

ELECTRIC VEHICLE SUPPLY EQUIPMENT [EVSE]

**PERMITTING &
INSPECTION GUIDELINES**

**FOR PERMITTING AND INSPECTING
LEVEL 2 EVSE OR 120V AND 240V OUTLETS
IN SINGLE-FAMILY & DUPLEX HOMES
2020 NATIONAL ELECTRICAL CODE**

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INTRODUCTION

More and more, buildings are incorporating charging capabilities to accommodate the growing market for electric vehicles. This is a new aspect of building operations that a growing number of jurisdictions will need to address. This guide provides an overview of code requirements for the installation of **Level 2 Electric Vehicle Supply Equipment (EVSE)** installations and **120V or 240V outlets** intended to power light-duty electric vehicles (EV). By providing a specific and replicable list of permitting and inspection requirements, local jurisdictions can reduce informational barriers and help ensure the design and installation of EV charging infrastructure is consistent and code-compliant. This guide references the most applicable requirements for the 2020 National Electrical Code (NEC) as they apply to EVSE installations. Not all requirements are covered by these checklists, but they do include the most important life and safety requirements of the installation and can be used to highlight “common mistakes” made by installers. While these guidelines are geared primarily toward implementing the 2020 NEC, jurisdictions enforcing and contractors using earlier editions of these codes can make use of these guidelines.

HOW TO USE THIS GUIDE

Read this guide for an overview of requirements for the installation of Level 2 Electric Vehicle Supply Equipment (EVSE) installations and 120-volt (120V) or 240-volt (240V) outlets to power an electric vehicle (EV). The process described in this guide can be adopted as-is, used as a reference, or adapted to incorporate specific local requirements. Designers, contractors, and building owners can use this guide to gain an understanding of what to expect in the permitting and inspection processes.


Building departments can use this guide as a starting point for conducting a plan review and inspection for solar and energy storage installations. When adopting or adapting this guide, building departments and their permit applicants are advised to reference all applicable local codes and requirements, including different cycles of the referenced codes as needed.


The replicable lists of permitting and inspection requirements in this guide can be used to reduce informational barriers and help ensure the design and installation of EV charging infrastructure is consistent and code-compliant.


Any building department implementing a new permitting and inspection process based on this guide is advised to provide communication, coordination, and education to key stakeholders in order to support successful implementation, including, but not limited to, the following:


- Communicate intentions with the utility company.
- Inform the Fire Department of any changes.
- Provide training to plan reviewers.

This guide has limitations on its intended use, including the following:

 This EVSE permitting and inspection guide does not include requirements for any service upgrades or other electrical work. If the required load calculation demonstrates a service upgrade is needed, this streamlined permitting and inspection guide cannot be used to determine code compliance of the service upgrade.

 Where electrical service or metering upgrades are required, another permit may be required before this guide can be followed.

 This EVSE permitting and inspection guide does not include requirements for indoor installation of infrastructure for EV batteries that require additional ventilation, including flooded lead-acid or nickel-iron batteries.

 The electrical requirements in this guide primarily focus on the requirements in Article 625: Electric Vehicle Power Transfer System of the National Electrical Code.

Additional general electrical requirements detailed in chapters one through four of the National Electrical Code also apply but are not listed throughout this guide. These include, but are not limited to, the following:

- Electrical equipment is installed in a neat and workmanlike manner. (NEC 110.12)
- Electrical connections of the circuit conductors and equipment grounding conductor connections are secure. (NEC 110.14. 250.148(A))
- Installed branch circuit wiring is properly secured, supported, and routed to prevent physical damage. (NEC 300.11)

PERMIT SUBMISSION REQUIREMENTS



TO APPLY FOR AN EVSE PERMIT, SUBMIT THE FOLLOWING:

1) Electrical permit application

2) Site plan (see Figure 8) drawn to scale showing:

- a) Property lines, adjacent streets, lot dimensions and the north arrow
- b) Primary use of the space or area where the EVSE will be installed
- c) Location of the proposed EVSE equipment on the property and
- d) Number of proposed EVSE chargers

3) Electrical line diagram (see Figure 7) with:

