

ARTICLE 625, NEC



ELECTRIC VEHICLE CHARGING SYSTEMS



NEC ARTICLE 90.2(B)

90.2(B) Not Covered. This Code does not cover:

Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

ARTICLE 625

ELECTRIC VEHICLE CHARGING SYSTEMS



HISTORY OF ARTICLE 625 ELECTRIC VEHICLE CHARGING SYSTEMS

Article 625 was entered into the NEC in 1996, covers the charging equipment external to the vehicle. It covers anything installed with either feeders or branch circuits to charge the vehicle

625.1 Scope. The provisions of this article cover the electrical conductors and equipment external to an electric vehicle that connect an electric vehicle to a supply of electricity by conductive or inductive means, and the installation of equipment and devices related to electric vehicle charging.

ELECTRIC VEHICLE SUPPLY EQUIPMENT EVSE

LEVEL 1	Rated 110-120 volts-15 or 20 Amps
LEVEL 2	Rated 208 or 240 Volts-20-100 Amp
LEVEL 3	Rated 480 Volts-60-400 Amps

LEVEL ONE CHARGERS-LEVITON



LEVITON LEVEL ONE CHARGERS CHARACTERISTICS

- 1) 120 volt (1.5 kw) Primarily Residential Household Power**
- 2) Permitted to be cord and plug connected**
- 3) Charge Time-approximately 8-20 hours**

LEVEL TWO CAR CHARGERS COMMERCIAL

**GE WATT STATION
30 AMP/ 208 V**



**HUBBEL
30 AMP/208 V**



LEVEL TWO CAR CHARGERS CHARACTERISTICS

RESIDENTIAL

- 1) 240V Single Phase (6.5-24kW) 30-100A**
- 2) Fixed in Place-Mandatory**
- 3) Charge Time: 4-8 Hours**

COMMERCIAL

- 1) 208 V Three Phase (14kW) 30 Amps**
- Fixed in Place-Mandatory**
- Charge Time: 4-8 Hours**

TESLA S CHARGING SCALE

LEVEL 2



Breaker Rating (Amperage)		Miles of Range per Hour of Charge (w/ Twin Charge)
100	#3 AWG	62
90	#3 AWG	56
80	#4 AWG	50
70	#4 AWG	43
60	#6 AWG	37
50	#8 AWG	31
40	#8 AWG	25

Home Connector Charge Times	
Your home's breaker rating will determine your charge time.	
Your Home's Breaker Rating (Amps)	Approximate Charge Time (Hours)
90	4
80	4.2
70	4.7
60	5
50	6
40	7.5
30	10

LEVEL 3 CHARGERS

CHAdemo (CHARGE for Moving)



LEVEL THREE CAR CHARGERS

CHAdeMo (CHArge for Moving)

CHARACTERISTICS

1) 480 Volts/30-40 Amps

2) These chargers are rated to charge at 480 volts and 400 amps

3) 50-80% partial charge in a matter of 15-30 minutes or so.

Nissan mentions that constant Level 3 charging of the Leaf would lower the range while consistent Level 2 charging would maintain maximum capacity.

LEVEL THREE CAR CHARGERS

CHAdemo (CHARGE for Moving)



TESLA CHARGING STATIONS

The stations--faster than any other charging stations in existence, according to Tesla--can provide up to 100 kW (in the future, up to 120 kW) of power to EVs, juicing them up in 30 minutes with enough power to drive for three hours.

TESLA S

It's no five-minute trip to the gas station, but we are getting closer.

Tesla's superchargers offer power for free for all Tesla S.



CHAdE-Mo CHARGING STATIONS

Japan 1677 Europe 759 USA 160 Others 12



CHARGING IN 30 MINUTES

Supercharging past the halfway point slows down considerably. This is due to the battery technology. The more full the cells become, the slower the charging has to be, because charging is too fast, the cells become damaged.

