



# Electric Vehicle Charging System Guidelines for One and Two-Family Dwellings Buildings

There are **2 basic types of EV chargers** for home use (Level 1 and Level 2). Level 1 Chargers are smaller units that plug directly into a standard 120-volt receptacle outlet. These types of chargers typically require longer to charge. If the receptacle outlet being used to plug-in the Level 1 Charger is existing, there is no requirement to secure 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 a 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 systems.

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

**When installing your EV charger**, be sure to use a licensed Electrical contractor whose state contractor’s license and insurance are current. The contractor should follow the installation instructions of the EV charger manufacturer and the requirements of *California Electrical Code*.

**What information do I need to provide to obtain the permit?** This Residential EV Charger Permit Guideline has been developed to streamline the permit, installation, and inspection process. In most cases, you or your contractor merely need to fill-in the blanks on this document, attach the manufacturer’s installation instructions and charger specifications and submit it to the Novato Building Division. Once the permit is issued, the installation may begin. When the installation is complete, an inspection of the work must be scheduled with the Building Inspector. Keep in mind that someone will need to be present during the inspection to provide access to the Building Inspector to the EV charger, circuit breaker, conductors and other related components.

**Project Address & Owner Name:** \_\_\_\_\_

**My project will be located in a (select one):**   Single Family Dwelling   Two-Family Dwelling.

**My project address is (select one):**

has an existing fire sprinkler system.    is not equipped with fire sprinklers; penetrations through the dwelling-garage separation will comply with *CRC302.5.3 item 4 & R302.4.2 Membrane Penetrations*.

**My project does NOT require mechanical ventilation and is verifiable via the equipment manufacturer’s installation guidelines; the installation guidelines for my proposed car charger is attached to this handout. If your project requires mechanical ventilation, you are not eligible for use of this document.**

## **LEVEL 2 ELECTRIC VEHICLE CHARGER - SERVICE LOAD CALCULATION**

**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 EV Charger). For each item checked, fill-in the corresponding “Watts used” (refer to the “Typical usage” column for wattage information). Add up all of 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.(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.)

Check All Applicable Loads	Description of Load	Typical usage	Watts used
<b>GENERAL LIGHTING AND RECEPTACLE OUTLET CIRCUITS</b>			
✓	Multiply the square footage of the house x 3	3 watts/sq. ft	
<b>KITCHEN CIRCUITS</b>			
✓	Small Appliance Circuits	3000 Watts	<b>3,000</b>
	Electric Oven	2000 Watts	
	Electric Stove Top	5000 Watts	
	Microwave	1500 Watts	
	Garbage Disposal under Kitchen Sink	1000 Watts	
	Dish Washer	3500 Watts	
	Garbage Compactor	1000 Watts	
	Instantaneous Hot Water Heater	1500 Watts	
<b>LAUNDRY CIRCUIT</b>			
✓	Laundry Circuit	1500 Watts	<b>1500</b>
	Electric Clothes Dryer	4500 Watts	
<b>HEATING AND AIR CONDITIONING CIRCUITS</b>			
	Central Heating (gas) and Air Conditioning	6000 Watts	
	Window Mounted AC	1000 Watts	
	Whole House or Attic Fan	500 Watts	
	Central Electric Furnace	8000 Watts	
	Evaporative Cooler	500 Watts	
<b>OTHER ELECTRICAL LOADS</b>			
	Electrical Water Heater (storage-type)	4000 Watts	
	Electric Tankless Water Heater	15,000 Watts	
	Swimming Pool or Spa	3500 Watts	
	Other (describe)	Watts	
	Other (describe)	Watts	
<b>ELECTRIC VEHICLE CHARGER CIRCUIT</b>			
	Level 2 Electric Vehicle Wattage Rating x1.25 *		
(Add-up all of the watts for the loads you have checked ✓)			
<b>TOTAL WATTS USED →</b>			

**\*Use name plate rating in watts or calculate as: (Ampere rating of circuit X 240 volts = Watts)**

**INSTRUCTIONS:** Using the “TOTAL WATTS USED” number from the previous page, check (✓) the appropriate line in column 1 and follow that line across to determine the minimum required size of the electrical service panel shown in column 3. In column 4, write-in the size of your existing service panel (main breaker size). If your Existing service panel (column 4) is smaller than the minimum required size of the existing service (column 3), then you will need to install a new upgraded electrical service panel to handle the added electrical load from the proposed Level 2 EV Charger.

