The background image shows a white electric vehicle charging station (EVSE) mounted on a grey horizontal-slat wall. A white electric car is parked in front of the station, with its charging cable plugged into the front. The car is partially visible, showing the front headlight and wheel. The scene is set in a covered area, possibly a garage or carport, with a concrete floor. A yellow and teal geometric overlay is on the right side of the image, containing the title and subtitle text.

ELECTRIC VEHICLE SUPPLY EQUIPMENT [EVSE]

**PERMITTING &
INSPECTION GUIDELINES**

**FOR PERMITTING AND INSPECTING
LEVEL 2 EVSE OR 120V AND 240V OUTLET
IN SINGLE-FAMILY & DUPLEX HOMES
2017 NATIONAL ELECTRICAL CODE**

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ACKNOWLEDGMENT AND DISCLAIMER

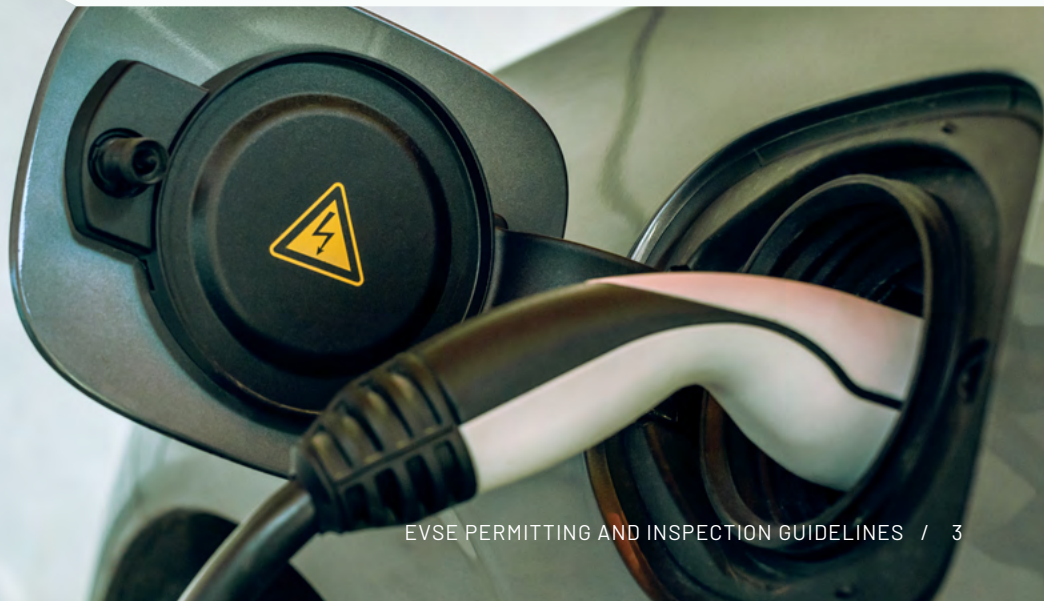
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Use of Electric Vehicle Supply Equipment Permitting and Inspection Guidelines is permitted on a royalty free basis. The authors claim no rights in and makes no representations as to the contents or use of the 2017 National Electrical Code (NEC). The authors further make no representations as to the suitability of this guide for any purpose, and all content is provided as-is. Projects are expected to meet locally adopted codes and should refer to the 2017 NEC and local amendments to ensure full compliance.

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 specific and replicable list of permitting and inspection requirements, local jurisdictions can reduce informational barriers and help ensure the design and installation EV charging infrastructure are consistent and code compliant. This guide references the most applicable requirements for 2017 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 2017 NEC, jurisdictions enforcing and contractors using earlier editions of these codes can make use of these guidelines.



HOW TO USE THIS GUIDE

The building department may conduct plan review and inspection for EVSE installations using this guide as a starting point. Designers, contractors and building owners can use this guide to know what to expect in the permitting and inspection processes. This guide was designed with limitations on its application in mind, including:

- ✕ 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.
- ✕ 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.
- ✕ Where electrical service or metering upgrades are required, another permit may be required before this guide may be followed.
- ✕ This electrical requirements in this guide primarily focuses on the requirements in Article 625: Electric Vehicle Charging of the National Electrical Code. Additional general electrical requirements detailed in Chapters 1 through 4 of the National Electrical Code also apply but are not included in this guide. This includes but is not limited by 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,
- d) Number of proposed EVSE chargers.