ARTICLE 625

ELECTRIC VEHICLE CHARGING SYSTEMS

PART 1 GENERAL PRIMARILY DEFINITIONS

PART II WIRING METHODS COUPLERS

625.9 (A) **Polarization** Of Coupler

(B) **Noninterchangeability** Not Interchangeable with other
Electrical Systems

(C) **Construction and Installation** Prevent Inadvertent contact
By Persons

(D) **Unintentional Disconnection** Positive means of locking

(E) **Grounding Pole** Provided Only if Coupler Requires

(F) **Grounding Pole Requirements** If provided, shall be First to
Make, last to Break

CHARGING COUPLER

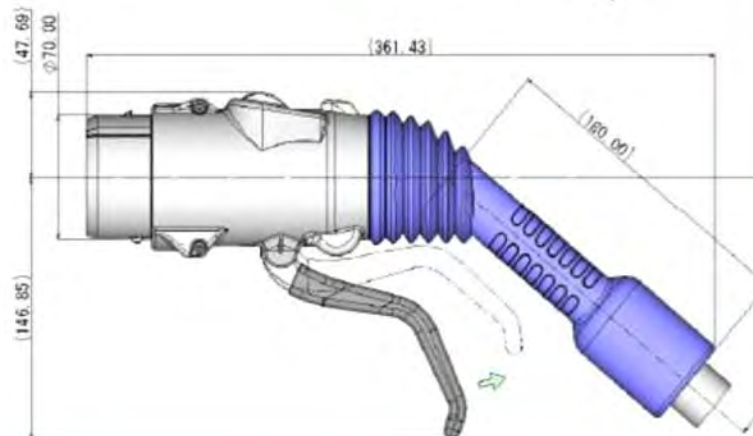
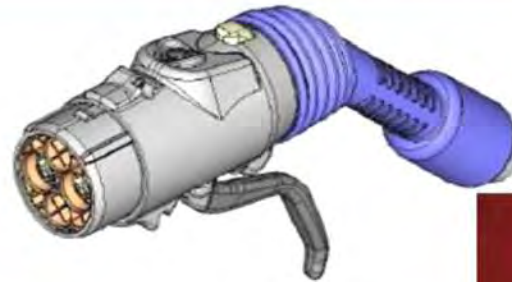


ARTICLE 625.9(A) PRIMARILY MANUFACTURER'S RESPONSIBILITY

Detail dimension of interface geometry is open to public, then any maker can fabricate compatible connector.

Power terminal
external diameter: 9 mm

Signal terminal
external diameter: 1.6 mm



ARTICLE 625

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PART III EQUIPMENT CONSTRUCTION

625.13 125V 15/20A EVSE Permitted to be cord and plug

625.15(A) Marking. “For Use with Electric Vehicles”

625.16 Means of Coupling. Coupling Listed and labeled for
the Purpose

625.18 Interlock. De-energize when uncoupled. Not required for
120v Single Phase Systems

625.19 Automatic De-Energization of Equipment De-energize
cable conductors & connector when
exposed to strain. Applies to portable 120v equipment.

DE-ENERGIZE CHARGER IF UNCOUPLED FROM VEHICLE



ARTICLE 625

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PART IV CONTROL AND PROTECTION