**Total based on CEC 220.83(A), 230.42, 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 Breaker (Amps)**
	Up to 48,000	100 amps	
	48,001 to 63,000	125 amps	
	63,001 to 78,000	150 amps	
	78,001 to 108,000	200 amps	
	108,001 to 123,000	225 amps	

\*\*Please note that 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.

**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. You must highlight the required sized of your EV circuit breaker.

Size of EV Charge Circuit Breaker	Required Minimum Size Of Conductors (THHN Wire Only)****	Electrical Metallic Tubing (EMT)***	Rigid Nonmetallic Conduit-Schedule 40 (RNC)***	Flexible Metal Condu (FMC)***
20 amp	#12	1/2"	1/2"	1/2"
30 amp	#12	1/2"	1/2"	1/2"
40 amp	#10	1/2"	1/2"	1/2"
50 amp	#8	3/4"	3/4"	3/4"
60 amp	#6	3/4"	3/4"	3/4"
70 amp	#6	3/4"	3/4"	3/4"

\*\*\*Based on 4 wires in the conduit (2-current carrying conductors, 1-grounded conductor, 1-equipment ground).

\*\*\*\* As an alternate, Nonmetallic Sheathed Cable (aka: Romex Cable or NMC) 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. Use of nonmetallic sheathed cable shall require the upsizing of NMC conductors to a greater ampacity.

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

<b>Conduit Support</b>	<b>Electrical Metallic Tubing (EMT)</b>	<b>Rigid Nonmetallic Conduit- Schedule 40 (RNC)</b>	<b>Flexible Metal Conduit (FMC)</b>	<b>Nonmetallic Sheathed Cable (NMC)</b>
<b>Conduit Support Intervals</b>	<b>10'</b>	<b>3'</b>	<b>4-1/2'</b>	<b>4-1/2'</b>
<b>Maximum Distance from Box to Conduit Support</b>	<b>3'</b>	<b>3'</b>	<b>1'</b>	<b>1'</b>

In addition to the above noted requirements, the 2022 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 and experienced Electrical Contractor.

