

COUNTY OF VENTURA RESOURCE MANAGEMENT AGENCY Building and Safety Division	ORIGINAL March,08 2019	POLICIES AND INTERPRETATIONS POLICY NO. 2019-E001
Topic: Page 1 of 7 Electric Vehicle Charging/Service Load Calculator	REVISED:	Ruben Barrera, CBO Building Official 

GUIDELINES: RESIDENTIAL ELECTRIC VEHICLE CHARGING SYSTEMS

SCOPE: Residential

APPLICABLE CODES: 2016 CRC, CEC, VCBC

The information provided in this document is general in nature and is intended as a guide only. Each project is unique and additional requirements may be necessary prior to approval.

PURPOSE

The purpose of this guide is to assist permit applicants with streamlining the permitting, installation, and inspection process for residential Electric Vehicle Charging Systems (EVCS).

TYPES OF ELECTRIC VEHICLE (EV) CHARGERS

Be aware that there are 2 basic types of EV chargers for residential use: Level 1 and Level 2

LEVEL 1

Level 1 chargers are smaller units (lesser demand) that plug directly into a standard 120-volt receptacle outlet. These types of chargers typically require a longer period to recharge the vehicle. If the receptacle outlet being used to plug in the Level 1 charger is existing, there is no requirement to obtain a permit from the Building and Safety Division. On the other hand, if you will be installing a new 120-volt receptacle outlet for the charger, you will need to obtain an electrical permit – but you will not need to provide any plans or electrical load calculations as would be required for the more powerful Level 2 type charging system.

LEVEL 2

A Level 2 EV charging system requires a 240-volt electrical circuit and charges the vehicle battery much faster than a Level 1 charger. Level 2 charger installations require an electrical permit and inspections of the installation. To obtain a permit, you will need to provide some basic information to show that your existing electrical service is sufficient for the additional load.

Installing a Level 2 EV charging system requires changes to the building electrical wiring. Before installing the EV charging equipment and the associated wiring, contact the EV manufacturer about the electrical requirements for the charger unit to be installed at your home.

In general, EV charging systems shall be installed by a qualified person only such as a CA state licensed electrical contractor (C10). Information regarding licensing requirements can be found at <http://www.cslb.ca.gov/>. The installer should follow the installation instructions provided by the EV charger manufacturer and the requirements of the California Electrical Code.

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SUBMITTAL REQUIREMENTS

These Residential EV Charger Permit Guidelines have been developed to streamline the permit, installation, and inspection process. In most cases, the homeowner or the contractor will need to fill in the blanks on this document, attach the manufacturer’s installation instructions and charger specifications and submit the information to Ventura County Building and Safety for an over-the-counter review. If all the information is provided and the proposal complies with the applicable codes and standards, the review and approval process can usually be performed over-the-counter or within a day or two, depending upon workloads and staffing levels at the time of submittal. Once the permit is issued, the installation may begin.

When the installation is complete, an inspection of the work must be scheduled with Building and Safety. Inspections are typically performed on the work day following your request for inspection. Keep in mind that a qualified person will need to be present during the inspection so that the Building Inspector can access the location of the electrical service equipment, EV charger (typically in the garage) and inspect the wiring methods and materials. This will require removing the dead-front and exposing the electrical wiring.

CALIFORNIA ELECTRICAL CODE GENERAL REQUIREMENTS

All Electrical Vehicle Charging Systems shall comply with the applicable sections of the California Electrical Code, including Article 625.

EQUIPMENT HEIGHT

The coupling means of the Electric Vehicle Supply Equipment shall be stored at a height of not less than 18 inches above the floor level for indoor locations and not less than 24 inches above the grade level for outdoor locations. (CEC 625.50)

LISTED EQUIPMENT

All Electric Vehicle Supply Equipment shall be listed by a nationally recognized testing laboratory. (CEC 625.5)

FASTENED IN PLACE

Specify if the Level 2 Electric Vehicle Supply Equipment will be permanently connected and fastened in place in accordance with the manufacturer’s installation instructions. (CEC 625.17)

PROTECTION FROM PHYSICAL DAMAGE

Electrical Vehicle Supply Equipment shall be protected against vehicle impact damage when located in the path of a vehicle. To avoid the installation of a substantial pipe bollard to provide protection of the equipment, locate the Electrical Vehicle Supply Equipment on a garage side wall, out of vehicular path (see sample drawing below). (CEC 110.27(B))

