

**DEVELOPMENT SERVICES – BUILDING DIVISION****SUBMITTAL GUIDELINES:
RESIDENTIAL ELECTRIC VEHICLE SUPPLY EQUIPMENT – EXPEDITED****EFFECTIVE:** 05/08/2017**SCOPE:** RESIDENTIAL**APPLICABLE CODES:** 2016 CBC, CRC, CPC, CMC, CEC, CALGreen, CEnC, and PAMC

The information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.

PURPOSE

The purpose of this guideline is to assist permit applicants in streamlining the permitting, installation and inspection process for Residential EV Chargers.

TYPES OF ELECTRIC VEHICLE (EV) CHARGERS

Be aware that there are different types of Electric Vehicle (EV) Chargers. There are 2 basic types of EV chargers for home use (Level 1 and Level 2).

LEVEL 1

Level 1 Chargers are smaller units that plug directly into a standard 120 volt receptacle outlet. These types of chargers typically require a longer period of time to recharge the vehicle. As long as the receptacle outlet being used to plug-in the Level 1 Charger exists, 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.

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 typically require an electrical permit and inspections of the installation. In order to obtain the permit you will need to provide some basic information to show that your existing electrical service can handle the added load.

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

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.

SUBMITTAL REQUIREMENTS

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 Building Department at the Development Center for an over-the-counter review and permit issuance.

If all of the information is provided and the proposal complies with the applicable codes, 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 the Building Inspector. Inspections are typically performed on the work day following your request for inspection. Keep in mind that someone will need to be present during the inspection so that the Building Inspector can access the location of the electrical meter and EV charger (typically in the garage) and perform torque requirements.

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. You can find a list in the US Department of Labor's [website](#). (CEC 110.3(B))

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. If the unit weighs more than 200 lbs and it is fastened in a wall, provide attachment details per PAMC 16.04.275.

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 below). (CEC 110.27(B))

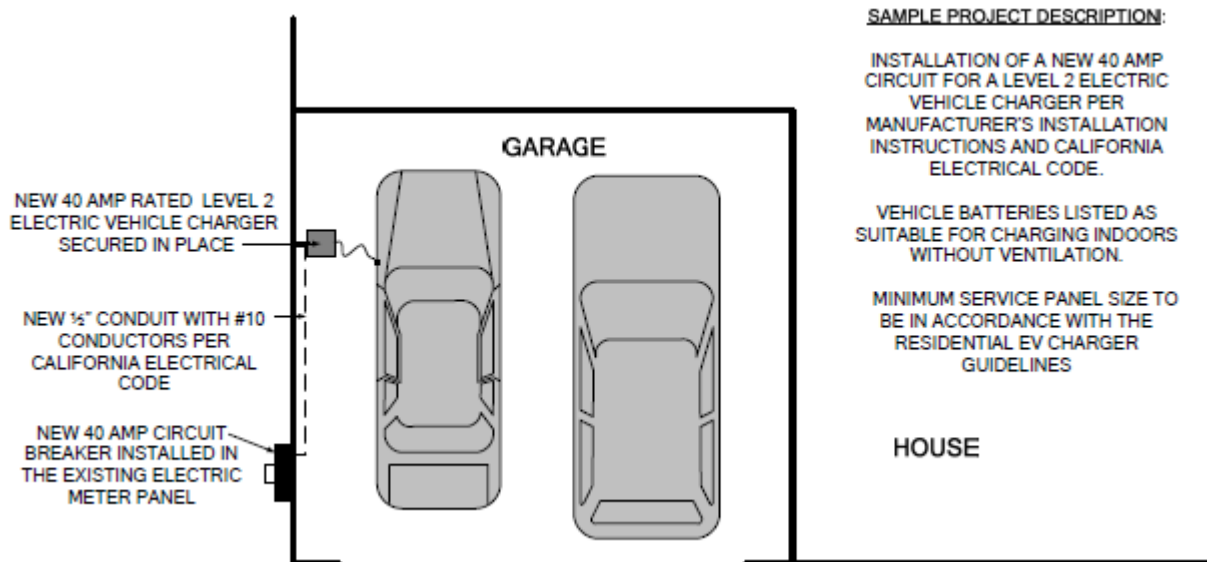
IF MORE THAN 60 AMPS

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 two copies of the job-specific site plan showing:

- The location of the building and street name
- All EVSE receptacle location(s), electric service, disconnects, and existing or proposed electric meter location
- Information as required in the tables in the following page (see Other Helpful Information)



Sample Electrical Plan for Level 2 Electric Vehicle Charger Circuit Installation (Source: City of Riverside)

CITY OF PALO ALTO UTILITY REQUIREMENTS

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 City of Palo Alto Utilities 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.

For EVSEs greater than 40 amps, or that require an overcurrent protection device (e.g., circuit breaker) greater than 50 amps, complete the [City of Palo Alto Utilities Department EVSE Information form](#).

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.

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	#6	3/4"	3/4"	3/4"
60 amps	#6	3/4"	3/4"	3/4"
70 amps	#4	1"	1"	1"

* 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 Department staff at the Development Center or a qualified and experienced Electrical Contractor.

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.

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

Instructions: Using the "TOTAL WATTAGE 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 a new upgraded electrical service panel to handle the added electrical load from the proposed Level 2 charger.

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) *
	Up to 48000	100 amps	
	48001 – 63000	125 amps	
	63001 – 78000	150 amps	
	78001 – 108000	200 amps	
	108001 – 123000	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.

Job 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.