



Solano County Guide to Expedited Permitting for Electrical Vehicle Supply Equipment (EVSE) for Residential and Commercial Buildings

Depending on your charging needs, building permits may be required if work needs to be performed in your building to upgrade or replace your electrical panel, outlets, or to add a second meter. Please contact PG&E for possible additional requirements.

Definitions:

- A **Hybrid** is a vehicle that has an internal combustion engine as well as an electric motor and battery to increase gas mileage
- A **Plug-in Hybrid Electric Vehicle (PHEV)** is a hybrid with a larger battery pack that produces superior gas mileage and reduced emissions comparable to a hybrid, and has the capability to be plugged in to charge the battery for increased efficiency.
- An **Electric Vehicle (EV)** or **Battery Electric Vehicle (BEV)** is 100% electric and has zero tail pipe emissions with no internal combustion engine.
- A **Plug-in Electric Vehicle (PEV)** refers to all vehicles that have a battery on board that can be charged/plugged in to an electrical outlet, such as PHEVs, Extended-Range Electric Vehicles (EREVs), BEVs, and EVs.
- **Electric Vehicle Supply Equipment (EVSE)**, or charging station, is your connection to the grid or charge connector for your **Plug-in Electric Vehicle (PEV)**.

Is your building ready?

Depending on the charging requirements that your vehicle needs, your electrical panel may need to be upgraded or replaced to accommodate the Electrical Vehicle Supply Equipment (EVSE) recommend for your vehicle.

There are three levels of electric vehicle (EV) charging systems for residential and commercial installation:

Level 1 charging: (120 V AC, 15/20 A) This is the standard electrical outlet found in most buildings. This charging level can take 8-15 hours to fully charge a vehicle, depending on how drained the battery is.

Level 2 charging: (208/240V AC, 40 A) This level of charging can take 4-6 hours to fully charge a vehicle, depending on how drained the battery is.

Level 3 charging: (500 V DC) Charging at this level takes only an hour or 2 depending on how drained your battery is to fully charge your vehicle. (For commercial use only)

To find where public and existing electric vehicle charging stations are currently located, view the map here:

<http://www.recargo.com/search>

Or

<http://www.afdc.energy.gov/afdc/locator/stations/>

Electric Vehicle Supply Equipment (EVSE) Permit Guide Steps:

1. Research car & get the charging specifications from the manufacturer.
2. Verify that the car will fit completely on your property while charging.
3. Have your electrical system assessed by a licensed electrician for capacity and to determine if upgrades are needed. *For safety reasons, it may be required to have a dedicated circuit for EVSE.*
4. Contact PG&E to apply for service and for help on charging levels & rate options. Call 1-877-743-7782.

Submission Checklist for Electric Vehicle Supply Equipment (EVSE) Installations

Article 625 – 2011 California Electrical Code

Submittal Requirements:

1. Site plan with property lines, garage or parking space dimensions, & clearances of proposed charging system location including location of additional meter, if applicable;
2. One-line diagram; showing:
 - Location(s) of new and existing meter/sub meter and charge controller.
 - Wire sizing and routing.
2. Provide manufacturer installation details and specifications for the electrical supply charging unit.
3. Provide information from the manufacturer indicating whether or not ventilation is required, label plans accordingly and provide mechanical ventilation if required.
4. Complete the Electrical Load Calculation Worksheet (*Form ELC-001*) and provide load calculation of electrical service – include the electrical load required to charge the vehicle at 125%.
5. Note the voltage (120V or 240V) and ampacities of the vehicle charger.
6. All supply equipment shall be listed or labeled.

General Requirements:

1. Coupling means of electric vehicle supply equipment shall be stored or located at a height of not less than 18” and not more than 48” above the floor level.
2. Electric vehicle supply equipment rated 125 volt, 15 or 20 amp may be cord and plug connected. All other EV supply equipment shall be permanently connected and fastened in place.
3. If both 120v and 240v circuits are desired to be monitored by the electric vehicle meter, a meter with distribution will be required.

Permit Fees: For Residential Level 1 - \$155.50 not including any additional permits required to upgrade the existing system. For current permitting fees for all other levels please contact us @ 707-784-6765.

Permit Code Information

Requirements for wiring the charging station are taken directly out of the 2011 edition of the National Electrical Code® (NEC) ® NFPA 70, Article 625 Electric Vehicle Charging System. This article does not provide all of the information necessary for the installation of an electric vehicle charging equipment. Please refer to the current edition of the electrical code adopted by the local jurisdiction for additional installation requirements. Reference to the 2011 NEC may be made at

