Bulletin 86-1-7
Electric vehicle charging systems
Rules 8-106, 8-202, 8-210, 86-300, 86-302, 86-304, 86-306, and 86-308

Issued May 2025
Supersedes Bulletin 86-1-6

Scope

1) Energy Management Systems (EMS)
2) Electric Vehicle Supply Equipment (EVSE) demand factors without EMS
3) Calculation of the minimum ampacity of service or feeder conductors for dwellings without EMS
4) Adjustable EVSE
5) Protection of EVSE from mechanical damage
6) Overcurrent and receptacle requirements for EVSE
    a) 50 A receptacles used for EVSE
    b) AFCI, GFCI and TR requirements for dwelling units
7) Bi-directional charging

1) Energy Management Systems (EMS)

Rule 8-500 permits Energy Management Systems (EMS) to monitor loads and automatically control Electric Vehicle Supply Equipment (EVSE) loads. EMS is defined as a means used to control electrical 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).

Rule 86-300 1) requires EVSE to be supplied by a separate branch circuit. Rule 86-300 2) permits electric vehicle supply equipment to be supplied from a branch circuit supplying other loads, provided that an EMS is installed.

EMS is permitted to be used in any type of occupancy or building.

As per Rules 8-106 10) and 11), when electrical vehicle supply equipment is controlled by EMS:

- The demand load for the EVSE shall be limited to the maximum load allowed by the EMS, as per Diagram B1 and B2.
- Where an EMS monitors the consumer's service and feeders and controls the EVSE, the demand load for the EVSE shall not be required to be considered in the determination of the calculated load, as per Diagram B2.

Diagram B1 – CTs monitor branch

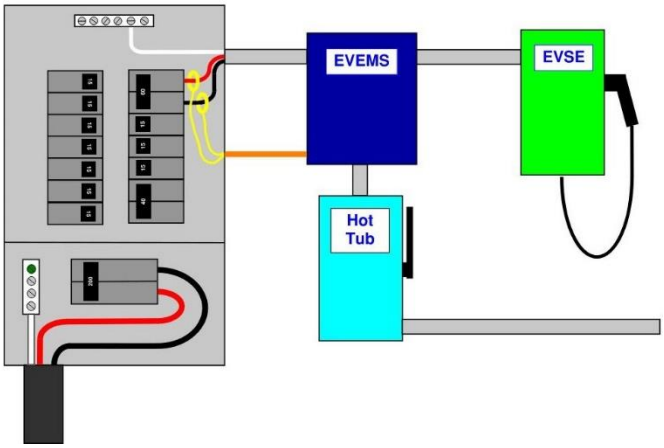
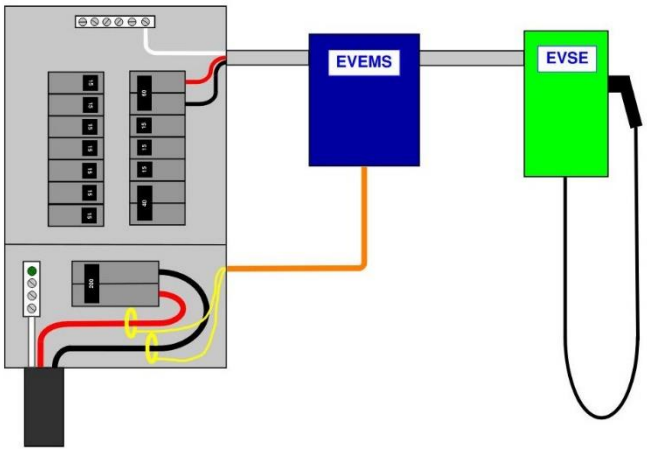


Diagram B2 – CTs monitor service conductors



2) EVSE demand factors without EMS

When EMS is not provided, any EVSE loads are permitted to be added with demand of 100%, which is applicable to Rules 8-202 to 8-210 that includes apartment buildings, schools, hospitals, hotels, motels, and dormitories.

3) Calculation of the minimum ampacity of service or feeder conductors for dwellings without EMS

Examples of calculations of the minimum ampacity of service or feeder conductors supplying single dwellings and two or more dwelling units that include EVSE (without EMS) is provided in Bulletin 8-3-*.

