

## **ELECTRIC VEHICLE SERVICE EQUIPMENT (EVSE) IN SINGLE FAMILY DWELLINGS (SFD)**

### **Purpose**

This handout summarizes the requirements for a permit application and inspections for the installation of EVSE in single family dwellings. The following guideline shall be reviewed before commencing any work.

It is not the intent of this document, nor should it be part of the permitting process to be concerned with the design or practicality of any EVSE system. EVSE products, charger location, charging capacity, charging times, and overall feasibility vary with the home, the vehicle, and the consumer's needs. These matters are best determined by designers and vehicle manufacturers. Applicants interested in design issues may also refer to the recommendations contained in the most current version of "Plug-in Electric Vehicle Infrastructure Permitting Checklist" published by the California Office of Planning and Research.

([https://opr.ca.gov/docs/ZEV\\_Guidebook.pdf#page=113](https://opr.ca.gov/docs/ZEV_Guidebook.pdf#page=113))

### **Definitions and Acronyms**

EVSE = Electric Vehicle Supply Equipment. This is the equipment that is installed between a source of electricity and the electric vehicle connection.

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

Hybrid = A vehicle that runs on a combination of electricity and another source of fuel.

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

Level-1 Charging = (120 VAC, 15Amp or 20Amp).

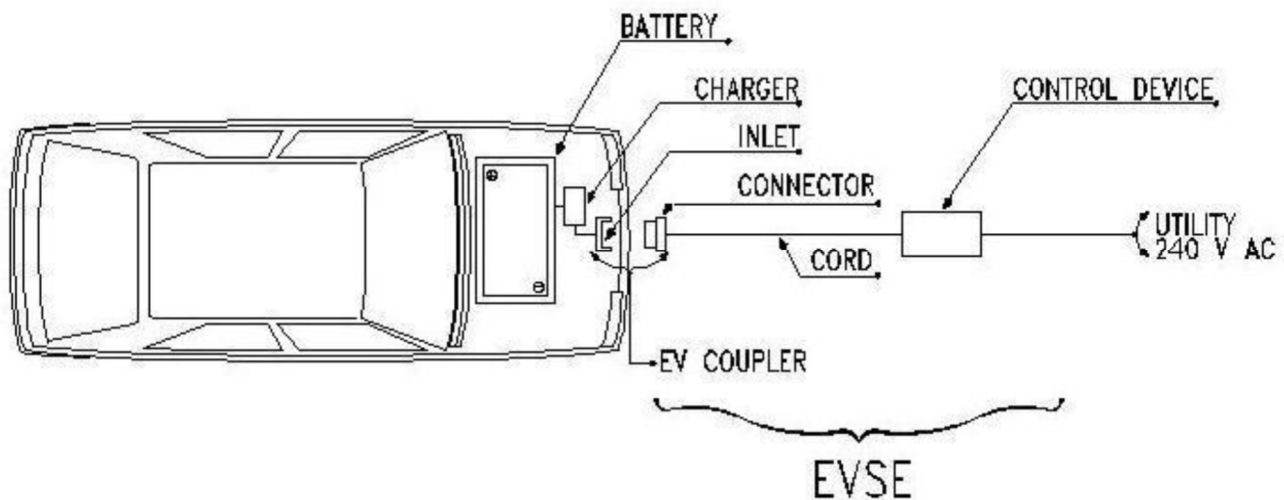
Level-2 Charging = (240 VAC, 30 - 100Amp).

Level-3 Charging = Fast DC Charging. Many vehicles have the capability to be connected to a DC Fast Charger, however these chargers are not practical for residential use due to the high electrical demand.

Hard-Wired or Permanently Wired = EVSE that is directly wired into the home's electrical wiring.

Cord and Plug Connected = The EVSE is plugged into an outlet that is either existing or installed for the purpose.