- a) EVSE wiring configuration
- b) EVSE specifications (manufacturer, maximum kW rating, voltage and ampacity, cable management system, if applicable)
- c) Mounting details (e.g., wall, pedestal with footing details)
- d) NEMA enclosure type
- e) Conductors, cables, and raceway types, sizes, and markings
- f) Wiring routes and requirements for their installation (e.g. within framing, mounted to structures, underground, etc.)
- g) Type and size rating of overcurrent protection and disconnects and
- h) Location of additional meters, main electrical service panel, distribution panels or subpanels

4) Load calculation for EVSE and 240V outlet installations

5) EVSE specification sheets and installation manuals

GENERAL INSTALLATION GUIDE



MINIMUM EVSE REQUIREMENTS

- 1 EVSE installed according to manufacturer's installation instructions. (NEC 110.3(B))
- 2 EVSE is suitable for the environment (indoor/outdoor) in which it will be installed. (NEC 110.28)
- 3 EVSE has a Nationally Recognized Testing Laboratory (NRTL) approved listing mark. (UL 2202/UL 2594)(NEC 625.5)
- 4 If EVSE with adjustable amperage setting is installed, equipment is fixed in place and adjusting means is accessible by qualified personnel with the use of a tool or password-protected commissioning software. (NEC 625.42)



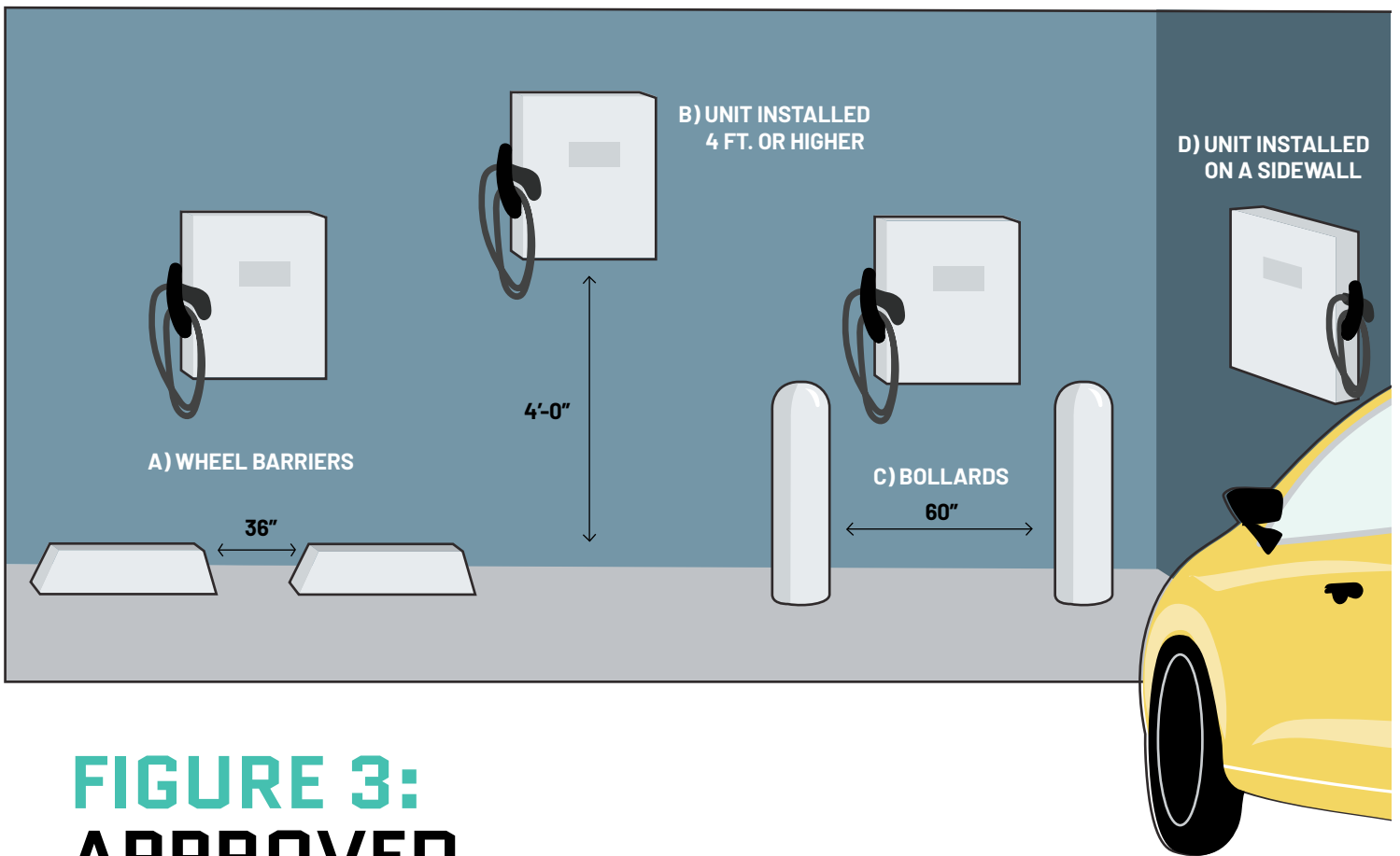
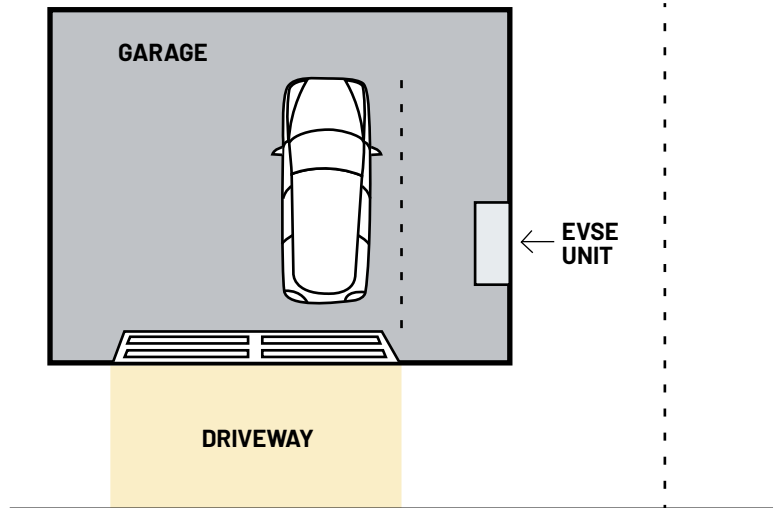
**FIGURE 1:
EXAMPLE
UL LISTING**