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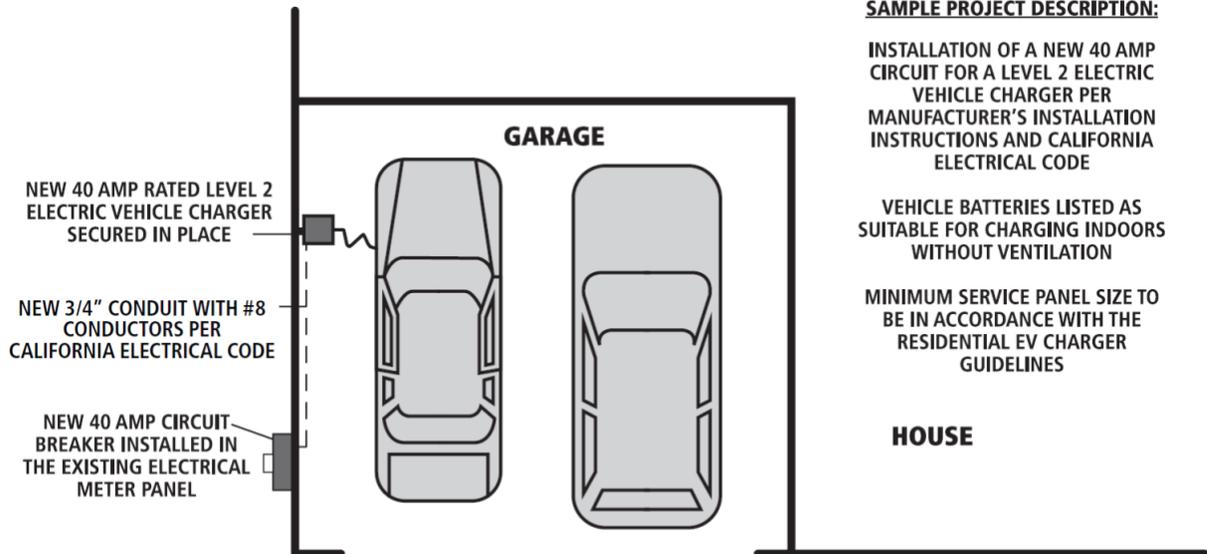
IF MORE THAN 60 AMPS

When EV charging equipment is rated at more than 60 amps, the disconnect means shall be provided and installed in a readily accessible location and shall be capable of being locked on the open position. (CEC 625.42)

SITE PLAN

Provide three copies of the job-specific site plan showing:

1. The orientation of the front of the building with the street name.
2. Location of the main service panel, location of the EVSE, disconnecting means, conduit size and material, wire size and insulation type.
3. See Sample Project and Other Helpful Information below.



Though an individual Level 2 EV charger may have a negligible impact on the utility electric system, the combined effect of several chargers in the same neighborhood could result in overloads on utility secondary wires and transformers. It is important that the local SCE office (SCE Planning 805-654-7444) be notified of any Level 2 charger installations to ensure that utility electrical system components are adequately sized to maintain high levels of service reliability.

OTHER HELPFUL INFORMATION FOR EV CHARGER INSTALLATIONS

The table below illustrates the type and size of wire and conduit to be used for various Electric Vehicle Charger circuits. All EVC breakers shall be full space (no quad breakers).

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Size of EV Charger Circuit Breaker	Required Minimum Size of Conductors (THHN wire; THHW wire for exterior)	Conduit Type and Size *		
		Electrical metallic Tubing (EMT)	Rigid Nonmetallic Conduit - Schedule 40 (RNC)	Flexible Metal Conduit (FMC)
20 amps	#12	1/2"	1/2"	1/2"
30 amps	#10	1/2"	1/2"	1/2"
40 amps	#8	3/4"	3/4"	3/4"
50 amps	#8	3/4"	3/4"	3/4"
60 amps	#6	3/4"	3/4"	3/4"
70 amps	#4	3/4"	3/4"	3/4"

* Based on 4 wires in the conduit (2-current carrying conductors, 1-grounded conductor, and 1-equipment ground). (CEC Chapter 9 Tables) As an alternate, Nonmetallic Sheathed Cable (NMC) (e.g., Romex cable) may be used if it is protected from physical damage by placing the cable inside a wall cavity or attic space which is separated from the occupied space by drywall or plywood.

The table below illustrates the required supports for various types of electrical conduit or cable.

Conduit Support	Electrical Metallic Tubing (EMT) (CEC 358.30 (A))	Rigid Nonmetallic Conduit - Schedule 40 (RNC) (CEC 352.28 (B))	Flexible Metal Conduit (FMC) (CEC 348.42 (B))	Nonmetallic Sheathed Cable (NMC) (CEC 334.30)
Conduit Support Intervals	10'	3'	4-1/2'	4-1/2'
Maximum Distance from Box to Conduit Support	3'	3'	1'	1'

*In addition to the above noted requirements, the California Electrical Code contains many other provisions that may be applicable to the installation of a new electrical circuit. Installers are cautioned to be aware of all applicable requirements before beginning the installation. For additional information or guidance, consult with the Building and Safety Division staff or a qualified CA state licensed electrical contractor.

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SERVICE LOAD CALCULATOR

Instructions: Review the list of electrical loads in the table below and check all that exist in your home (don't forget to include the proposed Level 2 charger). For each item checked, fill in the corresponding "Watts Used" (refer to the "Typical Usage" column for wattage information). Add up all the numbers that are written in the "Watts Used" column and write that number in the "TOTAL WATTS USED" box at the bottom of the table. Then go to the next page to determine if your existing electric service will accommodate the new loads.