**625.21 Overcurrent Protection rated 125%. Considered
“Continuous Duty”**

**625.22 Personnel Protection System-EV supply equipment shall
have listed protection against personnel shock**

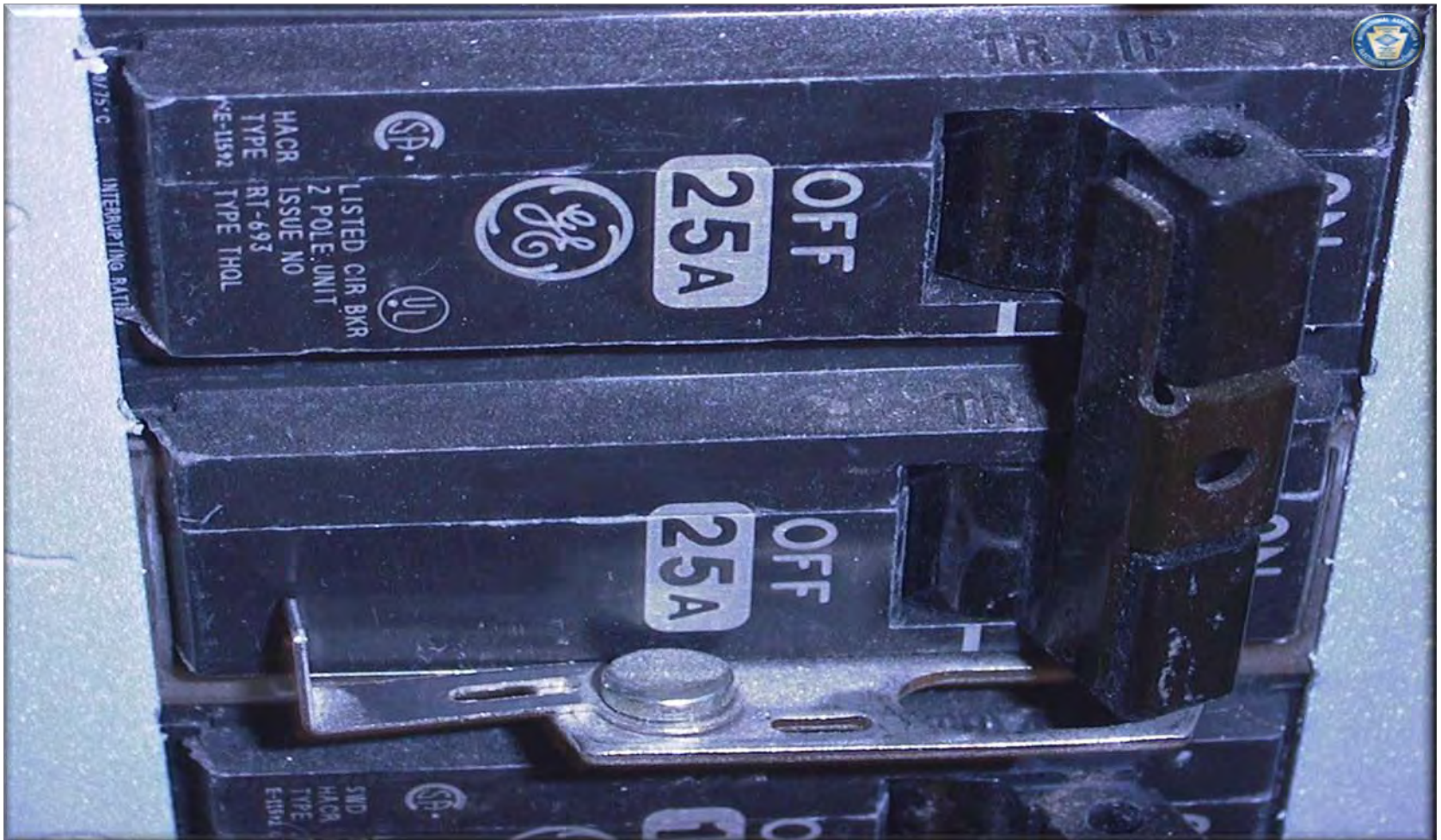
**625.23 >60 A/150 V Disconnect-Readily Accessible
Lockable in the Open Position-Permanent**

**625.25 Loss of Primary Source-No back feeding from
from Vehicle during Utility Outages**

**DISCONNECT READILY
ACCESSIBLE IF OVER 60 A or
more than 150 V to Ground**



“Circuit breaker used as the disconnecting means shall remain in place with or without the lock installed”



ARTICLE 625

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PART V ELECTRIC VEHICLE SUPPLY EQUIPMENT LOCATION

625.29 Indoor Sites. Integral, attached, detached garage enclosed, underground parking structures

- 625.29(A) Location.** Permit direct connection of vehicle
- (B) Height No lower than 18"-no higher than 4'
 - (C) Ventilation Not Required-Listed as non-vented storage batteries for indoor charging

18" Off Ground, No Higher than 4'



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PART V Continued.

(D) Mechanical Ventilation (fan) for indoor charging

625.30 Outdoor Sites. Residential Car Ports, driveways
curbside, parking structures, parking lots

(A) Location. EVSE located to permit
connection

(B) Height. Not less than 24” and not greater
4’