LOCATION AND EVSE INSTALLATION REQUIREMENTS

- 5 Permanently installed EVSE are located at a height of (NEC 625.50):
 - a) Indoor location: 1.5 feet or more above floor level
 - b) Outdoor location: 2 feet or more above grade level.
- 6 Output cable to EV meets one of the following: (NEC 625.17)
 - a) Does not exceed 25' in length, or
 - b) Is equipped with a cable management system that is part of the EVSE
- 7 The EVSE is protected from vehicular impact through one of the following:
 - a) Installation in a location not subject to vehicular impact such as a side wall or 4 feet or more above floor level
 - b) Wheel barriers
 - c) Bollards
 - d) Other approved barriers (NEC 110.27(B))

**FIGURE 2:
APPROVED
LOCATION
EXAMPLE**



**FIGURE 3:
APPROVED
BARRIERS**



ELECTRICAL REQUIREMENTS

- 8 For EVSE and 240V outlet installations, the electrical service rating is greater than or equal to the electrical service load, as demonstrated by electrical service load calculations. (NEC 220)
- 9 EVSE has a sufficient rating to supply the load served. (NEC 625.42)
- 10 Service and feeder are sized for EVSE to be considered continuous loads unless an automatic load management system (ALMS) is used. If an ALMS is used, the maximum equipment load on the service/feeder matches the maximum load permitted by the ALMS. (NEC 625.42)
- 11 The required overcurrent protection for the proposed EVSE are:
 - a) Rated for continuous duty
 - b) Have a rating of 125% or more of the maximum load of the equipment specification based on Table 1 (NEC 625.41)

**TABLE 1:
REQUIRED OVERCURRENT
PROTECTION DEVICE (OCPD)
SIZE**

Maximum EVSE current	Required OCPD Size
16A	20A
24A	30A
30A	40 A
32A	40 A
48 A	60 A
80 A	100A