NEC Chapter or Article	DESCRIPTION
Chapter 2 and 3	<p>Branch Circuit A new electrical box added on a branch circuit shall comply with NFPA 70 National Electrical Code® Chapter 2 Wiring Protection and Chapter 3 Wiring Methods and Materials and all administrative requirements of the NEC or the electrical code in effect in the jurisdiction</p>
625.4	<p>VOLTAGES Unless other Voltages are specified, the nominal ac system voltages of 120, 120/240, 208Y/120, 240, 480Y/277, 480, 600Y/347, and 600 Volts shall be used to supply equipment</p>
625.5	<p>LISTED OR LABELED All electrical materials, devices, fittings, and associated equipment shall be listed or labeled.</p>
625.9	<p>WIRING METHODS The electric vehicle coupler shall comply with 625.9(A) through (F).</p> <p>(A) Polarization. The electric vehicle coupler shall be polarized unless part of a system identified and listed as suitable for the purpose.</p> <p>(B) Noninterchangeability. The electric vehicle coupler shall have a configuration that is noninterchangeable with wiring devices in other electrical systems. Nongrounding-type electric vehicle couplers shall not be interchangeable with grounding-type electric vehicle couplers.</p> <p>(C) Construction and Installation. The electric vehicle coupler shall be constructed and installed so as to guard against inadvertent contact by persons with parts made live from the electric vehicle supply equipment or the electric vehicle battery.</p> <p>(D) Unintentional Disconnection. The electric vehicle coupler shall be provided with a positive means to prevent unintentional disconnection.</p> <p>(E) Grounding Pole. The electric vehicle coupler shall be provided with a grounding pole, unless part of a system identified and listed as suitable for the purpose in accordance with Article 250.</p> <p>(F) Grounding Pole Requirements. If a grounding pole is provided, the electric vehicle coupler shall be so designed that the grounding pole connection is the first to make and the last to break contact.</p>
625.13	<p>ELECTRIC VEHICLE SUPPLY EQUIPMENT Electric vehicle supply equipment rated at 125 volts, single phase, 15 or 20 amperes or part of a system identified and listed as suitable for the purpose and meeting the requirements of 625.18, 625.19, and 625.29 shall be permitted to be cord-and- plug-connected. All other electric vehicle supply equipment shall be permanently connected and fastened in place. This equipment shall have no exposed live parts.</p>
625.14	<p>Rating Electric vehicle supply equipment shall have sufficient rating to supply the load served. For the purposes of this article, electric vehicle charging loads shall be considered to be continuous loads.</p>

625.15	<p>Markings The electric vehicle supply equipment shall comply with 625.15(A) through (C). (A) General. All electric vehicle supply equipment shall be marked by the manufacturer as follows: FOR USE WITH ELECTRIC VEHICLES (B) Ventilation Not Required. Where marking is required by 625.29(C), the electric vehicle supply equipment shall be clearly marked by the manufacturer as follows: VENTILATION NOT REQUIRED The marking shall be located so as to be clearly visible after installation. (C) Ventilation Required. Where marking is required by 625.29(D), the electric vehicle supply equipment shall be clearly marked by the manufacturer, "Ventilation Required." The marking shall be located so as to be clearly visible after installation.</p>
625.16	<p>Means of Coupling The means of coupling to the electric vehicle shall be either conductive or inductive. Attachment plugs, electric vehicle connectors, and electric vehicle inlets shall be listed or labeled for the purpose.</p>
625.17	<p>Cable The electric vehicle supply equipment cable shall be Type EV, EVJ, EVE, EVJE, EVT, or EVJT flexible cable as specified in Article 400 and Table 400.4. Ampacities shall be as specified in Table 400.5(A)(1) for 10 AWG and smaller, and in Table 400.5(A)(2) for 8 AWG and larger. The overall length of the cable shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is listed as suitable for the purpose. Other cable types and assemblies listed as being suitable for the purpose, including optional hybrid communications, signal, and composite optical fiber cables, shall be permitted.</p>
625.18	<p>Interlock Electric vehicle supply equipment shall be provided with an interlock that de-energizes the electric vehicle connector and its cable whenever the electrical connector is uncoupled from the electric vehicle. An interlock shall not be required for portable cord-and-plug-connected electric vehicle supply equipment intended for connection to receptacle outlets rated at 125 volts, single phase, 15 and 20 amperes.</p>
625.19	<p>Automatic De-Energization of Cable The electric vehicle supply equipment or the cable-connector combination of the equipment shall be provided with an automatic means to de-energize the cable conductors and electric vehicle connector upon exposure to strain that could result in either cable rupture or separation of the cable from the electric connector and exposure of live parts. Automatic means to de-energize the cable conductors and electric vehicle connector shall not be required for portable cord-and-plug-connected electric vehicle supply equipment intended for connection to receptacle outlets rated at 125 volts, single phase, 15 and 20 amperes.</p>
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625.21	<p>Overcurrent Protection</p> <p>Overcurrent protection for feeders and branch circuits supplying electric vehicle supply equipment shall be sized for continuous duty and shall have a rating of not less than 125 percent of the maximum load of the electric vehicle supply equipment. Where noncontinuous loads are supplied from the same feeder or branch circuit, the overcurrent device shall have a rating of not less than the sum of the noncontinuous loads plus 125 percent of the continuous loads.</p>
625.22	<p>Personnel Protection System</p> <p>The electric vehicle supply equipment shall have a listed system of protection against electric shock of personnel. The personnel protection system shall be composed of listed personnel protection devices and constructional features. Where cord-and-plug-connected electric vehicle supply equipment is used, the interrupting device of a listed personnel protection system shall be provided and shall be an integral part of the attachment plug or shall be located in the power supply cable not more than 300 mm (12 in.) from the attachment plug.</p>
625.23	<p>Disconnecting Means</p> <p>For electric vehicle supply equipment rated more than 60 amperes or more than 150 volts to ground, the disconnecting means shall be provided and installed in a readily accessible location. The disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</p>
625.25	<p>Loss of Primary Source</p> <p>Means shall be provided such that, upon loss of voltage from the utility or other electrical system(s), energy cannot be back fed through the electric vehicle and the supply equipment to the premises wiring system unless permitted by 625.26.</p>

