City of Walnut Creek

Development Review Services

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Residential Electric Vehicle (EV) Charger Guidelines

Background

The increased use of electric vehicles will greatly help reduce air pollutants to meet State and Federal emission targets. Efficient permitting and inspection for electric vehicle (EV) chargers will help encourage the use of electrical vehicles in California. The purpose of this guideline is to assist permit applicants in streamlining the permitting, installation and inspection process for the EV chargers installed inside private garages or carports of residential properties (single family, duplex, and townhouse).

Definitions and Acronyms

AC = Alternating Current, **DC** = Direct Current, **HOA** = Home Owners Association.

Vehicle Charger = A device that converts household AC power to DC power and regulates the charging of the PEV batteries.

Electronic Vehicle Service Equipment (EVSE) = this is the equipment that is installed between a source of electricity and the electric vehicle connection.

PEV = A vehicle that either runs entirely on electricity, or a combination of electricity and another source of fuel (Plug-in Electric Vehicle).

Level 1 EV chargers are smaller units (like a golf cart) 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. This method, which allows broad access to charge a PEV, permits plugging into a common, grounded 120 volt electrical receptacle (NEMA 5-15R or 5-20R). The maximum load on this receptacle is 12 amperes or 1.4 kVA. The minimum circuit and overcurrent rating for this connection is 15 amperes for a 15-ampere receptacle and 20 amperes for a 20 ampere receptacle.

Level 2 EV chargers require a 240 volt electrical circuit and charge the vehicle battery much faster than a Level 1 charger. This level is the primary and preferred method of EV charging at both private and public facilities. It requires special equipment and connection to an electric power supply dedicated to EV charging. The voltage of this connection is either 240 volts or 208 volts. The maximum load is 32 amperes (7.7 kVA at 240 volts or

6.7 kVA at 208 volts). The minimum circuit and overcurrent rating for this connection is 40 amperes (32 x1.25 = 40 amperes). Electric vehicles are treated as continuous loads.

Level 3 charger uses high-speed, high- power method which will charge an EV in about the same time it takes to refuel a conventional vehicle. Because of individual supply and available source voltages, exact voltage and load specifications for Level 3 charging have not been defined as Level 1 and Level 2. These power requirements are specified by the equipment.

Permit Information

1. An electrical permit is required for the installation of an EV charger, charger receptacle outlet and branch circuit. The permit may be exempted where the EV charger will utilize an existing receptacle outlet without any modification of the existing circuit.
2. All work must comply with the 2016 California Residential Code (CRC), 2016 California Electrical Code (CEC), 2016 California Green Building Standards Code (CalGreen), and Walnut Creek Municipal Code (WCMC).
3. When the permit application is prepared according to the permit submittal requirements listed below, the review and approval will be performed over-the-counter or within a day or two depending upon workloads and staffing levels at the time of submittal.
4. The permit application can be submitted in person or by fax-back. Instructions of fax-back permitting can be found on City's website: http://www.walnut-creek.org/department-services/community-and-economic- development/building-division/contractor-s-fax-back-permitting
5. Where an EV charger is installed on a property governed by a Home Owner's Association (HOA), the applicant is recommended to consult with HOA prior to permit application submittal.

Permit Submittal Requirements

Please provide the following documents at application submittal:

1. Provide a completed building permit application.
2. Provide three sets of dimensioned site plans showing the location of new EV charger(s), scope of work, property address, and line diagram with existing and new electrical equipment identified.
3. Provide electrical load calculation for Level 2 or above charger(s) by using the worksheet included with this document. Note: Dedicated branch circuits from the central meter distribution panel to the charging station may be required.
4. Manufacturer's specifications and installation instructions shall be included as part of permit application documents
5. Electrical equipment exposed to weather shall be listed for such use.

