

Example Building Codes for Plug-In Electric Vehicle Charging

Snapshot: Local governments can use building codes to advance plug-in electric vehicle adoption in a way that ensures safe, cost-effective installation of charging equipment. For example, by adopting more stringent building codes that require PEV ready wiring in new construction, local governments can help meet future demand for charging and reduce or eliminate the costs associated with future retrofitting. Building code template language, excerpts from CALGreen and local government examples are provided. The model building code is adapted from City of Lancaster's Municipal Code.

Model Building Code for Plug-In Electric Vehicle Charging:

New residential development shall provide for electric vehicle charging stations (EVCSs) in the following prescribed manner.

1. Garages serving each new single-family residence and each unit of a duplex shall be constructed with a listed cabinet, box or enclosure connected to a raceway linking the garage to the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide an EVCS for use by the resident.
2. In new multiple-family projects of 10 dwelling units or less, 20% of the total parking spaces required (all of the 20% shall be located within the required covered parking) shall be provided with a listed cabinet, box or enclosure connected to a conduit linking the covered parking spaces or garages with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide EVCSs at such time as it is needed for use by residents. EVCSs shall be provided in disabled parking spaces in accordance with state and federal requirements.
3. In new multiple-family projects of more than 10 dwelling units, 10% of the total parking spaces required (all of the 10% shall be located within the required covered parking) shall be provided with a listed cabinet, box or enclosure connected to a conduit linking the covered parking spaces or garages with the electrical service, in a manner approved by the building and safety official. Of the total listed cabinets, boxes or enclosures provided, 50% shall have the necessary electric vehicle supply equipment installed to provide active EVCSs ready for use by residents. The remainder shall be installed at such time as they are needed for use by residents. EVCSs shall be provided in disabled parking spaces in accordance with state requirements.

New commercial development shall provide for electric vehicle charging stations in the following prescribed manner.

1. New residential uses shall provide EVCSs in accordance with the New Residential Development section.

2. New commercial, industrial and other uses with the building or land area, capacity or numbers of employees listed herein shall provide the electrical service capacity necessary and all conduits and related equipment necessary to ultimately serve 2% of the total parking spaces with EVCSs in a manner approved by the building and safety official. Of these parking spaces, 1/2 shall initially be provided with the equipment necessary to function as online EVCSs upon completion of the project. The remainder shall be installed at such time as they are needed for use by customers, employees or other users. EVCSs shall be provided in disabled person parking spaces in accordance with state and federal requirements.

a. Construction of a hospital of 500 or more beds, or expansion of a hospital of that size by 20% or more.

b. Construction of a postsecondary school (college), public or private, for 3,000 or more students, or expansion of an existing facility having a capacity of 3,000 or more students by an addition of at least 20%.

c. Hotels or motels with 500 or more rooms.

d. Industrial, manufacturing or processing plants or industrial parks that employ more than 1,000 persons, occupy more than 40 acres of land or contain more than 650,000 square feet of gross floor area.

e. Office buildings or office parks that employ more than 1,000 persons or contain more than 250,000 square feet of gross floor area.

f. Shopping centers or trade centers that employ 1,000 or more persons or contain 500,000 square feet of gross floor area.

g. Sports, entertainment or recreation facilities that accommodate at least 4,000 persons per performance or that contain 1,500 or more fixed seats.

h. Transit projects (including but not limited to transit stations and park and ride lots).

CALGreen

For one- and two-family dwellings, the CALGreen code offers a voluntary standard that, if adopted, calls for installation of a raceway to accommodate a dedicated branch circuit. For multifamily residential dwellings of three stories or less, CALGreen also provides an option to establish a minimum number of parking spaces to be capable of supporting PEV charging. The CALGreen code language is excerpted (California Building Standards Commission July 1, 2012 Supplement):

A4.106.6.1 One- and two-family dwellings. Install a listed raceway to accommodate a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the

main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure. Raceways are required to be continuous at enclosed or concealed areas and spaces. A raceway may terminate in an attic or other approved location when it can be demonstrated that the area is accessible and no removal of materials is necessary to complete the final installation.

