

5.12 Energy Storage Systems in R-3 Occupancies (2022)

Reference: 2022 California Fire Code Section 1207

Purpose: To provide guidance and clarify requirements to satisfy the 2022 California Fire Code Section 1207.11

Scope: Installation of energy storage systems (ESS) in R-3 occupancies, with the aggregate total energy capacity (nameplate rating; not useable energy rating) over the threshold quantities as listed in Table 1207.1 and not exceeding the maximum energy ratings by individual ESS unit and installation location as per CFC Section 1207.11.4, as summarized below:

Aggregate Threshold Quantities per Battery Technology per Table 1207.1.1

- 70 kWh = Lead-acid, NiCd, Ni-MH
- 20 kWh = Lithium-ion, Flow batteries
- 10 kWh = Other battery technologies
- 3 kWh = Capacitor ESS, Other electrochemical ESS technologies

Maximum Capacity per Individual ESS Unit = 20 kWh

Maximum Aggregate Capacity per Installation Location

- 40 kWh = utility closets; storage or utility spaces
- 80 kWh = outdoors on ground; on exterior walls; in garage or accessory structure (attached or detached)

ESS installations exceeding the individual or aggregate ratings shall be installed in accordance with CFC Sections 1207.1 through 1207.9 that apply to non-R-3 occupancies.

Specific SFFD Requirements:

1. Construction Documents: Submitted plans shall be required to meet the construction document requirements within CFC 1207.1.3; the following information shall be provided on plans with the permit application:

- Building Information: provide occupancy type, construction type, number of stories, existing sprinklers and/or fire alarm, etc.
- Location and layout diagram of the room or area in which the ESS is to be installed and in relation to the entire story/level: include elevation view; show all openings (doors, windows) and call out required distance separations; include property line and egress paths; plans and elevations shall be to scale.
- Details on the hourly fire-resistance rating of the assemblies upon which the ESS is to be installed
- Equipment Schedule: provide quantities and types of ESS to be installed, including but not limited to: manufacturer's specifications, ratings and listings of each ESS; battery technology, total

capacity (vs. useable energy), quantity (new and existing), make & model number; include product cut sheets on plans and listing and/or certification documentation on plans [See SAMPLE below]

EQUIPMENT SCHEDULE				
TAG	QUANTITY	MANUFACTURER	MODEL	DESCRIPTION
A	28	LG	LG365QIC-V5	MODULES, 365 W, MONOCRYSTALLINE /N-TYPE, WHITE BACKSHEET, ANODIZED ALUMINIUM FRAME, Voc= 42.8 V, Isc= 10.80 A
B	28	ENPHASE	IQ7PLUS-72-2-US	MICROINVERTERS, 240 V, MAX CONTINUOUS OUTPUT POWER= 290 W, MAX CONTINUOUS OUTPUT CURRENT= 1.21 A
C	1	ENPHASE	3CX-IQ-AMI-240-3C	PV COMBINER BOX, 125 A, ENPHASE IQ AC COMBINER BOX WITH INTEGRATED 10 A ENVOY BREAKER
D	1	SQUARE D	DU222RB	AC DISCONNECT, 3R, 60A, 2P, 120/240V/AC
E	1	SQUARE D	HOM4280225 PC	BACKUP LOADS PANEL, 225A, 200A MAIN BREAKER
F	1	TESLA	BACKUP GATEWAY 2	BACKUP GATEWAY, 200A, 120/240V, NEMA 3R
G	2	TESLA	1232100-XX-Y POWERWALL 2 2012170-XX-Y	ESS UNIT, 14 KWH TOTAL, 13.5 USEABLE, 240V SINGLE PHASE

- Installation Compliance Certification Statement: plans shall include the following designer-signed

statement indicating installation compliance: *“The ESS installed are in full compliance with the specific ESS listing requirements, UL 9540 and California Building Standards Code.”*

- Design Professional/Licensed Contractor Information & Signature: plans shall bear valid California-licensed design professional stamp or C-10 contractor license number, name of associated license holder and signature; plans shall be securely bound together and the first sheet shall have affixed an original signature and an index of all sheets included; the remaining sheets may have a signature facsimile with the contractor license information; the licensed contractor designing the system shall be the contractor who performs the work; the licensed contractor may not design work which is to be installed by another person