LEVEL 2 ELECTRIC VEHICLE CHARGER - SERVICE LOAD CALCULATION

INSTRUCTIONS: Review the list of electrical loads in the table below and check (v) all that exist in your home (don't forget to include the proposed Level 2 EV Charger). For each item checked (v), 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.)

(v) Check All Applicable Loads	Description of Load	Typical usage	Watts used
GENERAL LIGHTING AND RECEPTACLE OUTLET CIRCUITS			
	Multiply the Square Footage of House X 3	3 watts/sq. ft.	
KITCHEN CIRCUITS			
	Kitchen Circuits	3,000 watts	3,000
	Electric Oven	2,000 watts	
	Electric Stove Top	5,000 watts	
	Microwave	1,500 watts	
	Garbage Disposal under Kitchen Sink	1,000 watts	
	Automatic Dish Washer	3,500 watts	
	Garbage Compactor	1,000 watts	
	Instantaneous Hot Water at Sink	1,500 watts	
LAUNDRY CIRCUIT			
	Laundry Circuit	1,500 watts	1,500
	Electric Clothes Dryer	4,500 watts	
HEATING AND AIR CONDITIONING CIRCUITS			
	Central Heating (gas) 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	
OTHER ELECTRICAL LOADS			
	Electric Water Heater (Storage type)	4,000 watts	
	Electric Tankless Water Heater	15,000 watts	
	Swimming Pool or Spa	3,500 watts	
	Other: (*describe)*	watts	
	Other:	watts	
	Other:	watts	
ELECTRIC VEHICLE CHARGER CIRCUIT			
	Level 2 Electric Vehicle Charger Wattage Rating*		
	(Add-up all of the watts for the loads you have checked) **TOTAL WATTS USED** -+		

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.

Table based on CEC 220.83(A), 230.42, and Annex D.

1	2	3	4
(v) 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.

STATEMENT OF COMPLIANCE

Main Electric Service Upgrade Required ( )YES ( )NO

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

Job Address: _____
(Print job address)

Signature: _____ _____
(Signature of applicant) (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 Statement of Compliance form is a voluntary compliance worksheet for general residential compliance only! You may wish to hire a qualified individual or company to perform a thorough evaluation of your existing electrical service capacity in lieu of using this worksheet. Use of this electrical load calculation estimate worksheet is at the user's risk and carries no implied guarantee or warranty. Users of this load calculation methodology and these forms are advised to seek professional assistance in determining the electrical capacity of a service panel.*

GENERAL INSTALLATION GUIDELINES FOR LEVEL 2 RESIDENTIAL EV CHARGERS

All Electrical Vehicle Charging Systems shall comply with all 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 at least 18 inches above the finished floor level for indoor locations and at least 24 inches above grade level for outdoor locations. CEC 625.50.

LISTED EQUIPMENT - All Electric Vehicle Supply Equipment shall be listed by a nationally recognized testing lab like Underwriters Laboratory (UL).

