

# ONE AND TWO-FAMILY RESIDENTIAL ELECTRIC VEHICLE (EV) CHARGER GUIDELINES

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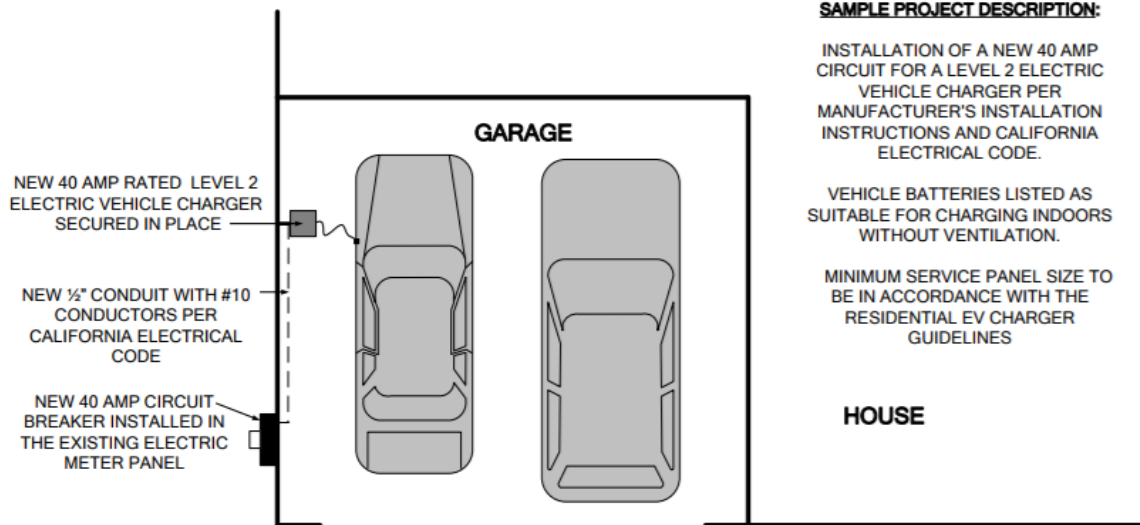
## Information needed to obtain permit

You will need to fill-in the blanks on this document, attach the manufacturer's installation instructions and charger specifications, along with a Building permit application, and submit it to the City. Once all of the information is provided and the proposal complies with the applicable codes, an appointment can be scheduled for a plan review at the counter. Once the permit is issued, the installation may begin. When the installation is complete, an inspection of the work must be scheduled. Please be aware 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).

## Installing charging system

Installing a Level 2 EV Charging system often requires changes to a 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.

### SAMPLE ELECTRICAL PLAN FOR LEVEL 2 ELECTRIC VEHICLE CHARGER CIRCUIT INSTALLATION



## Level 2 electric vehicle charger – service load calculation

1. 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).
2. For each item check marked, fill-in the watts used (refer to the typical usage column for wattage information).
3. 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,
4. 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	Typical usage	Watts used
<b>General lighting and receptacle outlet circuits</b>			
<input type="checkbox"/>	Multiply the square footage (sq. ft.) of the house x 3	3 watts/sq. ft.	
<b>Kitchen circuits</b>			
<input type="checkbox"/>	Kitchen circuits	3,000 watts	3,000
	Electric oven	2,000 watts	

