

ELECTRIC VEHICLE ENERGY MANAGEMENT SYSTEMS

This bulletin provides guidance on electric vehicle charging systems utilizing electric vehicle energy management systems with respect to the 2015 BC Electrical Code. The requirements of local municipal authorities having jurisdiction may vary. Owners, designers, and installers should consult with local authorities having jurisdiction prior to undertaking work to determine their requirements.

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Topic: Electric vehicle charging systems utilizing energy management systems.

Definitions:

Electric vehicle energy management system (EVEMS) — a means used to control electric vehicle supply equipment loads through the process of connecting, disconnecting, increasing, or reducing electric power to the loads and consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), and other applicable device(s).

Electric vehicle supply equipment (EVSE) — a complete assembly consisting of cables, connectors, devices, apparatus, and fittings installed for the purpose of power transfer and information exchange between the branch circuit and the electric vehicle.

Introduction: EVEMS are rapidly becoming available for use in British Columbia and are available for all types of occupancies and locations for both new and existing installations. BC Electrical Code 2015 Section 86 *Electrical Vehicle Charging Systems*, recognizes load management systems at a branch circuit level. Section 86 does not extend the load management systems to include distribution equipment, feeders, or services.

A variance may be considered to allow for the use of an EVEMS to limit the demand on distribution equipment, feeders, or services. All plans, specifications, load calculations, and variance applications shall be submitted to the appropriate authority having jurisdiction (AHJ). See Information Bulletin, 2016-05.

https://www.technicalsafetybc.ca/sites/default/files/section_2_-_general_rules_ib-el_2016-05.pdf

Details: BC Electrical Code 2015, Sections 8 and Section 86 do not permit the installation of any electrical equipment or systems such as EVEMS if the calculated load or demonstrated load exceeds the rating of the distribution equipment, feeders, or services. Electric vehicle supply equipment must be calculated at 100% load based on the nameplate rating of the equipment. Provisions for switching of loads have been identified in rule 8-106.

The power requirements for residential installations are diverse and cyclical in nature. EVEMS demands power for longer periods of time. EVSE can overload the conductors or distribution equipment if the charging loads are not controlled.

The 2018 edition of the Canadian Electrical Code (2018 CEC) recognizes technology advancements for EVEMS but the 2018 CEC has not yet been adopted into regulation. In the interim, Technical Safety BC will consider applications for variance of Sections 8 and 86 for installation of EVEMS to limit the demand on distribution equipment, feeders, and services. Local government authorities having jurisdiction should be consulted for installations within their jurisdiction.

Some EVEMS allow an administrator to manage, monitor, and control loads. These systems will require the administrator to play an important role in the safe management of the loads on the distribution equipment, feeders, and services. When the need for an administrator is identified in the manufacturer's instructions or plans and specifications the following are required:

1. An operating permit, regardless of occupancy type; and
2. A management plan, which must document how the EVEMS will control the connected loads and how the addition, alteration, or removal of loads will be managed.

At no time should the load, imposed by the electrical equipment, exceed feeder or service ratings as determined by applicable BC Electrical Code rules.

Utility equipment is not regulated by the BC Electrical Code but may be affected by the use of these systems. The electrical utility should be consulted and notified of all EVEMS when installation of EVSE and EVEMS is being considered.

The following items must be considered for the purpose of a variance application:

Installation Permits:

- In order to ensure that the permit scope includes all EVSE and EVEMS, plans and specifications including load calculations in accordance with the BC Electrical Code must be included with all permit applications.
- All loads being managed by the EVEMS shall be identified and included in load calculations.
- The connected load shall be determined by the nameplate markings on the equipment;
- EVSE with variable load settings shall have the maximum setting permanently marked on the equipment;
- A copy of the accepted variance, associated documentation, plans and specifications, and manufacturer's instructions, must be provided to the equipment owner prior to allowing the equipment to be placed into operation, and prior to final inspection.
- Compliance with the Safety Standards Act shall be verified in writing by a Field Safety Representative, for all EVSE and EVEMS, prior to final inspection and before allowing the equipment to be operated by an owner.

Operating Permits

- Operation of EVSE and EVEMS equipment may require an electrical operating permit, in accordance with terms and conditions of a variance;

For EVSE and EVEMS equipment that is installed where an electrical operating permit has already been issued for the facility:

- EVSE and EVEMS equipment may be installed under an operating permit, in accordance with Directive: Electrical operating permit requirements , D-E3 070801 7 Revision 1
- All EVSE and EVEMS, plans and specifications including load calculations in accordance with the BC Electrical Code must be identified in the electrical operating permit log;
- A copy of the variance must be recorded in the electrical operating permit log; and
- All alterations and modifications to the EVSE or EVEMS equipment, including changes to operation of the equipment must be recorded in the electrical operating permit log;

For EVSE and EVEMS equipment that is installed at a facility prior to issuance of an electrical operating permit (where required under a variance):

- A copy of the variance must be included as part of the electrical operating permit application;
- All EVSE and EVEMS, plans and specifications including load calculations in accordance with the BC Electrical Code must be identified in the electrical operating permit log;
- A copy of the variance must be recorded in the electrical operating permit log; and
- All alterations and modifications to the EVSE or EVEMS equipment, including changes to operation of the equipment must be recorded in the electrical operating permit log;

Information regarding operating permits can be found at

<https://www.technicalsafetybc.ca/electrical/electrical-operating-permits>

Variance Application Process: A variance is required in order to apply the relaxations to load calculations for feeders and services provided in the 2018 CEC.