- 12 If the EVSE is rated more than 60 amps or more than 150V to ground, the disconnecting means is able to be locked in the open position and is in an easily accessible location not protected by locked doors or other obstructions. (NEC 625.43, NEC 110.25)
- 13 Circuits serving EVSE do not supply any other outlets or loads. (NEC 625.40)
- 14 Circuit conductors are sized at 125% or more of EVSE maximum internal field selected current setting. (NEC 210.19(A)(1), NEC 215.2(A), NEC Table 310.16)
- 15 All electrical materials, devices, fittings, and associated equipment are listed and labeled. (NEC 625.5)
- 16 Underground wiring methods meet the minimum cover requirements in Table 2 below. Insulated conductors and cables must be suitable for use in wet locations and protected from physical damage. (NEC 300.5, NEC 310.10)

TABLE 2: UNDERGROUND WIRING METHOD MINIMUM COVER REQUIREMENT



DEPTH	DRIVEWAYS AND PARKING AREAS	IN TRENCH BELOW 2 INCH SLAB	UNDER A BUILDING	UNDER 40+ CONCRETE WITH NO VEHICULAR TRAFFIC	ALL OTHER LOCATIONS
0"					
4"				 [IN RACEWAY]	
6"				 [DIRECT BURIED]	
12"					
18"					
24"					

WIRING METHOD TYPES

- Direct Burial Cables or Conductors
- Rigid Metal or Intermediate Metal Conduit
- Nonmetallic Raceways Listed for Direct Burial Without Concrete Encasement or Other Approved Raceways
- 120V Branch Circuit and maximum OCPD of 20 amps