Questions have been asked if a service upgrade is required when EVSE is added to the existing single dwelling service. In order to calculate the new service rating and determine if a service upgrade is required, a calculation is permitted to be done in

accordance with Rule 8-106 8). See Bulletin 8-3-* about calculation example based on the demonstrated load.

4) Adjustable EVSE

EVSE amperage setting adjustments can be accomplished through internally mounted dip or rotary style switches or through internal and external software. Software and application based EVSEs are capable of connecting to the internet via an Ethernet, Bluetooth, or Wi-Fi connection. These chargers provide the user with increased control over the charging of their EV. Many allow access and control through a smart phone or computer, providing the user access to modifying EVSE functionality such as, setting the time of day charging will occur, the maximum charge current and source type (grid, PV, and ESS).

Question 1
Is it permitted to determine the rating of EVSE based on the adjustable field settings, which may include software, commissioning apps, dip switches, rotary dials, etc., that are part of the equipment, for the purposes of maximum circuit loading? (Rules 86-302, 86-304, and 86-306)

Answer 1
Yes, adjustable amperage settings which include commissioning apps, software, dip switches, rotary dials, etc., are permitted on fixed-in-place* equipment only, provided the manufacturer's instructions are followed, and the following conditions are met;

- A permanent legible marking (see Diagram B3) in accordance to Rule 2-100 is posted on or adjacent to the EVSE when set below the nameplate maximum rating with the minimum information shown in the example, and
- Access to the adjusting means is restricted.

Restricted access shall prevent the user from gaining access to the adjusting means and shall be accomplished by at least one of the following:

- A cover or door that requires the use of a tool to access the adjustments,
- Unique password protected commissioning apps,
- Software that has a unique password for that site to the adjusting means, or
- The manufacturer can prove restricted access

Note *
Definitions from CSA C22.2 No. 280

- **Fixed-in-place** - is a mounting means for EVSE that requires a tool to remove the EVSE from its mounted position.
- **Fastened-in-place** - is a mounting means for EVSE for relocation, interchangeability, maintenance or repair without the use of a tool.

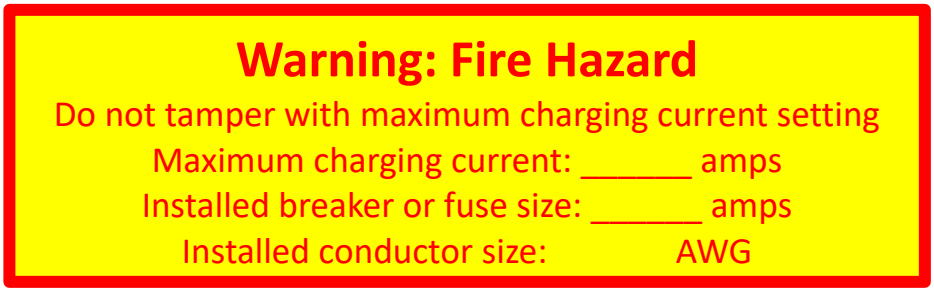
For example, see Table B1, when the dip switch is set to limit the output to 48 A and is connected to a 60 A branch circuit, a disconnecting means is not required. Rule 86-304 1) requires a separate disconnecting means for each installation of EVSE rated more

than 60 A or than 150 volts to ground. When the dip switch is set to limit the current to 64 A with an 80 A branch circuit, a disconnecting means is required.

Table B1 – Example of a dip switch setting for an EVSE as per manufacturer instructions

Rotary Switch Position	Maximum Output Current	Circuit Breaker
0	Test mode	N/A
1	12A	15A
2	16A	20A
3	20A	25A
4	24A	30A
5	28A	35A
6	32A	40A
7	36A	45A
8	40A	50A
9	48A	60A

Diagram B3 – Example of EVSE label when set below nameplate maximum setting



Question 2
Can an EVSE be used as an EMS?

Answer 2
No, unless it has features which allow it to function as an EMS (see Diagram B4).