A4.106.6.2 Multifamily dwellings. At least 3 percent of the total parking spaces, but not less than one, shall be capable of supporting future EVSE.

A4.106.6.2.1 Single charging space required. When only a single charging space is required, install a listed raceway capable of accommodating a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure.

A4.106.6.2.2 Multiple charging spaces required. When multiple charging spaces are required, plans shall include the location(s) and type of the EVSE, raceway method(s), wiring schematics and electrical calculations to verify that the electrical system has sufficient capacity to charge simultaneously all the electrical vehicles at all designated EV charging spaces at their full rated amperage. Plan design shall be based upon Level 2 EVSE at its maximum operating ampacity. Only underground raceways and related underground equipment are required to be installed at the time of construction.

CALGreen also offers municipalities a voluntary standard for PEV charging at commercial, retail and other nonresidential locations, as excerpted (California Building Standards Commission 2012 Supplement):

A5.106.5.3 Electric vehicle charging. Provide facilities meeting Section 406.7 (Electric Vehicle) of the California Building Code and as follows:

A5.106.5.3.1 Electric vehicle supply wiring. For each space required by Table A5.106.5.3, provide panel capacity and dedicated conduit for one 208/240V 40-amp circuit terminating within 5 feet of the midline of each parking space.

Table A5.106.5.3.1:

TOTAL NUMBER OF PARKING SPACES*	NUMBER OF REQUIRED SPACES
1–50	1
51–200	2
201 and over	4

Local Government Examples

Beverly Hills

Provide facilities meeting section 406.7 (Electric Vehicle) of the California building code and as follows: One 120 VAC 20 amp and one 208/240V 40 amp, grounded AC outlets or panel capacity for one 120 VAC 20 amp and one 208/240V 40 amp, grounded AC outlet and conduit installed for future outlets for each dwelling unit. Electric vehicle supply equipment shall be provided and may be installed in a stall provided to comply with the code minimum parking requirements. Dwelling unit shall be defined by the California building code. Exception: Apartment buildings and apartment units (Beverly Hills Municipal Code 2011).

City of Los Angeles

1. For one- or two-family dwellings and townhouses, provide a minimum of:
 - a. One 208/240 V 40-amp, grounded AC outlet, for each dwelling unit; or
 - b. Panel capacity and conduit for the future installation of a 208/240 V 40-amp, grounded AC outlet, for each dwelling unit. The electrical outlet or conduit termination shall be located adjacent to the parking area.
2. For other residential occupancies where there is a common parking area, provide one of the following:
 - a. A minimum number of 208/240 V 40-amp, grounded AC outlets equal to 5 percent of the total number of parking spaces. The outlets shall be located within the parking area; or
 - b. Panel capacity and conduit for future installation of electrical outlets. The panel capacity and conduit size shall be designed to accommodate the future installation, and allow the simultaneous charging, of a minimum number of 208/240 V 40-amp, grounded AC outlets, that is equal to 5 percent of the total number of parking spaces. The conduit shall terminate within the parking area; or
 - c. Additional service capacity, space for future meters, and conduit for future installation of electrical outlets. The service capacity and conduit size shall be designed to accommodate the future installation, and allow the simultaneous charging, of a minimum number of 208/240 V 40-amp, grounded AC outlets, that is equal to 5 percent of the total number of parking spaces. The

conduit shall terminate within the parking area. When the application of the 5 percent results in a fractional space, round up to the next whole number. (Los Angeles Municipal Code 2010)

Rolling Hills Estates

Any new residential construction, including an addition to a residential structure of greater than 50 percent of the existing floor area, including the primary garage, and/or any demolition of greater than 50 percent of the lineal walls of a residential structure within a twelve-month period, shall require the installation of a 220-volt dedicated electrical outlet in the garage for the purposes of charging an electric vehicle. (Rolling Hills Estates Municipal Code)

Temecula

Circuits for electric vehicle charging stations shall meet all the requirements of California Electrical Code Article 625.40. Residential garages shall have a minimum three-quarter (3/4) inch metal flex conduit run from meter box to the garage firewall and terminated in a metal box at forty-two (42) inches above finished floor for future electric vehicle charging station. (Temecula Municipal Code)