ARTICLE 100

DEFINITIONS

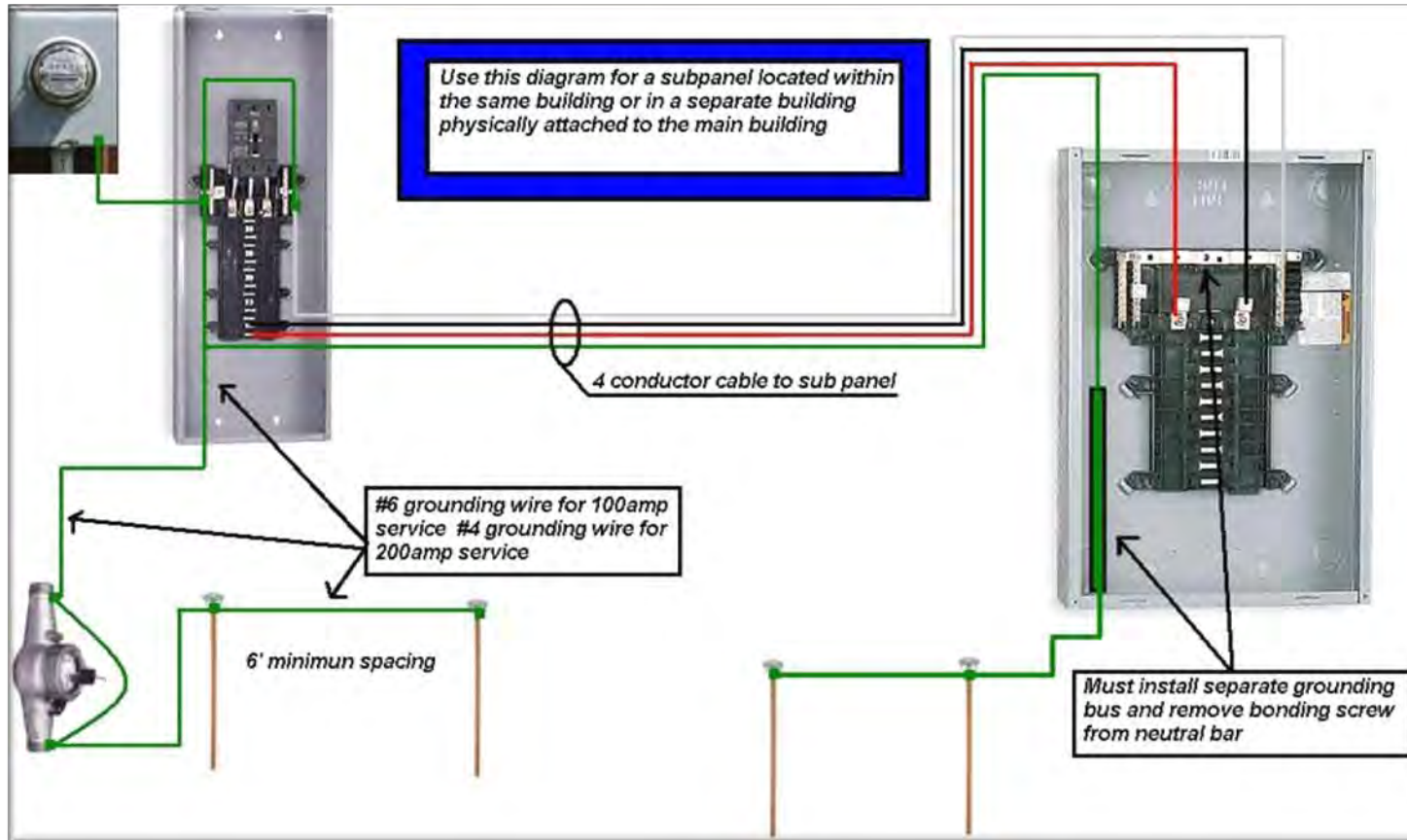
**DOES THE DEFINITION
OF A SEPARATE
STRUCTURE APPLY
TO FREE STANDING
CHARGERS
(COMMERCIAL) OR
CHARGERS
INSTALLED IN
DETACHED
GARAGES
(RESIDENTIAL)**