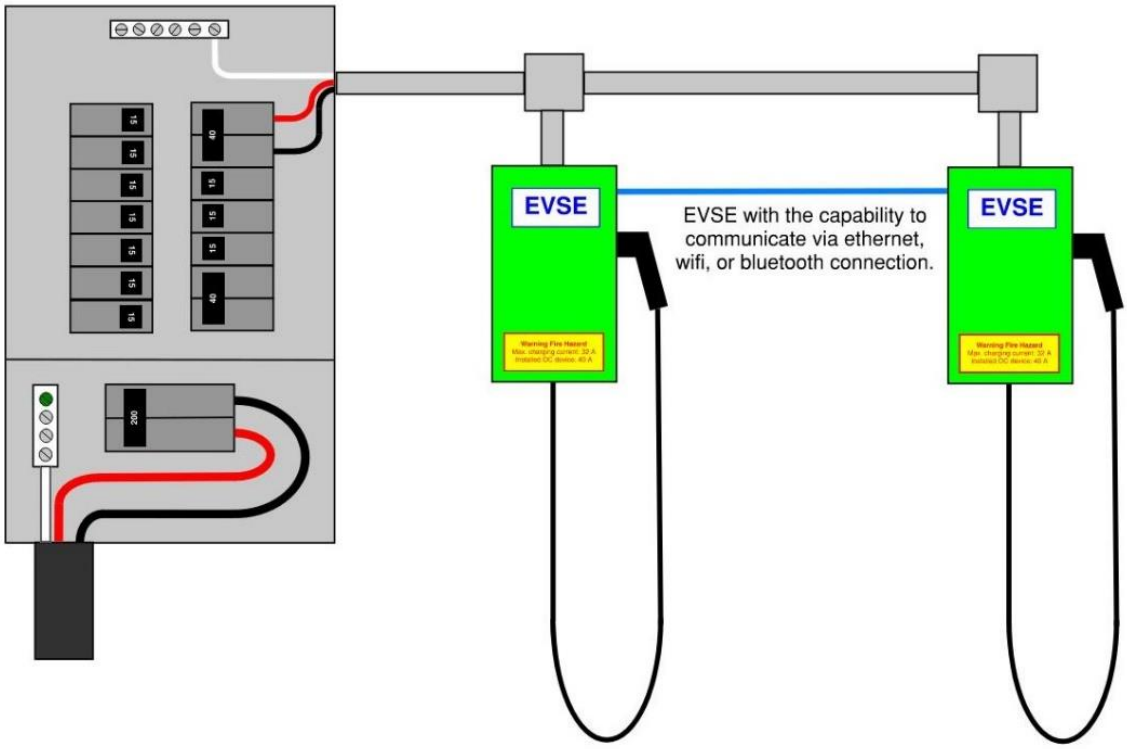
Rationale:
An EMS is defined as a means used to control electrical loads through the process of connecting, disconnecting, increasing, or reducing electric power to the loads and consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), and other applicable device(s).

Rule 8-106 10) allows the EVSE loads controlled by the EMS to equal the maximum load allowed by the EMS. Therefore, if we consider adjustable EVSE to function as

EMS, the maximum allowed load should be based on the setting of the load/current output of the adjustable EVSE.

Subrule 11) clarifies that where an EMS, as described in Subrule 10), monitors the consumer's service and feeders and controls the EVSE, the demand load for the EVSE shall not be required to be considered in the determination of the calculated load.

Diagram B4 – Multiple EVSEs with communication capabilities (load sharing)



5) Protection of EVSE from mechanical damage

Question 3
Does EVSE and mounting pedestals containing supply conductors require protection from mechanical damage as per Rule 2-200?

Answer 3
Yes. EVSE and mounting pedestals containing supply conductors are typically subject to mechanical damage (Photo B1) and protection is required.

Photo B1 – Damage to EVSE without mechanical protection

Direction

Protection of EVSE can be achieved by locating the EVSE at minimum of 1m away from vehicles, or by elevation or behind a physical barrier (mechanical protection) meeting the below requirements:

- Protected by curb (e.g. Photo B2) such that EVSE is installed on a raised curb or sidewalk and is installed 1 m back from the front of the curb.
- Protected by curb stops (e.g. Photo B3) provided it won't interfere with snow removal and the stops are a minimum of 10cm tall and 15cm wide and mechanically secured in place with a suitable fastening product. These would be suitable for underground or covered parking to keep vehicles 1m away from the EVSE.

  Notes:
  - Special consideration shall be given when charging stations are to be used for larger vehicles (e.g. delivery trucks) other than passenger vehicles and 1 m might not be sufficient.
  - This applies to all parking spots including parallel parking.

