CE217-19 Part II

IECC: R202 (IRC N1101.6), R404.2 (IRC N1104.2) (New), R404.2.1 (IRC N1104.2.1) (New), R404.2.2 (IRC N1104.2.2) (New), Table R404.2.2 (IRC N1104.2.2) (New), R404.2.3 (IRC N1104.2.3) (New)

Proponents:

Matt Frommer, Southwest Energy Efficiency Project, representing Southwest Energy Efficiency Project (mfrommer@swenergy.org); Eric Makela, New Buildings Institute, representing New Buildings Institute (ericM@newbuildings.org); jim edelson, representing New Buildings Institute (jim@newbuildings.org); Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org)

SECTION R202 (IRC N1101.6) GENERAL DEFINITIONS

Add new definition as follows:

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the Electric Vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the Electric Vehicle.

EV CAPABLE SPACE.

Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the *EVSE*.

EV READY SPACE.

A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for *EVSE*servicing Electric Vehicles. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an *EVSE*, and be located in close proximity to the proposed location of the EV parking spaces.

Add new text as follows:

R404.2 (IRC N1104.2) Electric Vehicle (EV) charging for new construction.

New construction shall facilitate future installation and use of *Electric Vehicle Supply Equipment (EVSE)*in accordance with the *National Electrical Code (NFPA 70).*

R404.2.1 (IRC N1104.2.1) One- to two-family dwellings and townhouses.

For each dwelling unit, provide at least one *EV Ready Space*. The branch circuit shall be identified as “EV Ready” in the service panel or subpanel directory, and the termination location shall be marked as “EV Ready”.

Exception:*EV Ready Spaces*are not required where no parking spaces are provided.

R404.2.2 (IRC N1104.2.2) Multifamily dwellings (three or more units).

*EV Ready Spaces*and *EV Capable Spaces*shall be provided in accordance with Table R404.2.2. Where the calculation of percent served results in a fractional parking space, it shall round up to the next whole number. The service panel or subpanel circuit directory shall identify the spaces reserved to support EV charging as “EV Capable” or “EV Ready”. The raceway location shall be permanently and visibly marked as “EV Capable”.

Table R404.2.2 (IRC N1104.2.2)
***EV Ready Space*and *EV Capable Space*requirements.**

Total Number of Parking Spaces	**Minimum number of *EV Ready Spaces***	**Minimum number of *EV Capable Spaces***
1	1	-
2 – 10	2	-
11 – 15	2	3
16 – 19	2	4
21 - 25	2	5
26+	2	20% of total parking spaces

R404.2.3 (IRC N1104.2.3) Identification.

Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future *EVSE*, raceway methods, wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the *EVSE*.

Reason:

In the United States, electric vehicle (EV) sales increased by 80 percent from 2017 to 2018 (1). According to a November 2018 forecast from the Edison Electric Institute, the number of EVs on U.S. roads is projected to grow from 1 million vehicles at the end of 2018, to 18.7 million by 2030. To recharge these new EVs, the U.S. will need 9.6 million charge ports, a substantial portion of which will be installed in workplace and commercial buildings (2).