625.26	<p>Interactive Systems Electric vehicle supply equipment and other parts of a system, either on-board or off-board the vehicle, that are identified for and intended to be interconnected to a vehicle and also serve as an optional standby system or an electric power production source or provide for bi-directional power feed shall be listed as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply, and when used as an electric power production source, the requirements of Article 705 shall apply.</p>
625.28	<p>Hazardous (Classified) Locations Where electric vehicle supply equipment or wiring is installed in a hazardous (classified) location, the requirements of Articles 500 through 516 shall apply.</p>
625.29	<p>Indoor Sites Indoor sites shall include, but not be limited to, integral, attached, and detached residential garages; enclosed and underground parking structures; repair and nonrepair commercial garages; and agricultural buildings.</p> <p>(A) Location. The electric vehicle supply equipment shall be located to permit direct connection to the electric vehicle. (B) Height. Unless specifically listed for the purpose and location, the coupling means of the electric vehicle supply equipment shall be stored or located at a height of not less than 450 mm (18 in.) and not more than 1.2 m (4 ft) above the floor level. (C) Ventilation Not Required. Where electric vehicle nonvented storage batteries are used or where the electric vehicle supply equipment is listed or labeled as suitable for charging electric vehicles indoors without ventilation and marked in accordance with 625.15(B), mechanical ventilation shall not be required. (D) Ventilation Required. Where the electric vehicle supply equipment is listed or labeled as suitable for charging electric vehicles that require ventilation for indoor charging, and is marked in accordance with 625.15(C), mechanical ventilation, such as a fan, shall be provided. The ventilation shall include both supply and exhaust equipment and shall be permanently installed and located to intake from, and vent directly to, the outdoors. Positive pressure ventilation systems shall be permitted only in buildings or areas that have been specifically designed and approved for that application. Mechanical ventilation requirements shall be determined by one of the methods specified in 625.29(D)(1) through (D)(4). (1) Table Values. For supply voltages and currents specified in Table 625.29(D)(1) or Table 625.29(D)(2), the minimum ventilation requirements shall be as specified in Table 625.29(D)(1) or Table 625.29(D)(2) for each of the total number of electric vehicles that can be charged at one time. (2) Other Values. For supply voltages and currents other than specified in Table 625.29(D)(1) or Table 625.29(D)(2), the minimum ventilation requirements shall be calculated by means of general formulas stated in article 625.39(D)(2). (3) Engineered Systems. For an electric vehicle supply equipment ventilation system designed by a person qualified to perform such calculations as an integral part of a building's total ventilation system, the minimum ventilation requirements shall be permitted to be determined in accordance with calculations specified in the engineering study. (4) Supply Circuits. The supply circuit to the mechanical ventilation equipment shall be electrically interlocked with the electric vehicle supply equipment and shall remain energized during the entire electric vehicle charging cycle. Electric vehicle supply equipment shall be marked in accordance with 625.15. Electric vehicle supply equipment receptacles rated at 125 volts, single phase, 15 and 20 amperes shall be marked in accordance with 625.15(C) and shall be switched, and the mechanical ventilation system shall be electrically interlocked through the switch supply power to the receptacle.</p>
625.30	<p>Outdoor Sites Outdoor sites shall include but not be limited to residential carports and driveways, curbside, open parking structures, parking lots, and commercial charging facilities. (A) Location. The electric vehicle supply equipment shall be located to permit direct connection to the electric vehicle. (B) Height. Unless specifically listed for the purpose and location, the coupling means of electric vehicle supply.</p>

DEPARTMENT OF RESOURCE MANAGEMENT



SOLANO COUNTY

Level 2 Electric Vehicle Charger Service Load Calculator (Form ELC-001)

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 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	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			
	Kitchen circuits	3,000 watts	
	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			
	Laundry circuit	1,500 watts	
	Electric clothes dryer	4,500 watts	
HEATING AND AIR CONDITIONING CIRCUITS			
	Central heating and air conditioning	6,000 watts	
	Window mounted air conditioning	1,000 watts	
	Whole-house or attic fan	500 watts	
	Central electric furnace	8,000 watts	
	Evaporative cooler	500 watts	
OTHER ELECTRICAL			
	Electric water heater (storage type)	4,000 watts	
	Electric tankless water heater	15,000 watts	
	Swimming pool or spa	3,500 watts	
	Other (describe)		
	Other (describe)		
	Other (describe)		
ELECTRIC VEHICLE			
	Level 2 electric vehicle charger wattage rating		
		TOTAL 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 charger.

The table below is based on CEC 220.83(A), 230.42 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 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	

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

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 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.