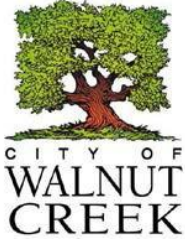


## *EV Charging Station Submittal Requirements*

To obtain a permit for an Electric Vehicle Charging Station, please provide the following:

- Plan and details of the charging system installation
  - Print applicable codes on the plan:
    - **Current edition of the California Electrical Code**
    - **Current edition of the California Building Code**
- Identify all EV charging station locations on the plan. Use a site plan to show where the charging station will be installed.
- EV system UL listing number or other approved nationally recognized testing laboratory shall be provided on plan.
- Provide electric load calculation and electrical system design for the charging stations. Dedicated branch circuits from the meter distribution panel to the charging station may be required.
- City Planning and Engineering division approval may be required, particularly for an outdoor installation.
- Contact Contra Costa County Fire Protection District (925/941-3300) to request if they will review the installation.
- Electric Vehicle Supply Equipment shall be installed in accordance with manufacturer's installation instructions and the terms of the listing and shall be suitable for the environment (indoor/outdoor).
- Manufacturer installation instructions shall be made available for the inspector at the site.
- Check with PG&E for any specific utility requirements such as whether a second electric meter is required to be installed because of electric utility rate for EV charging.

# ***RESIDENTIAL CHECKLIST - ELECTRIC VEHICLE CHARGING STATIONS***



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## ***BACKGROUND***

The increased use of electrical vehicles will greatly help reduce air pollutants to meet State and Federal emission targets. Efficient permitting and inspection for EV electric charging systems will help encourage the use of EV in California. The purpose of this guideline is to assist permit applicants in streamlining the permitting, installation and inspection process for Residential EV Chargers.

## ***DEFINITIONS & 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 charging system requires a 240 volt electrical circuit and charges 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 x 1.25 = 40 amperes). Electric vehicles are treated as continuous loads.

**Level 3** The EV equivalent of a commercial gasoline dispensing station, this high-speed,

high- power method charges 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.

### ***CODE REFERENCE(S):***

- 2016 California Electrical Code (CEC)
- 2016 California Residential Code (CRC)
- 2016 California Green Building Standards Code (CalGreen)
- Underwriters Laboratory (UL) listed charging system.

### ***PERMIT REQUIREMENTS:***

**Exemption:** *If proposed Electric Vehicle Service Equipment (EVSE) specifications allow utilizing Level 1 charging on an existing 15 amp or 20 amp circuit with a manufacturer approved, cord and plug connection, directly from EVSE to an existing residential receptacle outlet. In this case, a Permit is NOT required.*

**An electrical permit is required** for all new EV charging station(s) serving one and two family dwellings, **unless exempted** by using an existing circuit and receptacle outlet. 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 charging station(s), including scope of work, property address, a line diagram with existing and new electrical equipment identified.
3. Provide electrical load calculation for Level 2 or above charging station(s) by using forms included with this document. Note: Dedicated branch circuits from the central meter distribution panel to the charging station may be required.
4. EV charging system components shall be listed with UL or other approved nationally recognized testing agency, the listing information shall be included on the plan as supporting document attachment.
5. Electrical equipment exposed to weather shall be listed for such use.
6. Manufacturer specifications and installation instructions shall be included with permit application documents.

NOTE: EV charging systems installed on property governed by a Home Owner's Association (HOA). Please consult with HOA prior to application submittal, a letter of approval from the HOA may be included with permit application documents however, is not required.

**Exemption:** *If proposed Electric Vehicle Service Equipment (EVSE) specifications allow utilizing Level 1 charging on an existing 15 amp or 20 amp circuit with a manufacturer approved, cord and plug connection, directly from EVSE to an existing residential receptacle outlet. In this case, a Permit is NOT required.*

# **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).

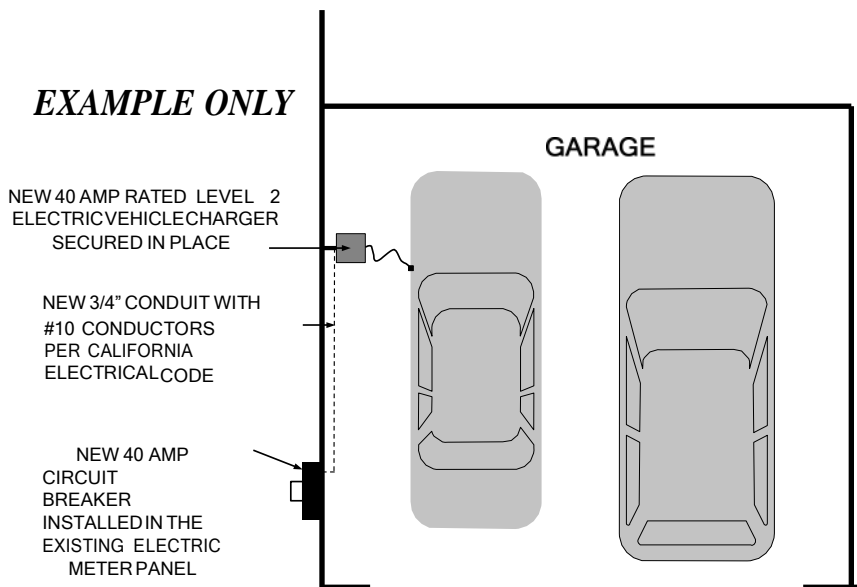
- (A) "FOR USE WITH ELECTRIC VEHICLES" **and**
- (B) "VENTILATION NOT REQUIRED" **or**
- (C) "VENTILATION REQUIRED".

**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**

### **EXAMPLE ONLY**



### **SAMPLE PROJECT DESCRIPTION:**

INSTALLATION OF A NEW 40 AMP CIRCUIT FOR A LEVEL 2 ELECTRIC VEHICLECHARGER 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 RESIDENTIAL **HOUSE** CHARGER GUIDELINES.

# **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.)*

| Applicable Loads                                       | (v) Check All<br>Description of Load       | Typical usage   | Watts used |
|--|--|-----------------|------------|
| <b>GENERAL LIGHTING AND RECEPTACLE OUTLET CIRCUITS</b> |  |                 |            |
|  | Multiply the                               |                 |            |
|  | Square Footage of House X 3                | 3 watts/sq. ft. |            |
| <b>KITCHEN CIRCUITS</b>                                |  |                 |            |
|  | 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     |            |
| <b>LAUNDRY CIRCUIT</b>                                 |  |                 |            |
|  | Laundry Circuit                            | 1,500 watts     | 1,500      |
|  | Electric Clothes Dryer                     | 4,500 watts     |            |
| <b>HEATING AND AIR CONDITIONING CIRCUITS</b>           |  |                 |            |
|  | 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       |            |
| <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: (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.*



**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.

| <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 Interval</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 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.

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