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

- a) EVSE 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 conduit types, sizes, and markings,
- f) Conduit 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 outlets installations

5) EVSE specification sheets and installation manuals

GENERAL INSTALLATION GUIDE

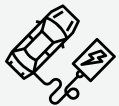


MINIMUM EVSE REQUIREMENTS

- 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 Charging cord 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 Charging cord length reaches the vehicle's charging inlet without excessive slack. (NEC 625.17)
- 8 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, or
 - d) Other approved barrier. (NEC 110.27(B))

FIGURE 2:
APPROVED
LOCATION
EXAMPLE

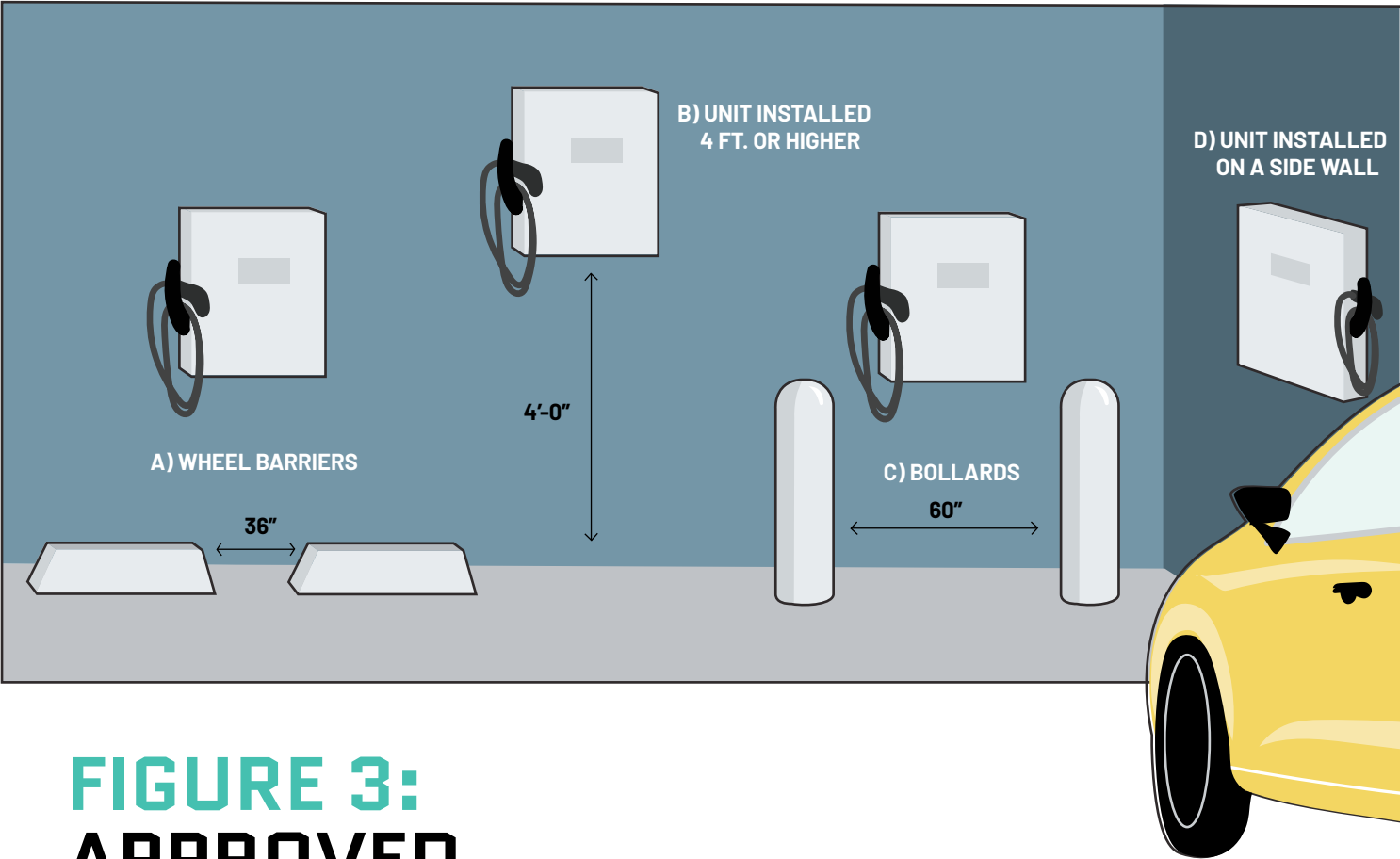
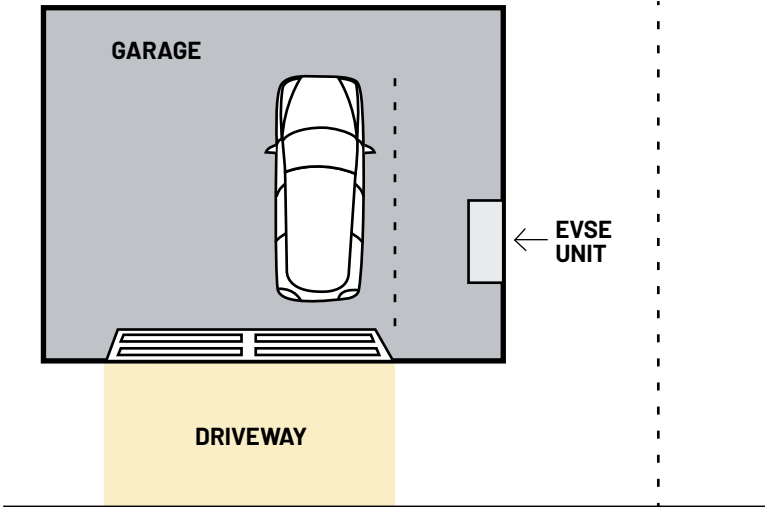