General requirements:

- The variance application must:
 - identify the rules to be varied under the BC Electrical Code 2015;
 - provide rationale in support of the variance request;
 - provide a clear description of the system design and operation; and

- demonstrate that the EVEMS, by means of control and management of loads, meets the fundamental principles of protection for safety mandated by the BC Electrical Code and will not cause the loading of distribution equipment, feeders, or services to exceed the requirements of rules 8-104(3), (5) and (6).
- Incomplete applications for variance will not be accepted.
- Where the completed installation involves an administrator, the variance application shall also include a detailed plan demonstrating:
 - How loads will be managed; and
 - How changes to the connected load (such as the addition, alteration or removal) are documented.
- The variance application shall clearly indicate when an administrator is required to operate the regulated product.
- The variance application shall indicate that the administrator plan is to be made part of the terms and conditions on the variance.

Documentation and Conditions required for Variance: Documentation and the confirmation of conditions are required for each variance. Additional conditions may be set by the authority having jurisdiction, when issuing a variance.

Documentation:

A copy of the certification record for the EVSE from the certification body; or

A copy of the SPE-1000 Inspection report is attached to this application.

For third party EVEMS, documentation on the suitability of the system with the EVSE.

Documentation showing the utility has been made aware of this installation.

Rule 2-014, Rule 8-106: Plans and specifications of the equipment and the electrical system including load calculations, and managed loads.

Conditions:

The asset holder (equipment owner) will appoint an administrator or an authorized agent of the administrator to be responsible for operating the electric vehicle energy management system if required by EVEMS.

In the event of a breakdown or malfunction of the EVEMS, EVSE communications or electric vehicle response, the EVSE will disconnect power to the electric vehicle (EV). The EVSE will establish a fail-safe condition if there is a loss of communications between the EVEMS and the EVSE if the EV does not respond appropriately or when it is evident that automatic restarting or the lack of communications is liable to create a hazard. Once safe operating conditions are restored a safe start-up of the EVSE will be ensured.

The failsafe processes installed in the energy management system will remain in effect for the life of this equipment and will not be altered in any way.

Original documentation including installation and maintenance instructions, plans and specifications, commissioning reports and other documentation associated with this variance, the EVEMS, and the EVSE shall be provided by the installer to the equipment owner.

The installer will provide clear instructions to the owner and will include a description of records that must be maintained by owner.

Safety attributes of the system will be verified and documented in the commissioning report. The report will be provided with the inspection request to connect the system for installation permits or in the case of an operating permit by declaration into the log book.

The product(s) included under this variance will be maintained in a safe manner and all maintenance records will be kept by the owner.

The EVEMS will not permit the load of any regulated equipment to exceed the rating marked on the equipment.

The EVEMS will be continuously operational when charging is occurring.

The EVEMS will not adversely affect operation of the life safety systems, essential electrical systems and emergency electrical power supply systems as defined or referenced in the BC Electrical Code.

An EVEMS that has the ability to manage and control an electric vehicle used as an electric production source will not provide

power to loads in excess of the output rating of the production source equipment.

The permit holder, equipment owner, administrator, and operators will be provided with the necessary training to operate the system in a safe manner. Confirmation of this training will be documented and be made available to the authority having jurisdiction, upon request.

The permit holder will be responsible to maintain a management plan that controls the loads on the electrical system, including the demand loads on the system.

The operating permit holder will document in the log book the addition, alteration, or removal of equipment.

The utility will be consulted and notified of all EVEMS installations where the service may be overloaded upon the failure or removal of the EVEMS.

The variance applicant will ensure that the asset holder and installer are promptly given a copy of this application and the variance.

The asset owner must take out an operating permit for the EVEMS as a condition of the variance even if an operating permit is not otherwise required by the Safety Standards Act and its regulations. An operating permit must be kept in force until such time as Technical Safety BC advises the asset holder that it is no longer required.

Provincial Safety Manager, Electrical

References:

Safety Standards Act, SBC 2003, c. 39

Electrical Safety Regulation, B.C. Reg. 50/2017

Safety Standards Act:

Variance — means a document without precedential value issued, for an individual circumstance on a single occasion, by a safety officer or safety manager allowing

(a) a deviation from the application of a regulation under this *Act*, or

(b) a use, other than the standard use, of a regulated product if the proposed use is not specifically prohibited under this *Act*.

Variances

32 (1) A safety officer may, if requested by any person, issue, in writing, a variance to the person varying the application of a provision of the regulations with respect to a regulated product or regulated work.

(2) A variance may

(a) be made subject to terms and conditions specified by the safety officer, and

(b) continue for a specified period of time.

(3) If the person who holds a variance complies with the terms and conditions of the variance, the person must be considered to be in compliance with the regulation that it varies.

(4) If a person applies for a variance and a safety officer refuses to issue it, or issues it with terms or conditions attached to it that are not requested or agreed to by the applicant, the safety officer who deals with the application must inform the applicant and, if the applicant requests written notice, give the applicant written notice of that decision.

(5) A written notice under subsection (4) must state the reasons for the decision and that the applicant has the right to make a written request for a review by a safety manager.

(6) A decision of a safety manager on a review of a decision under subsection (4) is not appealable to the appeal board.