FIGURE 4:
PORTABLE EVSE



FIGURE 6: **FIXED EVSE**

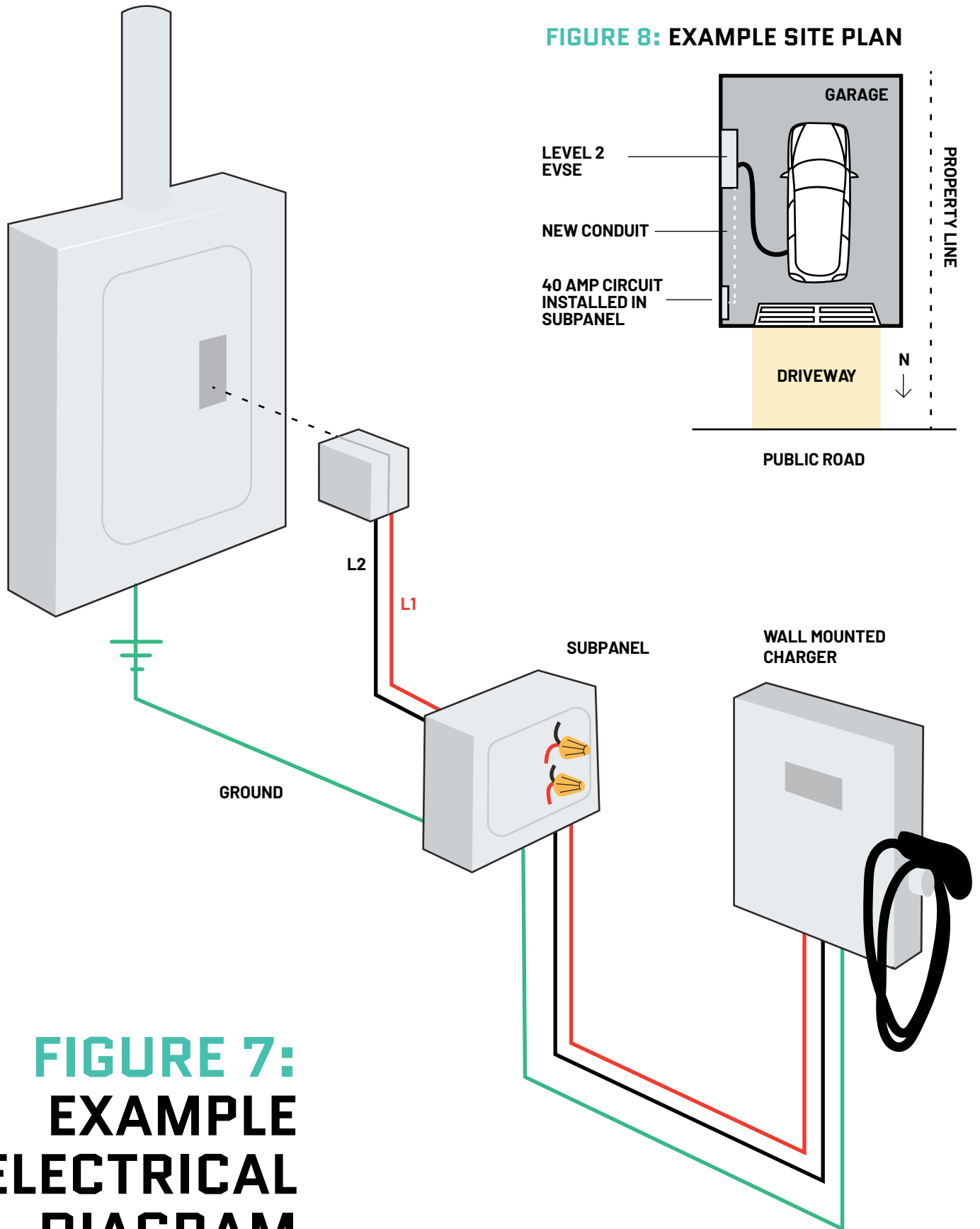


FIGURE 5: **FASTENED IN PLACE EVSE**

- 17** Portable EVSE is connected by one of the following: (NEC 625.44(A))
- a) A nonlocking, 2 pole, 3-wire grounding-type receptacle outlet rated at 125V, single phase, 15 or 20 amps
 - b) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 125V, single phase, 15 or 20 amps
 - c) A nonlocking, 2-pole, 3-wire or 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, single phase, 30 or 50 amps
 - d) A nonlocking, 2-pole, 3-wire grounding-type outlet rated at 60V DC maximum, 15 or 20 amps

- 18** Fastened-in place EVSE are connected by one of the following: (NEC 625.44(B))
- a) A nonlocking, 2 pole, 3-wire grounding-type receptacle outlet rated at 125V or 250V, single phase, up to 50 amps
 - b) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, three-phase, up to 50 amps
 - c) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, single phase, 30 or 50 amps
 - d) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 60 V DC maximum, 15 or 20A amps

- 19** Fixed EVSE are permanently wired and fixed in place to the supporting surface. (NEC 625.44 (C))
- 20** Receptacles have GFCI protection. (NEC 625.54)
- 21** All receptacles installed in a wet location for EV charging have a weatherproof enclosure with the attachment plug cap inserted or removed. If an outlet box hood is installed, it is extra duty. (NEC 625.56)



**FIGURE 7:
EXAMPLE
ELECTRICAL
DIAGRAM**

(Source: SemaConnect)



PERMITTING CHECKLIST

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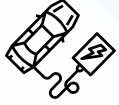
INSPECTION CHECKLIST

PERMITTING CHECKLIST



MINIMUM EVSE REQUIREMENTS

- 1 EVSE installed according to manufacturer's installation instructions.
- 2 EVSE is suitable for the environment (indoor/outdoor) in which it will be installed.
- 3 EVSE has a Nationally Recognized Testing Laboratory (NRTL) approved listing mark. (UL 2202/UL 2594)



LOCATION AND EVSE INSTALLATION REQUIREMENTS

- 4 Permanently installed EVSEs are indicated to be at the height of:
 - a) Indoor location: 1.5 feet or more above floor level
 - b) Outdoor location: 2 feet or more above grade level.
- 5 Output cable to EV must meet one of the following:
 - a) Does not exceed 25' in length
 - b) Is equipped with a cable management system that is part of the EVSE
- 6 The EVSE is protected from vehicular impact through one of the following:
 - a) Installation in a location not subject to vehicular impact, such as a side wall or 4 feet or more above floor level
 - b) Wheel barriers
 - c) Bollards
 - d) Other approved barriers