SEPARATE STRUCTURE

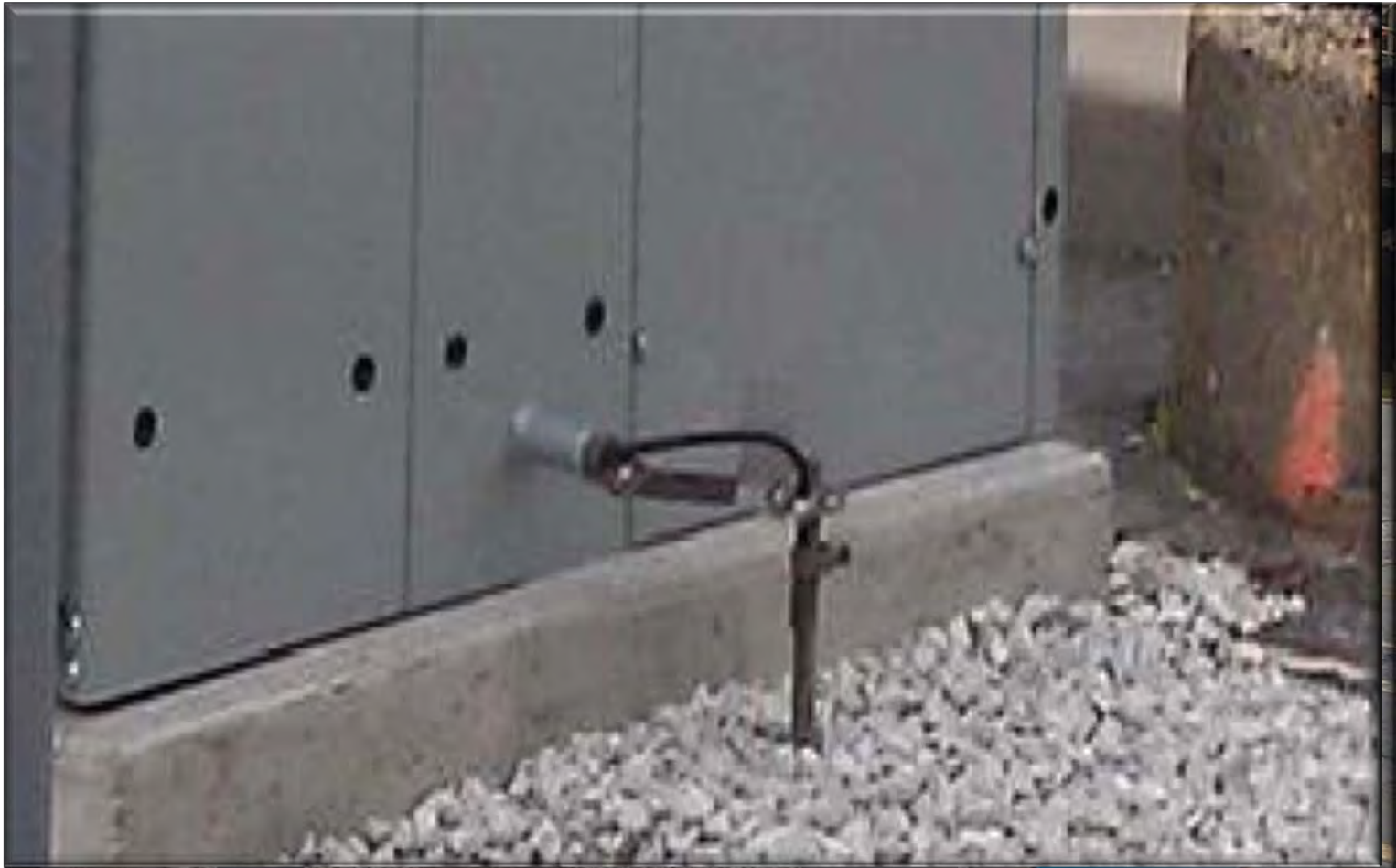
**“That which is built
or constructed.”**