Photo B2 – EVSE Protected by curb

Photo B3 – EVSE protected by curb stop

- Protected by Elevation (e.g. Photo B4) such that:
    - EVSE is installed such that the bottom of the EVSE and electrical wiring is 1m above grade.

  Notes:
    - Special consideration shall be given when charging stations are for larger vehicles (e.g. delivery trucks) other than passenger vehicles and 1 m might not be sufficient.
    - This applies to all parking spots including parallel parking.
    - Mechanical protection applies to the structure supporting an elevated EVSE.

B4 – EVSE protected by elevation

- Protected by physical barrier (e.g. Photo B5) such as:
    - Steel bollard installed at least 1.5m below grade.
    - Manufactured bollards installed at least 1.5m below grade.
    - 6”x6” pressure treated wood installed to a minimum 1.5m below grade.
    - Posts bolted to a concrete sonotube installed at a minimum 1.5m below grade. Min ½” bolts, the types used for light standards
    - Posts secured to a concrete slab with minimum ½” lag bolts or similar type fastener. Asphalt only, would not be acceptable.

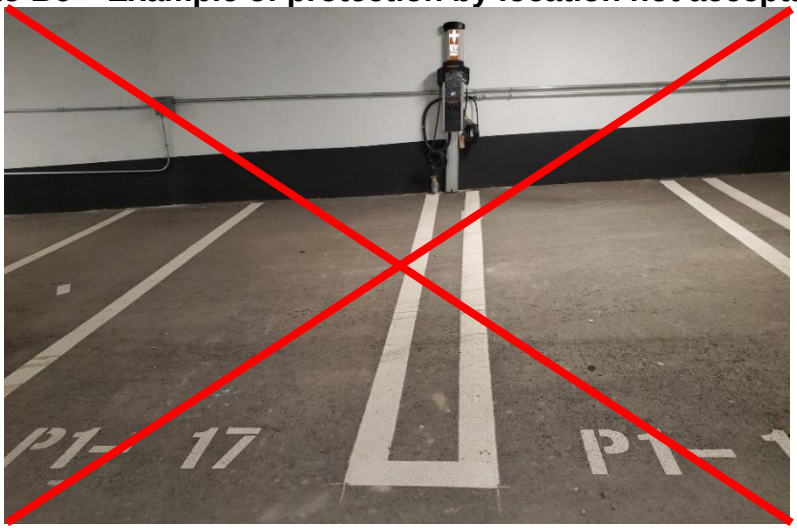
  Note: Where multiple bollards or equivalent physical barrier is used, shall not be spaced more than 1.5m (centre to centre) apart.

Photo B5 – EVSE protected by bollards



Note: protection by location that does not meet any of the above requirements is not acceptable to ESA (e.g. Photo B6)

Photo B6 – Example of protection by location not acceptable.



6) Overcurrent and receptacle requirements for EVSE

a) 50 A receptacles used for EVSE

Installations that include the use of a 50 A receptacle configuration of either 14-50R or 6-50R for a cord connected EVSE will be required to be protected with a 50 A rated overcurrent device in accordance with Rule 26-700 as per Diagram B5.

Diagram B5 – 50 A receptacle with 50 A overcurrent device

14-50R

OR

6-50R

=

50 A overcurrent device

b) AFCI, GFCI, and TR requirements for dwelling units

For installations where branch circuits for dwelling units supplying a CSA configuration 5-20R receptacle that will be used for the purpose of the connection of an EVSE, the applicable Rules 26-658, 26-704 2) and 26-706 1) d) with regards to AFCI, GFCI, and TR protection shall apply.

7) Bi-directional charging

Bi-directional charging is essentially 2-way charging. In conventional unidirectional charging, the EV takes power from the grid or home or another electrical source to charge the EV's onboard batteries. With bi-directional charging, current can now flow in the opposite direction allowing the EV's battery to supply power back into the grid, home, or appliance.

When the EV becomes the electrical power source and is capable of running in parallel with the supply grid, the system is considered to be interconnected with grid. The Section 84 rules for the interconnection of electric power production sources will apply. Since the EV is essentially a large battery (ESS) that will have its dc current inverted to ac current, the applicable rules from Section 64 will also apply.

Rule 86-308 requires electric vehicle supply equipment that provides bi-directional power to be marked.

Bulletin 2-11-* outlines the requirements for submitting plans for bi-directional EVSE to ESA for plan review.