systems
- Installations on noncombustible rooftops of buildings exceeding 75' in height that do not obstruct fire department rooftop operations, or where approved by the fire code official
- Rooms containing stationary battery systems shall be separated from other areas of the building in accordance with the IBC Section 509.1. (WSFC 1206.2.8.2)
- Stationary batteries, prepackaged and pre-engineered stationary storage battery systems shall be segregated into arrays not exceeding 50 kWh each. Each array shall be spaced not less than 3 feet from other arrays and from walls. (WSFC 1206.2.8.3)

Exceptions:

- Lead-acid and nickel-cadmium storage battery arrays
- Listed pre-engineered and pre-packaged stationary storage battery systems shall not exceed 250 kWh each.
- The fire code official is authorized to approve listed, pre-engineered and prepackaged battery array with larger capacities or smaller array spacing if the system has had testing conducted or witnessed and reported by an approved testing laboratory, and found that a fire involving one array will not propagate to an adjacent array and be contained within the room for the duration equal to the fire-

resistance rating of the room.

- When stationary batteries are located in an occupied work center, they shall be housed in a noncombustible cabinet or other enclosure to prevent unauthorized access. The cabinets shall be located within 10' of the equipment they support. (WSFC 1206.2.8.5)
- Where the stationary storage battery system disconnecting means is not within sight of the main service disconnecting means, placards or directories shall be installed at the location of the main service disconnecting means indicating the location of the battery system disconnection means. (WSFC 1206.2.8.6.1)
- Battery storage cabinets provided in work centers shall have exterior labels that identify the manufacturer, model number and electrical rating of the system. There shall be signs within the cabinet that indicate the relevant electrical and chemical hazards. (WSFC 1206.2.8.6.2)

Outdoor installations:

- Installations in outdoor enclosures or containers that can be occupied for servicing, testing, maintenance and other functions shall be treated as battery storage rooms. These shall not be occupied for other purposes. (WSFC 1206.2.8.7, 1206.2.8.7.4)
- Stationary battery systems shall be separated by a minimum of 5 feet from:
(WSFC 1206.2.8.7.1)
 - Lot lines
 - Public ways
 - Buildings
 - Stored combustible materials
 - Hazardous materials
 - High-piled stock
 - Other exposure hazards
- Stationary storage battery systems shall be separated from any means of egress by not less than 10 feet. (WSFC 1206.2.8.7.2)
- The stationary storage battery system located outdoors shall be secured against unauthorized entry and safeguarded in an approved manner. (WSFC 206.2.8.7.3)

Storage batteries and equipment:

- **Listings** (WSFC 1206.2.10.1)
 - Storage batteries shall be listed in accordance with UL 1973.
 - Pre-packaged and pre-engineered stationary storage battery systems shall be listed in accordance with UL 9540
Exception: Lead-acid batteries are not required to be listed.
 - Battery chargers shall be listed and labeled in accordance with UL 1564, or provided as part of a listed system.
(WSFC 1206.2.10.4)
 - Invertors shall be listed in accordance with UL 1741, or provided as part of a listed system. (WSFC 1206.2.10.5)

- **Equipment**
 - An energy management system shall be provided for battery technologies for monitoring and balancing cell voltages, currents, and temperatures. The system shall transmit an alarm signal to an approved location if a dangerous/hazardous condition is detected. (WSFC 1206.2.10.2)
 - Prepackaged and pre-engineered systems shall be installed in accordance with their listing and manufacturer's instructions. (WSFC 1206.2.10.2)
 - Vented batteries shall be provided with flame-arresting safety caps. (WSFC 1206.2.10.6)
 - Batteries required to have thermal runaway protection shall be provided with a listed device or other approved method to prevent, detect, and control thermal runaway. (WSFC 1206.2.10.7)
 - Battery systems that have the potential to release toxic and highly toxic gas during charging, discharging and normal use conditions shall comply with IFC chapter 60. (WSFC 1206.2.10.8)

Fire extinguishing and detection systems:

- **Automatic fire extinguishing system:**
Rooms containing stationary storage battery systems shall be equipped with an automatic sprinkler system. The commodity classification for specific technologies of storage batteries shall be in accordance with chapter 5 of NFPA 13, or as approved by the fire code official.
(WSFC 1206.2.11.1)