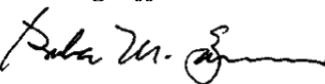
Note: Loads shown are rough estimates; actual loads may vary. For a more precise analysis, use the nameplate ratings for appliances and other loads and consult with a trained electrical professional.

****This completed Load Calculator and signed Statement of Compliance is required to be provide to the inspector at the time of the first inspection. ****

*Alternatively, the calculation of a feeder or service load for existing installations shall be permitted to use actual maximum demand to determine the existing load under **ALL** of the following conditions (CEC 220.87):*

- 1. The maximum demand data is available for a 1-year period.*
- 2. The maximum demand at 125 percent plus the new load (EVSE) does not exceed the ampacity of the feeder or rating of the service.*
- 3. The feeder has overcurrent protection in accordance with 240.4, and the service has overload protection in accordance with 230.90.*

Provide a minimum of 1-year of the most recent utility bills identifying the project location and a calculation as outlined above justifying the additional load with your submittal.

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Check All Applicable Loads	Description of Load	Typical Usage	Watts Used
<input type="checkbox"/>	GENERAL LIGHTING AND RECEPTACLE OUTLET CIRCUITS		
<input type="checkbox"/>	Sq. ft. of the house: _____ (multiply by 3 watts/sq.ft.)	3 watts/sq.ft.	
<input type="checkbox"/>	KITCHEN CIRCUITS		
<input type="checkbox"/>	Kitchen Circuits	3000 watts	
<input type="checkbox"/>	Electric Oven	2000 watts	
<input type="checkbox"/>	Electric Stove Top	5000 watts	
<input type="checkbox"/>	Microwave	1500 watts	
<input type="checkbox"/>	Garbage Disposal under Kitchen Sink	1000 watts	
<input type="checkbox"/>	Automatic Dish Washer	3500 watts	
<input type="checkbox"/>	Garbage Compactor	1000 watts	
<input type="checkbox"/>	Instantaneous Hot Water at Sink	1500 watts	
<input type="checkbox"/>	LAUNDRY CIRCUITS		
<input type="checkbox"/>	Laundry Circuit	1500 watts	
<input type="checkbox"/>	Electric Clothes Dryer	4500 watts	
<input type="checkbox"/>	HEATING AND AIR CONDITIONING CIRCUITS		
<input type="checkbox"/>	Central Heating and Air Conditioning	6000 watts	
<input type="checkbox"/>	Window Mounted Air Conditioning	1000 watts	
<input type="checkbox"/>	Whole-House or Attic Fan	500 watts	
<input type="checkbox"/>	Central Electric Furnace	8000 watts	
<input type="checkbox"/>	Evaporative Cooler	500 watts	
<input type="checkbox"/>	OTHER ELECTRIC LOADS		
<input type="checkbox"/>	Electric Water Heater (Storage Type)	4000 watts	
<input type="checkbox"/>	Electric Tankless Water Heater	15000 watts	
<input type="checkbox"/>	Swimming Pool or Spa	3500 watts	
<input type="checkbox"/>	Other (Describe)	watts	
<input type="checkbox"/>	Other (Describe)	watts	
<input type="checkbox"/>	Other (Describe)	watts	
<input type="checkbox"/>	ELECTRIC VEHICLE CHARGER CIRCUIT		
<input type="checkbox"/>	Level 2 EV Charger Wattage: _____ (multiply by 1.25)		
TOTAL WATTS USED			

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The table below is based on CEC 220.83(A) and Annex D.

1	2	3	4
Check the Appropriate Line	Total Watts Used (from Previous Page)	Minimum Required Size of Existing 240-Volt Electrical Service Panel (Main Service Breaker Size)	Identify the Size of Your Existing Main Service Breakers (Amps) *
<input type="checkbox"/>	Up to 24,000 W	100 amps	
<input type="checkbox"/>	24,001 - 30,000 W	125 amps	
<input type="checkbox"/>	30,001 - 36,000 W	150 amps	
<input type="checkbox"/>	36,001 - 48,000 W	200 amps	
<input type="checkbox"/>	48,001 - 54,000 W	225 amps	
* Note: The size of your existing service (column 4) MUST be equal to or larger than the Minimum Required size (column 3) or a new larger electrical service panel will need to be installed in order to satisfy the electrical load demand of the EV charger			

STATEMENT OF COMPLIANCE

By my signature, I attest that the information provided is true and accurate.

Installation Address: _____

Signature: _____ Date: _____

In addition to this document, you will also need to provide a copy of the manufacturer’s installation literature and specifications for the Level 2 charger you are installing.

Note: This is a voluntary compliance alternative and you may wish to hire a qualified individual or company to perform a thorough evaluation of your electrical service capacity in lieu of this alternative methodology. Use of this electrical load calculation estimate methodology is at the user’s risk and carries no implied guarantee of accuracy. Users of this methodology and these forms are advised to seek professional assistance in determining the electrical capacity of a service panel.