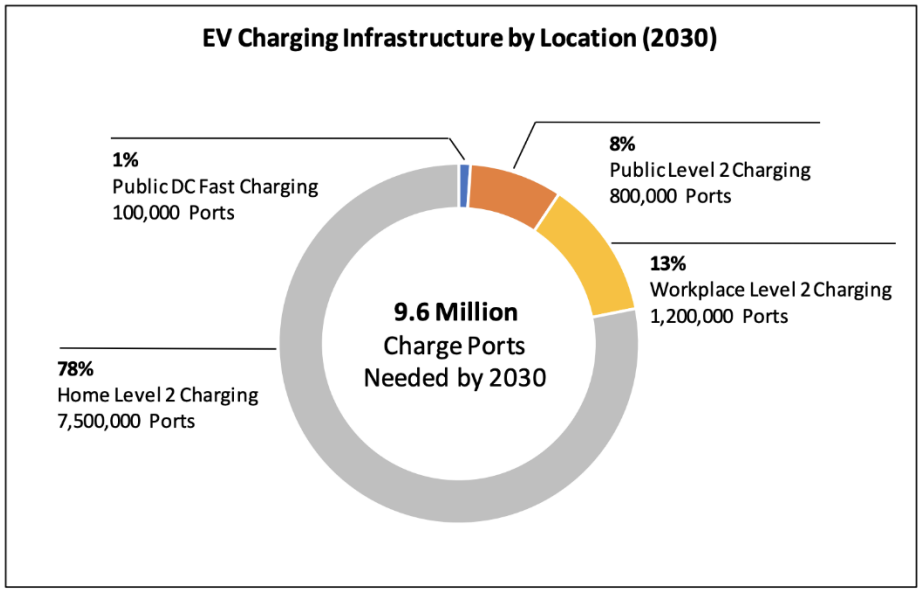


Figure 1. EV Charging Infrastructure in 2030 Based on EEI/IEI Forecast.

EVs provide significant economic benefits for consumers through fuel and maintenance cost savings, and have been identified as a key climate strategy to reduce GHG emissions from the U.S. transportation sector. The interest in EVs has grown alongside greater EV model availability and increased vehicle range. Every major auto manufacturer in the world has announced a plan to electrify a significant portion of their vehicle fleets over the next 3-5 years. Ford recently announced an $11 billion investment to reach their goal of 40 EV models by 2022 (3). The goal for GM: 20 EV models by 2023 (4); for VW: 27 EV models by 2022 (5); for Toyota: 10 BEVs by the early 2020's (6); and similar goals for Volvo, Daimler, Nissan, BMW, and Fiat-Chrysler.

However, the lack of access to EV charging stations continues to be a critical barrier to EV adoption. In particular, there are significant logistical barriers for commercial building tenants to upgrade existing electrical infrastructure and install new EV charging stations.

A lack of pre-existing EV charging infrastructure, such as electrical panel capacity, raceways, and pre-wiring, can make the installation of a new charging station cost-prohibitive for a potential EV-owner. The installation of an EV charging station is made three to four times less expensive when the infrastructure is installed during the initial construction phase as opposed to retrofitting existing buildings to accommodate the new electrical equipment.

New commercial buildings are constructed to last for decades, and so it is critical that EV charging infrastructure is incorporated at the pre-construction stage to ensure that new buildings can accommodate the charging needs of future EV-owners.

Bibliography:

1. "Monthly Plug-In EV Sales Scorecard." Inside EVs: Monthly U.S. Plug-in EV Sales Report Card. Accessed January 2019. https://insideevs.com/monthly-plug-in-sales-scorecard/.
2. Edison Electric Institute. *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030.* Report. November 2018. Accessed January 2019. http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI EV Forecast Report_Nov2018.pdf.