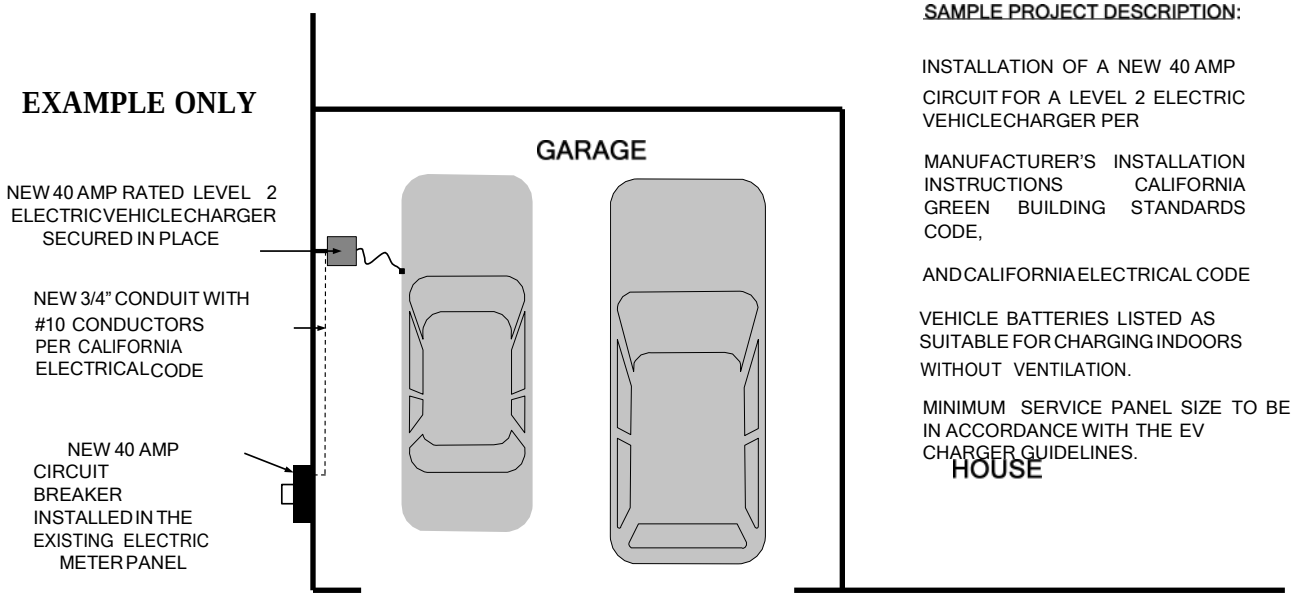
MARKINGS - Level 2 Electric Vehicle Supply Equipment shall comply with CEC 625.15 (A) and (B) or (C).

(A) "FOR USE WITH ELECTRIC VEHICLES" **and**
(B) "VENTILATION NOT REQUIRED" **or**
(C) "VENTILATION REQUIRED".

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 (CEC 625.42) and shall be capable of being locked on the open position (CEC 110.25)

SAMPLE ELECTRICAL PLAN FOR LEVEL 2 ELECTRIC VEHICLE CHARGER CIRCUIT INSTALLATION



SAMPLE PROJECT DESCRIPTION:

INSTALLATION OF A NEW 40 AMP CIRCUIT FOR A LEVEL 2 ELECTRIC VEHICLE CHARGER PER

MANUFACTURER'S INSTALLATION INSTRUCTIONS CALIFORNIA GREEN BUILDING STANDARDS CODE,

AND CALIFORNIA ELECTRICAL CODE

VEHICLE BATTERIES LISTED AS SUITABLE FOR CHARGING INDOORS WITHOUT VENTILATION.

MINIMUM SERVICE PANEL SIZE TO BE IN ACCORDANCE WITH THE EV CHARGER GUIDELINES.

OTHER HELPFUL INFORMATION FOR EV CHARGER INSTALLATIONS:

The Table below illustrates the type and size of conductor and conduit to be used for various Electric Vehicle Charger circuits.

Size of EV Charger Circuit Breaker	Required minimum size of Conductors (THHN Wire) Copper	Conduit Type and Size***		
		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	#10	1/2"	1/2"	1/2"
40 amp	#8	3/4"	3/4"	3/4"
50 amp	#8	3/4"	3/4"	3/4"
60 amp	#6	3/4"	3/4"	3/4"
70 amp	#4	1"	1"	1"

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

NOTE: New construction shall provide minimum 1" raceway per CEC 625.1.1 and CAL-GREEN 4.106.4.1 for future use and shall be clearly marked "EV CAPABLE".

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

Conduit Support	Electrical Metallic Tubing (EMT)	Rigid Nonmetallic Conduit – Schedule 40 (RNC)	Flexible Metal Conduit (FMC)	Nonmetallic Sheathed Cable (NMC)
Conduit Support Interval	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 Division staff or a qualified and experienced Licensed Electrical Contractor.