- **Alternative automatic fire extinguishment system:**
Battery systems utilizing water reactive materials shall be protected by an approved alternative automatic fire-extinguishing system in accordance with section 904. The system shall be listed for protecting the type, arrangement and quantities of storage batteries in the room. (WSFC 1206.2.11.1.1)

□ **Smoke detection:**

An approved automatic smoke detection system shall be installed in rooms containing stationary storage battery systems in accordance with section 907.2 (WSFC 1206.2.11.2)

BATTERY TYPES AND REQUIREMENTS

Battery type - requirements	<i>Lead-Acid</i>	Nickel-cadmium	Lithium-ion	Sodium-beta	Flow storage	Other types
Ventilation	X	X		X	X	X
Gas detection						X
Spill control and neutralization	X	X			X	X
Thermal runaway protection	X	X				
Signage required	X	X	X	X	X	X

Ventilation requirements: (WSFC1206.11.3)

- Ventilation of rooms containing stationary storage battery systems shall be provided with ventilation in accordance with the IMC, and designed to limit the maximum concentration of flammable gas to 25% of the lower flammable limit, or for hydrogen 1% of the total volume of the room. Ventilation shall be continuous at a rate of not less than 1 cubic foot per minute per square foot of floor area, but not less than 150 cfm. The exhaust system shall be designed for the type of gas to be ventilated – gasses lighter than air shall provide ventilation with air movement across all parts of the ceiling, gasses heavier than air shall have air movement across all parts of the floor.
- Cabinets housing batteries other than Lithium-ion shall be provided with ventilation. (WSFC 1206.2.11.3.1)
- Required mechanical ventilation systems shall be supervised by an approved central station or shall initiate an audible and visual signal at an approved constantly attended on-site location. (WSFC 1206.2.11.3.2)

Gas detection system requirements: (WSFC 1206.2.11.4)

- Gas detection systems complying with IFC Section 916 shall be installed where:
 - Batteries have the potential to produce toxic or highly toxic gas in the storage room

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or cabinet in excess of the permissible exposure limits (PEL) during charging, discharging and normal operation.

- Rooms containing stationary storage battery systems designed to activate where the level of flammable gas exceeds 25% of the lower flammable limit (LFL) or where the level of toxic or highly toxic gas exceeds one-half of the IDLH.

- Activation of the gas detection system shall result in the following: (WSFC 1206.2.11.4.1)
 1. Initiation of distinct audible and visible alarms in the battery storage room.
 2. Transmission of an alarm to an approved location.
 3. De-energizing of the battery charger.
 4. Activation of the mechanical ventilation system, where the system is interlocked with the gas detection system.

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

Spill control and neutralization requirements: (IWSFC 1206.2.11.5)

- Approved methods and materials shall be provided for the control and neutralization of spills of electrolyte or other hazardous materials in areas containing stationary storage batteries as follows:
 - For batteries with free flowing electrolyte, the method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a PH between 5.0 and 9.0
 - For batteries with immobilized electrolyte, the method and material shall be capable of neutralizing a spill of the total capacity of the largest cell of block in the room to a PH between 5.0 and 9.0.

Thermal runaway protection: (WSFC 1206.2.10.7)

- Batteries required to have thermal runaway protection shall be provided with a listed device or other approved method to prevent, detect, and control thermal runaway.

Signage requirements: (WSFC 1206.2)

- Approved signs shall be provided on doors or in locations near entrances to stationary storage battery rooms and shall include the following:
 - The room contains energized battery systems
 - The room contains energized electrical circuits
 - Signage indicating the type of batteries present in the room, the potential hazards associated with the battery type:

- a. Lead-acid – signage indicating room contains lead-acid batteries
- b. Nickel-cadmium – signage indicating room contains nickel-cadmium batteries
- c. Lithium-ion – signage indicating room contains lithium-ion batteries
- d. Sodium-beta – signage indicating type of sodium batteries in the room and include the instructions “APPLY NO WATER”.
- e. Flow batteries – signage indicating flow batteries in the room
- f. Other battery technologies – signage indicating type of batteries present, describe the potential hazards associated with the battery type.