2. Installation Requirements:

- a) Individual ESS Unit and ESS Spacing: individual ESS units shall be separated by at least 3-feet of spacing; smaller separation distances based on large-scale fire testing are not being AHJ-approved; modular ESS products shall be considered as an individual unit and shall be limited to the maximum total individual unit capacity of 20 kWh
- b) System, Installation Locations & Maximum Capacity:
 - ESS System: a system is defined as all ESS units tied into the same PV modules, distribution panel and other such supportive components
 - Exterior Wall & Outdoors Installations: an installation shall be considered outdoors and/or on an exterior wall, and therefore not require fire detection per CFC §1207.11.6, under the following situations:
 - no eaves, structures, decking or other such construction protruding more than 2 feet from the exterior wall upon which the ESS is installed and ESS is at least 5 feet from such protrusion;
 - wall upon which the ESS is installed shall be at least 5 feet from other exterior walls of the same building in either direction;
 - installations shall be considered outdoors if on ground, and not on building (roof top, balcony, etc.)
 - Maximum Capacity: maximum aggregate capacity shall be limited to the maximum amount permitted in each structure area (40 kWh for utility closet and 80 kWh for outdoors, for on exterior walls, for in attached garage & for detached structure) in order for CFC §1207.11 to apply; although a total of 280 kWh total capacity is permitted in R-3 occupancies, installations with aggregate capacity exceeding 80 kWh shall be required to comply with CFC Sections 1207.1 through 1207.9
 - Two (2) Unit R-3 Occupancies: threshold & maximum aggregate capacity limitations apply to the entire occupancy and not to an individual unit; no more than two (2) ESS systems may be installed, with combined maximum aggregate capacity limitations cited above not being exceeded in order for CFC §1207.11 to apply

3. Clearance to Exposures:

- a) All Installations:
 - Property Lines: ESS shall be installed at a minimum of 5 feet from property lines, unless

- protected by a 1-hour fire barrier
- Means of Egress: ESS shall be installed at a minimum of 5 feet from the dedicated 36"-wide means of egress pathway, unless protected by a 1-hour fire barrier; this pathway is typically defined as the exterior or interior route from the main entrance of a dwelling unit to the public way
- Public Way: ESS shall be installed at a minimum of 5 feet from the public way, unless protected by a 1-hour fire barrier
- Ceiling and/or Eaves: ESS shall be minimum 5 feet from eaves and 3 feet from ceiling with the required fire detection; ESS may be 24" from 1-hour rated ceiling or 18" from 1-hour rated ceiling within sprinklered space

b) Interior Installations (in utility closets, attached garage, detached garage or structure, etc.):

- Combustible Storage: clearance of 3 feet shall be provided in front of electrical equipment for maintenance purposes in compliance with CA Electrical and Mechanical Codes and kept clear of all combustible storage; utility closets shall only contain equipment supporting the ESS system
- Windows, Doors & Openings: ESS shall be separated from doors, windows HVAC inlets and other operable openings entering into the dwelling unit by at least 3 feet

c) Exterior Installations (outdoors and on exterior walls):

- Property Lines & Means of Egress: minimum separations of 5 feet may be reduced to 3 feet where a 1-hour free-standing fire barrier (suitable for exterior use) and extending 5 feet above and 5 feet beyond the physical boundary of the ESS installation is provided to protect the exposure
- Windows, Doors & Openings: ESS shall be separated from doors, windows, HVAC inlets, and other operable openings entering into the dwelling unit by at least 3 feet; ESS installed below openings to habitable spaces shall be separated by a minimum of 10 feet
- Vegetation: vegetation shall be controlled around exterior wall and outdoor ESS installations by minimum of 10 feet; ground cover and single specimens of trees, etc., shall be permitted, provided they do not form a means of readily transmitting fire

4. Construction Requirements: the construction requirements listed below pertain to walls/partitions upon which ESS are installed, both existing and new; field verification of partition/wall construction shall be required:

- Walls Less Than 5 feet from Property Line: any wall upon which ESS is installed, interior or exterior, shall be of 1-hour fire-rated construction or equivalent at minimum
- Walls of Dwelling Unit: walls of habitable room upon which ESS is installed on the opposite side shall be of 1-hour fire-rated construction or equivalent at minimum; shall apply to both exterior and interior installations
- Walls of Non-Habitable Spaces: walls of non-habitable spaces, such as garage, utility shed, etc., upon which ESS is installed shall be constructed of not less than ½-inch gypsum board or equivalent applied to the interior or exterior side of the exterior wall, respectively; ESS shall not be installed upon any open frame structure

- d) Existing Non-Rated Walls: walls upon which ESS is installed that are required to be of 1-hour fire-rated construction or equivalent may be mitigated by installing ESS upon a 1-hour rated fire barrier and extending barrier 5 feet above and 5 feet beyond the physical boundary of the ESS installation to provide the level of required protection; walls of non-habitable spaces upon which ESS is installed that are required to be of not less than ½-inch gypsum board or equivalent may be mitigated by installing ESS upon a ½-inch gypsum board or equivalent barrier and extending barrier 5 feet above and 5 feet beyond the physical boundary of the ESS installation to provide the level of required protection

5. Fire Detection Requirements (§1207.11.6 & CA State Fire Marshal Information Bulletin 12-004): there are a several ways to meet the intent of this requirement; below are examples that may apply; this pertains to R-3 occupancies ONLY