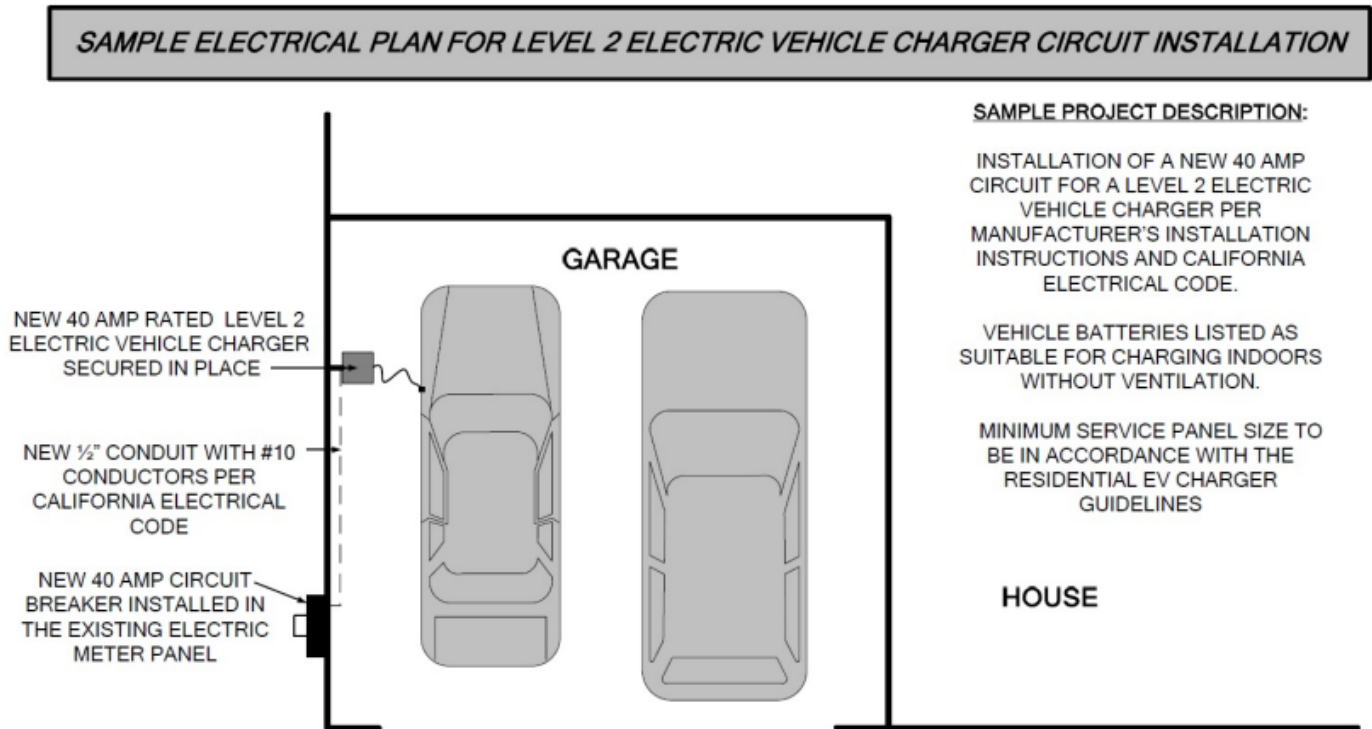
**GENERAL INSTALLATION GUIDELINES FOR LEVEL 2 RESIDENTIAL EV CHARGERS**

1. GENERAL REQUIREMENTS - All Electrical Vehicle Charging Systems shall comply with the applicable sections of the 2022 California Electrical Code, including Article 625.
2. EQUIPMENT HEIGHT - The coupling means of the Electric Vehicle Supply Equipment shall be stored at a height of 18 inches minimum above the finished floor; 24 inches for outdoor locations (CEC Art 625.50).
3. LISTED EQUIPMENT - All Electric Vehicle Supply Equipment shall be listed by a nationally recognized testing laboratory.
4. 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 lockable open in accordance with 110.25. (CEC Art. 625.43)
5. VENTILATION, only indoor charging installations may require ventilation. To determine whether you need to ventilate the space, the CEC instructs you to consult the equipment manufacturer. Providers of EV chargers must list ventilation requirements: If they say you need mechanical ventilation (exhaust fans, for example), then you do. If they say you don't, you don't. CEC 625.52 (A).
6. OVERCURRENT PROTECTION, according to CEC 625.22, EV chargers must include a "personnel protection system" that prevents shocks. Typically, that means an "interrupting device," which blocks the flow of electricity for

disconnected circuits.

7. PROTECTION FROM PHYSICAL DAMAGE - Electrical Vehicle Supply Equipment shall be protected against vehicle impact damage when located in the path of a vehicle. In order to avoid the installation of a substantial pipe bollard as an equipment guard, locate the Electrical Vehicle Supply Equipment on a garage side wall, out of vehicular path. (See sample drawing on below) (CEC Art. 110.27(B))

8. INDIVIDUAL BRANCH CIRCUIT. Each outlet installed for the purpose of charging an EV shall be supplied by an individual branch circuit. CEC 625.40



I acknowledge that all construction, regardless of details or note son this handout, shall comply with the 2022 California Residential Code, 2022 California Building Code, 2022 California Mechanical Code, 2022 California Electrical Code, 2022 California Plumbing Code, 2022 California Energy Code, 2022 CALGreen Building Code, City of Novato Municipal Code.

Applicant Signature \_\_\_\_\_

Date \_\_\_\_\_