ELECTRICAL REQUIREMENTS

- 7 For EVSE and 240V outlet installations, the electrical service rating is greater than or equal to the electrical service load, as demonstrated by electrical service load calculations.
- 8 EVSE has a sufficient rating to supply the load served.
- 9 Service and feeder are sized for EVSE to be considered continuous loads unless an automatic load management system (ALMS) is used. If an ALMS is used, the maximum equipment load on the service/feeder matches the maximum load permitted by the ALMS.
- 10 The required overcurrent protection for the proposed EVSE is:
 - a) Rated for continuous duty
 - b) Has a rating of 125% or more of the maximum load of the equipment specification based on Table 1
- 11 If the EVSE is rated more than 60 amps or more than 150V to ground, the disconnecting means is able to be locked in the open position and is in an easily accessible location not protected by locked doors or other obstructions.
- 12 Circuits serving EVSE do not serve any other outlets or loads.
- 13 Circuit conductors are sized at 125% or more of EVSE nameplate current
- 14 Underground wiring methods meet minimum cover requirements in Table 1. Insulated conductors and cables are suitable for use in wet locations and protected from physical damage.
- 15 Portable EVSE is connected by one of the following:
 - a) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 125V, single phase, 15 or 20 amps
 - b) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 250V, single phase, 15 or 20 amps
 - c) A nonlocking, 2-pole, 3-wire or 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, single phase, 30 or 50 amps
 - d) A nonlocking, 2-pole, 3-wire grounding-type outlet rated at 60V DC maximum, 15 or 20A
- 16 Fastened-in place EVSE are connected by one of the following:
 - a) A nonlocking, 2 pole, 3-wire grounding-type receptacle outlet rated at 125V or 250V, single phase, up to 50 amps
 - b) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, three-phase, up to 50 amps
 - c) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated at 250V, single phase, 30 or 50 amps
 - d) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 60 V DC maximum, 15 or 20A amps
- 17 Fixed EVSE are permanently wired and fixed in place to the supporting surface.



HELPFUL TIP

Numbers that correspond to the requirement in the permitting checklist are provided next to the same requirement in the field inspection checklist.



MINIMUM EVSE REQUIREMENTS

- 1** Specifications of EVSE must match the approved plans for:
 - a) Maximum kW rating
 - b) Voltage
 - c) Ampacity
 - d) Manufacturer
 - e) NEMA enclosure type
- 2** EVSE installed according to manufacturer's installation instructions. (1)
- 3** EVSE is suitable for the environment in which it is installed (indoor and outdoor). (2)
- 4** EVSE has a Nationally Recognized Testing Laboratory (NRTL) approved listing mark. (UL 2202/UL 2594). (3)
- 5** If an EVSE with an adjustable amperage setting is installed, equipment is fixed in place, and adjusting means is accessible by qualified personnel with the use of a tool or password-protected commissioning software.



LOCATION AND EVSE INSTALLATION REQUIREMENTS

- 6** EVSE installation location matches approved floor plan.
- 7** Permanently installed EVSE are located at a height of: (4)
 - a) Indoor location: 1.5 feet or more above floor level
 - b) Outdoor location: 2 feet or more above grade level
- 8** Output cable to EV meets one of the following: (5)
 - a) Does not exceed 25' in length
 - b) Is equipped with a cable management system that is part of the EVSE
- 9** The EVSE is protected from vehicular impact through one of the following: (6)
 - a) Installation in a location not subject to vehicular impact, such as a side wall or 4 feet or more above floor level
 - b) Wheel barriers
 - c) Bollards
 - d) Other approved barriers



ELECTRICAL REQUIREMENTS

- 10** For EVSE and 240V outlet installations, the electrical service rating is greater than or equal to the electrical service load.
- 11** Overcurrent protection is the type and rating according to the approved plan. (10)
- 12** For EVSE rated greater than 60 amperes or 150 volts, a disconnecting means is able to be locked in the open position and is located an easily accessible location not protected by locked doors or other obstructions. (11)
- 13** Circuits serving EVSE do not serve any other outlets or loads. (12)
- 14** Circuit conductors are the type and size according to the approved plan. (13)
- 15** All electrical materials, devices, fittings, and associated equipment are listed and labeled.
- 16** Underground wiring methods meet minimum cover requirements according to the approved plan. Insulated conductors and cables are suitable for use in wet locations and protected from physical damage. (14)
- 17** Portable and fastened-in-place EVSE are connected to the wiring system according to the approved plans. (15 and 16)
- 18** Fixed EVSE are permanently wired and fixed in place to the supporting surface. (17)
- 19** Receptacles have GFCI protection.
- 20** All receptacles installed in a wet location for EV charging have a weatherproof enclosure with the attachment plug cap inserted or removed. If an outlet box hood is installed, it is extra duty.



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EVSE AGENCY CONTACTS

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