- a) Existing Fire Sprinkler Monitoring System: verify system has a UL 864/CSFM listed Fire Alarm Control Unit; provide DBI Permit Application (PA) number under which system was installed for reference on plans; a licensed electrical contractor shall apply for a Fire-Only Permit with Scope: *"expand existing sprinkler monitoring system to provide heat detection & notification for a new installed ESS"*
- b) Existing Fire Alarm System: verify system has a UL 864/CSFM listed Fire Alarm Control Unit; provide DBI PA number under which system was installed for reference on plans; a licensed electrical contractor shall apply for a Fire-Only Permit with Scope: *"expand existing fire alarm system to provide heat detection & notification for a new installed ESS"*
- c) Existing UL 539/CSFM listed Interconnected Heat Alarms (hard-wired with battery backup) AND Garage/Unconditioned ESS Area Not Exceeding 100 degrees F at All Times: a licensed contractor or design professional shall apply for a DBI permit to install UL 539/CSFM listed interconnected heat alarms above the ESS area(s) (i.e., add additional heat alarms to existing system); may be included on the same permit as the ESS installation; design professional must include a statement in plans that: *"the temperature in the garage/ESS area must not exceed 100 degrees Fahrenheit at all times" ***; Fire Only permit not required
- d) No Existing System AND Garage/Unconditioned: ESS Area Not Exceeding 100 degrees F at All Times: a licensed contractor or design professional shall apply for a DBI permit to install UL 539/CSFM listed interconnected heat alarms above the ESS area(s) AND heat alarm inside each dwelling unit in an approved location near the door leading to the garage/ESS space; may be included on the same permit as the ESS installation; design professional must include a statement in plans that: *"the temperature in the garage/ESS area must not exceed 100 degrees Fahrenheit at all times" ***; Fire Only permit not required
- e) No Existing System AND Garage/Unconditioned ESS Area Exceeds 100 degrees F at Any Time: a licensed electrical contractor shall apply for a Fire-Only Permit to install a dedicated function UL 864/CSFM listed Fire Alarm Control Unit in an approved location at the dwelling unit; UL 521/CSFM listed heat detectors shall be installed at the ESS area(s) and compatible horns/audible appliances at the ESS at inside the dwelling unit, etc.

** design professional = California State licensed engineer or architect; licensed C-10 contractors shall obtain letter from building owner that includes verification statement and include copy of letter on plans

6. Protection from Impact (§1207.11.7): where an ESS is installed within a garage or other

location subject to vehicle impact, impact protection shall be provided; any ESS unit shall be protected behind structural walls or, if in the normal driving path of vehicle travel, protected with approved bollards or approved wheel barriers; other method designed to resist a 2000 lb. impact in the direction of travel at 24 inches above grade require pre-approval [SAMPLE]

- a) Normal Driving Path of Vehicle Travel: space between the garage vehicle opening and the interior face of the back wall extending 3 feet to either side, along the back wall, and to a height of 48 inches above the finished floor; width of the normal driving path shall be equal to the width of the garage door opening; normal driving path for garage spaces accommodating more than one vehicle side-by-side shall be considered on a case-by-case basis
- b) Bollards shall be constructed in accordance with one of the following:

- Minimum 48 inches in length by 3 inches in diameter schedule 80 steel pipe embedded in a concrete pier not less than 12 inches deep and 6 inches in diameter, with at least 36 inches of pipe exposed, filled with concrete, and spaced at a maximum interval of 5 feet. Each bollard shall be located not less than 6 inches from an ESS.
- Minimum 36 inches in height by 3 inches in diameter schedule 80 steel pipe fully welded to a minimum 8 inch by 8 inch by ¼ inch thick steel plate and bolted to a concrete floor by means of 4-½ inch concrete anchors with 3-inch minimum embedment. Spacing shall be not greater than 60 inches and each bollard shall be located not less than 6 inches from the ESS.
- Pre-manufactured steel pipe bollards shall be filled with concrete and anchored in accordance with the manufacturer's installation instructions, with spacing not greater than 60 inches, and each bollard shall be located not less than 6 inches from the ESS.

- c) Wheel barriers shall be constructed in accordance with one of the following:

- 4 inches in height by 5 inches in width by 70 inches in length wheel barrier made of concrete or polymer, anchored to the concrete floor not less than every 36 inches and located not less than 54 inches from the ESS. Minimum 3 x ½ inch diameter concrete anchors with a 3-inch embedment per barrier shall be used. Spacing between barriers shall be no greater than 36 inches.
- Pre-manufactured wheel barriers shall be anchored in accordance with the manufacturer's installation instructions.

8. Equivalencies or Requests for Smaller Separation Distances: equivalencies may be proposed via a Pre-Application meeting with the SFFD by submitting a pre-application meeting request form: <https://sf-fire.org/services/plan-check#pre-ap>; please be advised that smaller separation distances based on large-scale fire testing and allowed under §1207.11 are not being considered for R-3 occupancy applications by the Authority Having Jurisdiction at this time

9. Additional Guidance: If any of the specific requirements above or any other applicable codes requirements are not clear or require further and specific SFFD interpretation, the building owner or the permit applicant may request to have a Pre-Application meeting with the SFFD by submitting a Pre-Application meeting request form: <https://sf-fire.org/services/plan-check#pre-ap>