

ENERGY STORAGE SYSTEMS

Date of Issue: June 20th, 2023

No: IB-EL 2023-06

Topic: Location requirements for battery-based energy storage systems in residential occupancies

The purpose of this bulletin is to clarify the BC Electrical Code (BCEC) location requirements as written, and to outline the variance process by which deviations from the requirements of the 64-800 (Installation of Batteries) / 64-900 (Energy Storage Systems) series of rules may be considered for equipment meeting the safety performance criteria of UL 9540. Variance applications shall be submitted to the appropriate authority having jurisdiction (AHJ).

Definitions from the Canadian Electrical Code

Energy storage system (ESS): a system capable of supplying electrical energy to local power loads or operating in parallel with a supply authority system or any other power sources.

Residential use energy storage system: an energy storage system that

- is marked as being suitable for residential use; and
- conforms to the requirements of UL 9540.

Self-contained energy storage system: a system that conforms to the requirements of UL 9540.

Introduction

Energy storage systems (ESS) are directly addressed by the BCEC for the first time in the 2021 edition, through the addition of the new 64-900 series of rules. The standards governing their construction and performance criteria are relatively new and are updated regularly. The UL 9540 safety standard and UL 9540A testing standard have allowed for battery based ESS's to demonstrate fire safety performance beyond what may have been considered at the time of code development.

BCEC Clarifications

Rule 64-918 2) and 3), prohibit the installation of energy storage systems utilizing batteries either more than 23m above grade, or below grade unless installed in an *electrical equipment vault* – See Section 0 - "vault" in BCEC.

Rule 64-918 4), prohibits the installation of energy storage systems with a capacity of 1 kWh or more in dwelling units and living spaces of a residential occupancy.

Rule 64-918 8), recognizes the evaluation of the fire performance of an energy storage system through the procedure outlined in the UL 9540A testing standard, which can demonstrate an additional level of safety beyond UL 9540 certification. In the case of equipment evaluated to meet the cell level requirements of UL 9540A (see references below), the maximum capacity limits of 64-918 6) and 7) may be permitted to be exceeded. Code users are advised to consult UL 9540A test report for the revised limits when employing subrule 8).

ANSI/CAN/UL 9540A (UL 9540A) - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems**Technical Requirements for a Variance**

Technical Safety BC will consider applications for variance from the location requirements of 64-918 for the use of energy storage systems that are UL 9540 approved and meet the residential use testing criteria of UL 9540A in non-living or non-habitable areas of dwelling units if all of the following conditions are met:

- 1) Energy Storage Systems shall not be installed in sleeping or living areas, or spaces opening directly into sleeping or living areas
- 2) Energy storage systems are installed in a dedicated storage room, utility closet, a similar room or area, or area below grade, such as in a basement, with:
 - A fire resistance rating not less than 1 hour, or not less than that required by building authority having jurisdiction, and
 - A smoke alarm that is in addition to a smoke alarm required by BC Building Code and interconnected with other smoke alarms.
- 3) The capacity of energy storage systems in dwelling units or residential occupancies, does not exceed
 - 20 kWh for a single energy storage system, and
 - 40 kWh in aggregate where multiple energy storage systems are installed, and these have been spaced not less than 1m apart, or not less than the minimum separation requirement in the manufacturer's instructions, 4) Energy storage systems evaluated to UL 9540A shall be permitted to be installed with revised spacing requirements and limits in accordance with the manufacturer's installation instructions.

Technical Safety BC may also consider variances for lead acid battery based, field assembled ESS that meet the above location requirements of #1 and # 2 and capacity requirements of #3 as well as all the following conditions below:

- A. The lead acid batteries are certified to an applicable standard or information is provided as part of the variance to demonstrate that the batteries are "suitable for the purpose".
- B. All separate equipment incorporated to form the ESS are individually approved.
- C. All separate equipment incorporated to form the ESS are installed as per their corresponding manufacturer's installation instructions.
- D. All interconnecting and/or field wiring as per the BCEC; and
- E. Original documentation including installation and maintenance instructions, plans and specifications, commissioning reports and other documentation associated with the accepted variance, will be provided to the AHJ and equipment owner.

Note: Energy Storage Systems that utilize lead acid batteries will typically not experience thermal runaway conditions similar to lithium-ion based battery systems. Most lead acid batteries have not currently been evaluated under the UL 9540 and UL 9540A but are not excluded from the 64-900 series of rules in the BCEC. Rule 64-920 2) references refers back to 64-800 to 64-820 for the

installation of batteries for field assembled ESS. Rule 64-804 1) requires batteries to be suitable for the purpose and references ANSI/CAN/UL 1973 -Batteries for Use in Stationary and Motive Auxiliary Power Applications and UL 9540 as the standard for batteries.

Variations:

Note: To apply for a variance, please download **Request for Variance form 1076** from our website, complete the application, and submit it to <https://www.technicalsaftybc.ca/contact/contact-us>

Provincial Safety Manager

References:

Safety Standards Act

Electrical Safety Regulation

Safety Standards General Regulation

C22.1-21 Canadian Electrical Code adopted for use in British Columbia