FIGURE 3:
APPROVED
BARRIERS



ELECTRICAL REQUIREMENTS

- 9 For EVSE and 240V outlets installations, electrical service rating is greater than or equal to the electrical service load as demonstrated by electrical service load calculations. (NEC 220)
- 10 EVSE has a sufficient rating to supply the load served. (NEC 625.42)
- 11 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)
- 12 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 below. (NEC 625.41)

TABLE 1:
REQUIRED OVERCURRENT
PROTECTION DEVICE SIZE

Maximum EVSE current	Required OCPD Size
16A	20A
24A	30A
30A	40 A
32A	50 A
48 A	60 A
80 A	100A



- 13 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)
- 14 Circuits serving EVSE do not serve any other end uses. (NEC 625.40)
- 15 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)
- 16 All electrical materials, devices, fittings, and associated equipment are listed and labeled. (NEC 625.5)
- 17 Underground conduit meet minimum depth 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 310.5)

TABLE 2: UNDERGROUND CONDUIT MINIMUM DEPTH REQUIREMENT



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

CONDUIT 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 5: FASTENED IN
PLACE EVSE**



FIGURE 6: FIXED EVSE

18 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

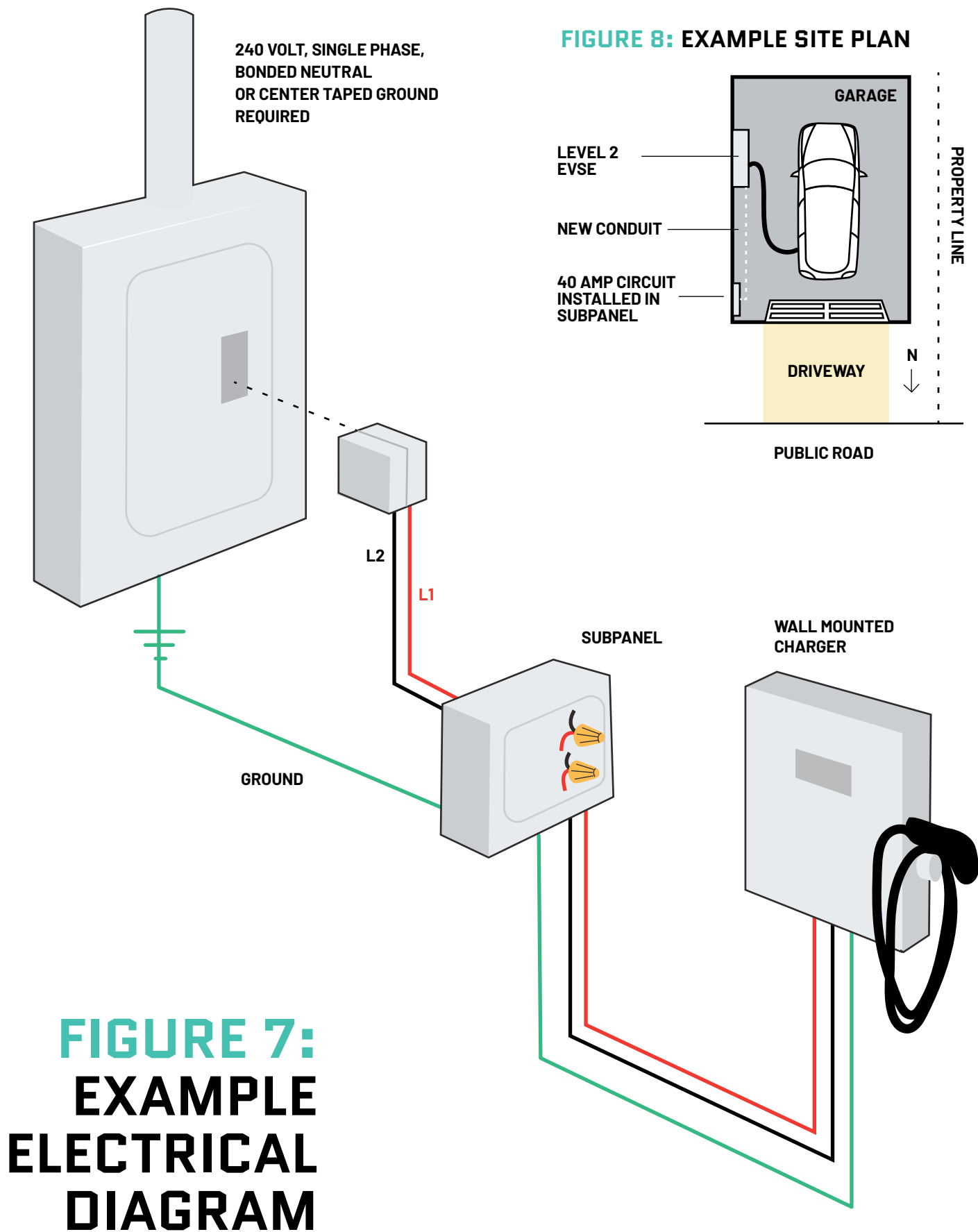
19 Fastened-in place EVSE are connected by one of the following: (NEC 625.44(B))

- 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, 2-pole, 3-wire grounding-type receptacle outlet rated at 60 V DC maximum, 15 or 20A amps

20 Fixed EVSE are permanently wired and fixed in place to the supporting surface (NEC 625.44 (C))

21 All single-phase receptacles for electric vehicle charging that are rated 150 volts to ground or less, and 50 amperes or less have GFCI protection. (NEC 625.54)

22 All receptacles installed in a wet location for EV charging have a weatherproof enclosure with the attachment plug cap inserted or removed. (NEC 625.56)



(Source: SemaConnect)



PERMITTING CHECKLIST

+



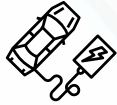
INSPECTION CHECKLIST

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 EVSE are located at a height of:
 - a) Indoor location: 1.5 feet or more above floor level
 - b) Outdoor location: 2 feet or more above grade level.
- ☐ **5** Charging cord meets 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; or
 - d) Other approved barrier.



ELECTRICAL REQUIREMENTS

- ☐ **7** For EVSE and 240V outlets installations, 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 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 below.
- ☐ **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 end uses.
- ☐ **13** Circuit conductors are sized at 125% or more of EVSE nameplate current
- ☐ **14** Underground conduit meet minimum depth requirements in Table 1 below. 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
- ☐ **17** Fixed EVSE are permanently wired and fixed in place to the supporting surface.



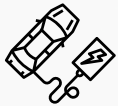
HELPFUL TIP

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 match the approved plans:
 - 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 to 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 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.



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** Charging cord 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** Charging cord length reaches the vehicle's charging inlet without excessive slack.
- ☐ **10** 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; or
 - d) Other approved barrier.