## Typical EV Charging System



The chargers for Level 1 and 2 systems are actually located on-board the vehicle. The Electric Vehicle Supply Equipment (EVSE) is the interface device between the vehicle charging system and the household power. EVSE consists of the connector, cord, control device, and interface to the household power. The connector at the vehicle is typically a standard SAE J1772 coupler (with adapters available for those vehicles using a different style connector). At the other end, the device may be directly hard-wired to the home or it may be connected via a cord and plug.

Level-1 systems operate on a standard 120 volt wall outlet. This outlet may be existing on the premises, but consideration needs to be given to the minimum amperage requirements of the EVSE and what other electrical loads are on the circuit. It is recommended that a circuit dedicated solely to the EVSE be used. The installation of a new outlet for this purpose would require a permit and inspection. Load calculations should be performed to determine adequacy of the electric service, however for a Level-1 system the additional load on most residential electrical services is likely negligible. Plug-in Hybrid Vehicles (that use both gas and electric), and those people not concerned about long charging times, may be served adequately by Level-1 EVSE.

Level 2 systems are commonly desired because of the lesser time needed to charge the vehicle. They can range from a 30-amp system all the way up to 100-amps. Thus the size of the system, and the home's capacity to support it, are critical to code compliance. Level-2 systems and circuits will always require a permit and inspection. In some cases the

home's electric service may need to be upgraded. Load calculations on the home are the only way to determine if the existing electrical service has the capacity for a Level-2 charger. There are devices available that remove an existing load from the dwelling in order to facilitate the load of the charger. These devices do not allow both loads (such as an electric dryer) to operate simultaneously; therefore, the larger of the two loads can be used in the calculations. Such devices should be UL listed to applicable product safety standards.

### **Minimum Plan Requirements**

Unless an existing circuit is determined to be adequate for a Level-1 EVSE device, an electrical permit is required for an EVSE system or for the installation of a circuit/outlet for a cord and plug connected unit.

The following information is required for a permit:

1. Owner should work with a contractor or EVSE professional to determine the vehicle's specific needs and vehicle owner's expectations. Referencing the vehicle's owner's manual may provide valuable information on charging. Once the details have been determined then the permit process may proceed.
2. Identify the make and model of the proposed EVSE system. The system must be listed by an approved nationally recognized testing laboratory in accordance with UL 2202, "Standard for Electric Vehicle (EV) Charging System Equipment".

3. Identify the EVSE location on the permit application. EVSE shall be installed in accordance with manufacturer's installation instructions and be suitable for the environment (indoor/outdoor). Note: for projects where the EVSE equipment is installed on a shared wall (separating the Garage and the main residence), Verify in field EV charger installed on fire rated wall meets penetration protection requirements of R302.11 Item 4, per guidelines on R302.5.
4. Identify if the system is Level-1 or Level-2.
5. Provide the required circuit ampacity identified on the EVSE documentation. Identify the amperage rating of the circuit on the permit application. Use this rating for the load calculations.
6. Provide existing electrical service panel information and load calculations for the residence. Include EVSE load and circuit size to determine if an electrical service panel upgrade is required.
7. Contact the local utility company and advise them of the additional loads on the electric service. Identify if a second electric meter is required to be installed because of electric utility rate for EV charging.
8. Manufacturer installation instructions must be available for the inspector at the site.
9. Electrical wiring and installation shall be in conformance with the current edition of the California Electrical Code, including Article 625.

## Inspections

A Final inspection must be scheduled after the EVCS equipment and electrical work is completed.

## Questions

Contact the **Building & Safety Division** at **(925) 833-6620** for inquiries on plan check and building fees. Project information such as valuation cost, square footage areas, and type of construction are necessary to provide estimates on fees.

## Codes and References

2022 California Electrical Code  
 2022 California Green Building Standards Code  
 UL 2202 listed EV charging system  
 Zero-Emission Vehicles in California: Community Readiness Guidebook  
[https://opr.ca.gov/docs/ZEV\\_Guidebook.pdf#page=113](https://opr.ca.gov/docs/ZEV_Guidebook.pdf#page=113)

## Typical EVSE Location