	Electric stove top	5,000 watts	
	Microwave	1,500 watts	
	Garbage disposal	1,000 watts	
	Automatic dish washer	3,500 watts	
	Garbage compactor	1,000 watts	
	Instant hot water at sink	1,500 watts	
<b>Laundry circuit</b>			
<input type="checkbox"/>	Laundry circuit	1,500 watts	1,500
	Electric clothes dryer	4,500 watts	
<b>Heating and air conditioning circuit</b>			
	Central heating and air conditioning	6,000 watts	
	Window mounted AC	1,000 watts	
	Whole-house or attic fan	500 watts	
	Central electric furnace	8,000 watts	
	Evaporative cooler	500 watts	
<b>Other electrical loads</b>			
	Electric water heater (storage type)	4,000 watts	
	Electric tankless water heater	15,000 watts	
	Swimming pool or spa	3,500 watts	
	Other:		
<b>Electric vehicle charger circuits</b>			
	Level 2 electric vehicle charger wattage rating (ampere rating of circuit x 240 volts = watts)		
<b>Total watts used</b>			
Add up all the watts for the loads that you placed a checkmark			
<b>Total watts used</b>			
Using the total watts used number from above:			
5. Check <input type="checkbox"/> 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.			
6. In column 4, write-in the size of your existing service panel. If your existing service panel 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.			
<b>1. Checkmark the appropriate line</b>	<b>2. Total watts used</b>	<b>3. Minimum required size</b>	<b>4. Identify the size of your existing main breaker (amps)</b>
	Up to 48,000	100 amps	
	48,001 – 63,000	125 amps	
	63,001 – 78,000	150 amps	
	78,001 – 108,000	200 amps	

	108,001 – 123,000	225 amps		
Please note that column 4 must be equal to or larger than 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.				
<b>Type and size of wire and conduit to be used</b>				
Size of EV charger circuit breaker	Required minimum size of conductors	Electrical metallic tubing (EMT)	Rigid nonmetallic conduit – schedule 40 (RNC)	Flexible metal conduit (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"
Nonmetallic Sheathed Cable (aka: Romex Cable or NMC) may be used if it is protected from damage by placing the cable inside a wall cavity or attic space which is separated from the occupied space by drywall or plywood.				
<b>Required supports for various types of electrical conduit or cable</b>				
Conduit support	Electric metal tubing (EMT)	Rigid nonmetallic conduit – schedule 40 (RNC)	Flexible metal conduit (FMC)	Nonmetallic sheathed cable (NMC)
<b>Conduit support intervals</b>	10'	3'	4-1/2'	4-1/2'
<b>Maximum distance from box to conduit support</b>	3'	3'	1'	1'
In addition to the above requirements, the California Electrical Code contains many other provisions that may be applicable to the installation of a new electrical circuit. For additional information or guidance, consult with City staff or a qualified and experienced Electrical Contractor.				
<b>General installation guidelines</b>				
<ol style="list-style-type: none"> <li>1. General requirements – All electrical vehicle charging systems shall comply with the applicable sections of the Cal. Electrical Code., including Article 625.</li> <li>2. Equipment height – The plug of the Electric Vehicle Supply Equipment shall be stored between 18 and 48 inches above the floor. Cal. Electrical Code. § 625.29(B) (2019).</li> <li>3. Listed equipment – All electric vehicle supply equipment shall be listed by a nationally recognized testing laboratory.</li> <li>4. Fastened in place – Level 2 electric vehicle supply equipment must be permanently connected and fastened in place in accordance with the manufacture's installation instructions. Cal. Electrical Code. § 625.13 (2019).</li> <li>5. Protection from physical damage – electric 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 barricade as an equipment guard, locate the electric vehicle supply equipment on a garage side wall or out of any vehicular path. Cal. Electrical Code. § 110.27 (B) (2019).</li> <li>6. If more than 60 amps – When EV charging equipment is rated at more than 60 amps, a manual means of disconnect means be provided and installed in a readily accessible location and shall be capable of being locked in the open or off position. Cal. Electrical Code. § 625.23 (2019).</li> <li>7. Electric use only – All electric vehicle supply equipment shall be marked for use with electric vehicles only. Cal. Electrical Code. § 625.15(A) (2019).</li> <li>8. Ventilation – If equipment does not require ventilation, the electric supply equipment shall be marked ventilation not required Cal. Electrical Code. § 625.15(B) (2019). If the equipment requires ventilation, the electric supply shall be marked ventilation required Cal. Electrical Code. § 625.15(C) (2019)</li> </ol>				