ARTICLE 250.32

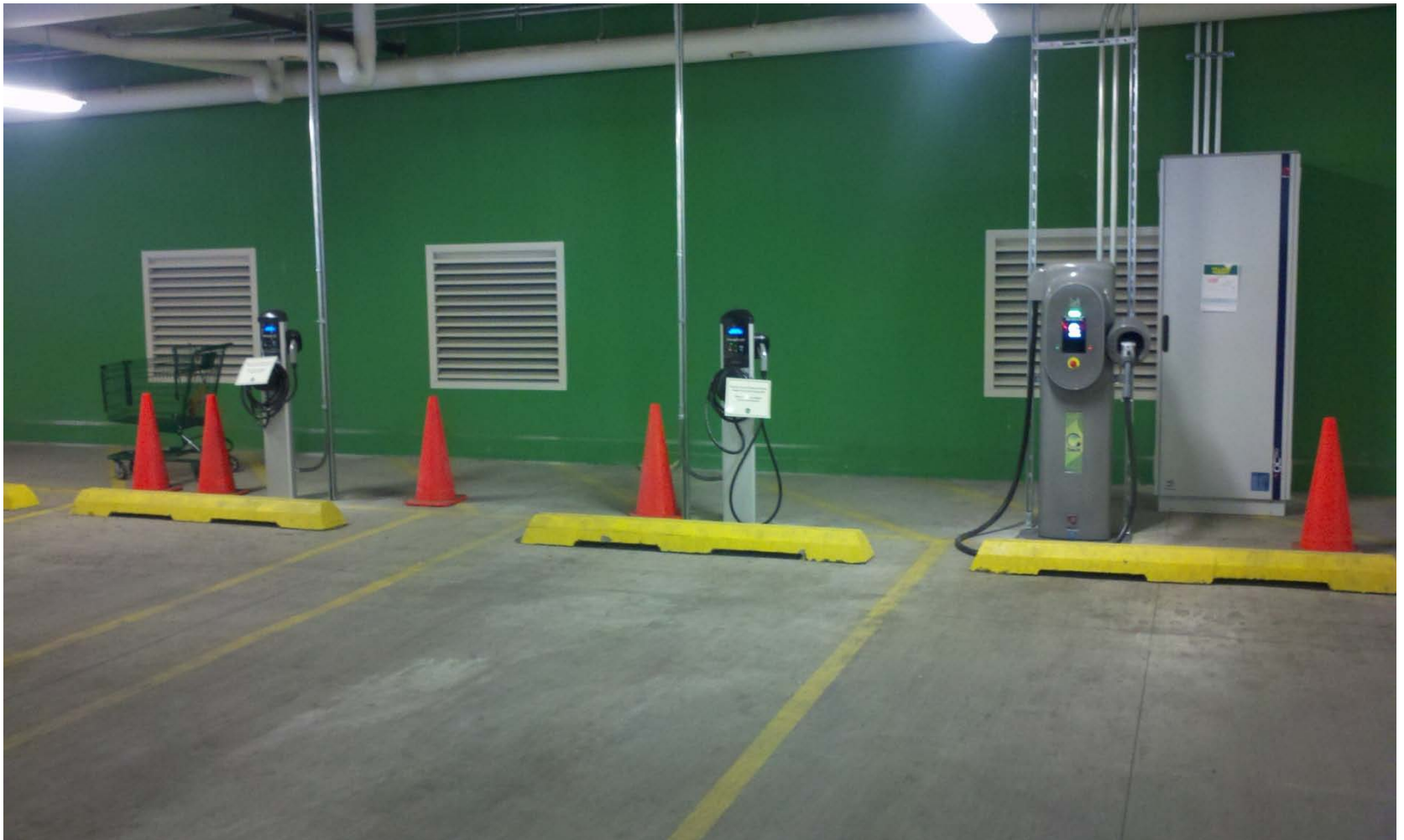
BUILDINGS OR STRUCTURES SUPPLIED BY A FEEDER(S) OR BRANCH CIRCUIT(S)



LEVEL 3 CHARGER WITH GROUND RODS-SEPARATE STRUCTURE



LEVEL THREE CHARGER OVER 60 Amps/150 v to Ground



SOLAR CAR PORTS

RESIDENTIAL



COMMERCIAL



BOLLARDS



NEW

FOR

2011 NEC

625.2 Definitions: Electric Vehicle



Electric Vehicle: An automotive-type vehicle for on-road use primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current

Plug-in hybrid electric vehicles (PHEV) are considered electric vehicles



The definition of an "Electric Vehicle" has been revised to include a "Plug-in Hybrid Electric Vehicle" (PHEV)



625.2 Definitions: PHEV



Plug-in Hybrid Electric Vehicle (PHEV): A type of electric vehicle intended for on-road use with the ability to store and use off-vehicle electrical energy in the rechargeable energy storage system, and having a second source of motive power



A new definition has been added to Article 625 for "Plug-in Hybrid Electric Vehicle" (PHEV)



625.2 Definitions: RESS

Rechargeable Energy Storage System: Any power source that has the capability to be charged and discharged

Informational Note: Batteries, capacitors, and electro mechanical flywheels are examples of rechargeable energy storage systems



A new definition has been added to Article 625 for "Rechargeable Energy Storage System"

END OF PRESENTATION