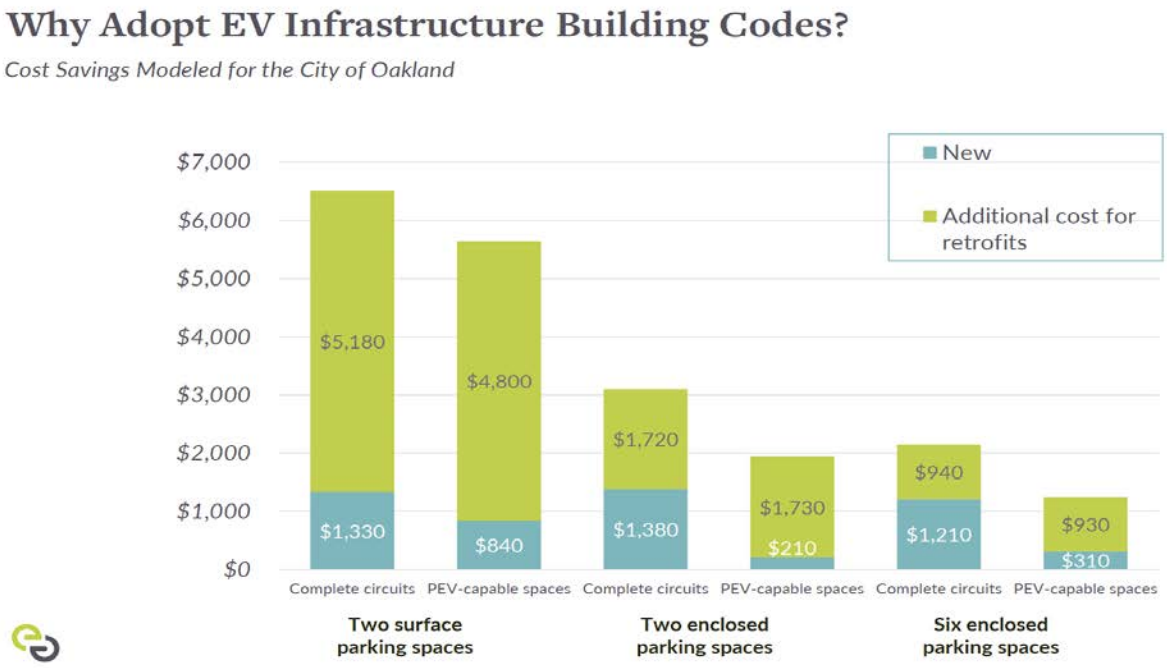
3. Carey, Nick. "Ford Plans $11 Billion Investment, 40 Electrified Vehicles by 2022." Reuters. January 16, 2018. Accessed January 2019. https://www.reuters.com/article/us-autoshow-detroit-ford-motor/ford-plans-11-billion-investment-40-electrified-vehicles-by-2022-idUSKBN1F30YZ.
4. "GM Just Upped the Ante On Its Electric Car Plans." Fortune. Accessed January 2019. http://fortune.com/2017/10/02/gm-20-all-electric-vehicles-2023/.
5. Evarts, Eric C. "VW Plans 27 Electric Cars by 2022 on New Platform." Green Car Reports. September 19, 2018. Accessed January 2019. https://www.greencarreports.com/news/1118857_vw-plans-27-electric-cars-by-2022-on-new-platform.
6. Kageyama, Yuri. "Toyota Planning 10 Purely Electric Vehicles by 2020s." USA Today. December 18, 2017. Accessed January 2019. https://www.usatoday.com/story/money/cars/2017/12/18/toyota-planning-10-purely-electric-vehicles-2020-s/960486001/.
7. Pike, Ed. *EV Infrastructure Building Codes.*Report. June 2018. Accessed January 2019. http://roadmapforth.org/program/presentations18/EdPike.pdf.
8. *ELECTRIC VEHICLE (EV) CHARGING INFRASTRUCTURE: MULTIFAMILY BUILDING STANDARDS.* Report. April 2018. Accessed January 2019. https://arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf.
9. "NFPA 70®." NFPA Reports - Fires in the United States. Accessed January 2019. https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70.

Cost Impact:

The code change proposal will increase the cost of construction

The code change proposal will increase the cost of initial construction, but provide long-term savings for EV owners through the avoided retrofit costs of installing EV charging infrastructure.

The chart below compares the cost of installing the necessary electrical infrastructure to support EV-Ready spaces (complete circuit) and an EV-Capable spaces (PEV-capable) at the time of new construction versus a building retrofit. In one example, the cost to retrofit an existing building with two EV-Capable spaces is $5,640, and $4,800 or 85 percent of that cost would be avoided if EV-Capable infrastructure was included during the initial construction of the parking lot. These additional retrofit costs typically include labor expenses for demolition, treching and boring, balancing the circuits, and new permitting costs.



In April, 2018, the California Air Resources Board published a cost analysis for a proposed code change to increase the required percentage of EV-Capable spaces. (8)

"Avoided Retrofit Costs: Significant retrofit costs can be avoided by installing EV charging infrastructure in new construction. CARB staff reviewed multiple sources to obtain average retrofit costs of installing infrastructure to support Level 2 charging stations in existing buildings. An estimated $7,000 per parking space can be avoided with multiple installations of Level 2 charging stations. An estimated $8,000 per parking space can be avoided when an individual Level 2 charging station is installed. These retrofit costs do not include the cost of the electrical vehicle supply equipment (EVSE). Retrofit costs are focused on parking lot trenching, adding electrical service and/or panel upgrades. The 10 percent requirement would result in the installation of an additional 38,000 to 47,000 parking spaces with EV charging infrastructure beyond the current 3 percent requirement. If the proposed 10% requirement is not adopted, CARB staff assumed that every one of these parking spaces would need the basic EV charging infrastructure (raceway and panel capacity) to become EV Capable and support future installation of Level 2 charging stations. CARB staff estimates that the avoided retrofit costs range from $272 million to $386 million between 2020 and 2025."