ELECTRICAL REQUIREMENTS

- ☐ **11** For EVSE and 240V outlets installations, electrical service rating is greater than or equal to the electrical service load. (7 and 9)
- ☐ **12** Overcurrent protection are the type and rating according to the approved plan. (10)
- ☐ **13** 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)
- ☐ **14** Circuits serving EVSE do not serve any other end uses. (12)
- ☐ **15** Circuit conductors are the type and size according to the approved plan. (13)
- ☐ **16** All electrical materials, devices, fittings, and associated equipment are listed and labeled.
- ☐ **17** Underground conduit meet minimum depth requirements according to the approved plan. Insulated conductors and cables are suitable for use in wet locations and protected from physical damage. (14)
- ☐ **18** Portable and fastened-in-place EVSE are connected to the wiring system according to the approved plans. (15 and 16)
- ☐ **19** Fixed EVSE are permanently wired and fixed in place to the supporting surface. (17)
- ☐ **20** All single-phase receptacles for electric vehicle charging that are rated 150 volts to ground or less, and 50 amperes or less have GFCI protection.
- ☐ **21** All receptacles installed in a wet location for EV charging have a weatherproof enclosure with the attachment plug cap inserted or removed.



RESOURCES

National Fire Protection Association. "NFPA 70®." NFPA 70®: National Electrical Code®, Delmar Cengage Learning, 18 Sept. 2019, <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70&access=open>.

EVSE AGENCY CONTACTS

Agency			
Division			
Contact			
Email			
Phone			



APPENDIX: EVSE PERMIT APPLICATION

FOR OFFICE USE ONLY

Application Number: _____

Permit Number: _____

Issued By: _____

Date Applied: _____

Date Issued: _____

SECTION 1 - GENERAL INFO

PROJECT ADDRESS _____

PROPERTY OWNER'S NAME _____

PHONE NUMBER _____

EMAIL _____

PROPERTY OWNER'S MAILING ADDRESS (IF DIFFERENT FROM PROJECT ADDRESS) _____

SECTION 2 - PROJECT DETAILS

BUILDING TYPE/EXISTING USE

☐ MULTI-FAMILY

☐ OFFICE

☐ NEW CONSTRUCTION

☐ OTHER: _____

EVSE LOCATION:

☐ GARAGE

☐ EXTERIOR
WALL

☐ STREET CURB

☐ OTHER

MAXIMUM RATING OF
LEVEL 2 EV SERVICE
EQUIPMENT

_____ kW

EVSE VOLTAGE

MANUFACTURER

NUMBER OF EVSE

LOAD OF EXISTING
PANEL SUPPLYING
EVSE

_____ AMPS

TOTAL LOAD
(EXISTING PLUS
EVSE LOAD)

_____ AMPS

SERVICE LOAD

_____ AMPS

PROJECT DESCRIPTION:

SECTION 3 - CONTRACTOR INFORMATION

CONTRACTOR BUSINESS NAME

CONTRACTOR LICENSE NUMBER

BUSINESS ADDRESS

CONTRACTOR CONTACT NAME

PHONE NUMBER

EMAIL

SECTION 4 - PERMIT FEE

[Include fee schedule/options and/or instructions for calculating fee, directions on how and when to submit the permit fee.]

SECTION 5 - IMPORTANT NOTICE

A permit must be obtained for all installations or alterations of electrical equipment BEFORE WORK STARTS. Refer to EVSE Permitting Checklist for additional documents required. Failure to provide all required documents, including **(1) Site Plan, (2) Electrical Diagram, and (3) Specification Sheets** and Installation Manuals will delay permit approval. All permits expire six (6) months after date of issuance. Failure to start the work authorized by a permit within this six-month period renders the permit invalid and a new permit must be obtained. Once work begins, noticeable progress must continue until completion. All work must be complete within eighteen (18) months of a permit issue date.

Please Submit the following additional documents with the EVSE Permit Application

- | | |
|--|-------------------------------------|
| - Site Plan | - Transformer Specification Sheets |
| - Electrical Diagram | - Load Calculation |
| - EVSE Specification Sheets and Installation Manuals | - Automatic Load Management System |
| | - Specification sheet if applicable |

Submit Permit Application

[Describe the submission process, how should the permits be submitted? In-person, on-line, e-mail, fax, etc.]

SECTION 6 - APPLICANT SIGNATURE

I, the undersigned, certify that I have proper authority to apply for this permit, that the Contractor has obtained a signed contract from the Property Owner for the specified work, that all contractors have consented to being listed, and that all the information contained on this application is true and accurate to the best of my knowledge.

NAME

TITLE

SIGNATURE

DATE

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