ARTICLE
625 Electric Vehicle Power Transfer System

Part I. General

The automotive industry has provided consumers with a large variety of electric vehicles (EVs) and combination electric–fossil fuel, or hybrid, vehicles that have overcome the "range anxiety" concerns associated with many of the early EVs. EV charging occurs in all occupancies, including residential, commercial, retail, and public sites. The National Institute of Standards and Technology (NIST) projects that many homes and businesses will soon have EV charging infrastructure included as a standard part of the premises wiring system. Legislation in several U.S. states requires new homes to be EV ready, meaning that infrastructure needs to be provided to support the installation of electric vehicle supply equipment (EVSE). Additionally, laws in some states require new public parking areas to be equipped with a certain number of spaces that have EVSE.

Article 625 covers installation safety requirements for charging equipment and for connecting the charging (supply) equipment to the EV through either a conductive, inductive, or wireless power transfer. In addition, ventilation requirements aimed at preventing an ignitible air-hydrogen mixture are included in the requirements. The fundamental purpose of the *NEC*® to minimize fire and shock hazards is conveyed through the Article 625 requirements covering the charger-vehicle interface and the environment that is created by the charging of some types of batteries.

Use of the EV as a power source for standby power or as an interconnected source is also covered in Article 625. This bidirectional connection is attractive to consumers who would otherwise be using an engine generator or other alternate source in the event of an interruption of the normal utility supply.

See also

90.2(C)(6) for the *NEC* scope statement on connecting electric vehicles to the premises wiring system

Δ **625.1 Scope.** This article covers the electrical conductors and equipment connecting an electric vehicle to premises wiring for the purposes of charging, power export, or bidirectional current flow.

Informational Note No. 1: See NFPA 505-2018, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, for information on fire protection of industrial trucks.

Informational Note No. 2: See UL 2594-2016, *Electric Vehicle Supply Equipment*, for information on conductive electric vehicle supply equipment.

Informational Note No. 3: See UL 2202-2009, *Electric Vehicle Charging System Equipment*, for information on conductive electric vehicle charging equipment.

Informational Note No. 4: See UL 2750-2020, *Outline of Investigation for Wireless Power Transfer Equipment for Electric Vehicles*, for information on wireless power transfer equipment for transferring power to an electric vehicle.

Informational Note No. 5: See NECA 413-2019, *Installing and Maintaining Electric Vehicle Supply Equipment (EVSE)*, for information on the procedures for installing and maintaining AC Level 1, AC Level 2, and fast-charging dc electric vehicle supply equipment (EVSE).

Article 625 covers all electrical wiring and equipment installed between the service point and the automotive-type EV. Automotive-type EVs are emphasized because they are much different from other commonly used electric vehicles, such as industrial forklifts, hoists, lifts, transports, golf carts, and airport personnel trams. The charging systems and other exterior electrical connections for these off-road vehicles are usually serviced and maintained by trained mechanics or technicians.

• **625.4 Voltages.** Unless other voltages are specified, the nominal ac system voltages of 120, 120/240, 208Y/120, 240, 480Y/277, 480, 600Y/347, 600, or 1000 volts or dc system input voltages of up to 1000 volts shall be used to supply equipment covered by this article. Output voltages to the electric vehicle are not specified.

625.6 Listed. Electric vehicle power transfer system equipment for the purposes of charging, power export, or bidirectional current flow shall be listed.

Part II. Equipment Construction

625.17 Cords and Cables.

(A) Power-Supply Cord. The cable for cord-connected electric vehicle supply equipment (EVSE) shall comply with all of the following:

(1) Be any of the types specified in 625.17(B)(1) or hard service cord, junior hard service cord, or portable power cable types in accordance with Table 400.4. Hard service cord, junior hard service cord, or portable power cable types shall be listed, as applicable, for exposure to oil and damp and wet locations.

(2) Have an ampacity as specified in Table 400.5(A)(1) or, for 8 AWG and larger, in the 60°C (140°F) columns of Table 400.5(A)(2).

(3) Have an overall length as specified in either of the following:

a. When the interrupting device of the personnel protection system specified in 625.22 is located within the enclosure of the supply equipment or charging system, the power-supply cord shall be not more than the length indicated in (i) or (ii):

(i) For portable equipment in accordance with 625.44(A), the power-supply cord shall be not more than 300 mm (12 in.) long.

(ii) For fastened-in-place equipment in accordance with 625.44(B), the power-supply cord shall be

not more than 1.8 m (6 ft) long and the equipment shall be installed at a height that prevents the power-supply cord from contacting the floor when it is connected to the proper receptacle.

b. When the interrupting device of the personnel protection system specified in 625.22 is located at the attachment plug, or within the first 300 mm (12 in.) of the power-supply cord, the overall cord length shall be not greater than 4.6 m (15 ft).

Δ **(B) Output Cable to Electric Vehicles.** The output cable to electric vehicles shall be one of the following:

(1) Listed Type EV, EVJ, EVE, EVJE, EVT, or EVJT flexible cable as specified in Table 400.4

(2) An integral part of listed electric vehicle supply equipment

Informational Note No. 1: See UL 2594-2016, *Standard for Electric Vehicle Supply Equipment*, for information on conductive electric vehicle supply equipment.

Informational Note No. 2: See UL 2202-2009, *Standard for Electric Vehicle (EV) Charging System Equipment*, for information on conductive electric vehicle charging equipment.

(C) Overall Cord and Cable Length. The overall usable length shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is part of the listed electric vehicle supply equipment.

(1) Portable Equipment. For portable EVSE, the cord-exposed usable length shall be measured from the face of the attachment plug to the face of the electric vehicle connector.

(2) Fastened-in-Place. Where the EVSE is fastened-in-place, the usable length of the output cable to the electric vehicle shall be measured from the cable exit of the electric vehicle supply equipment to the face of the electric vehicle connector.

Where the wireless power transfer equipment (WPTE) is fastened-in-place, the output cable to the primary pad shall be measured from the cable exit of the control box to the cable inlet at the primary pad.

The maximum 25-foot cable length takes into account both the power supply cable and the output cable to the EV. For example, 625.17(A)(3)(b) allows a maximum 15-foot-long power cord, which limits the length of the output cable to 10 feet. Cable lengths in excess of 25 feet are permitted where provided with a listed cable management system. This provides commercial parking areas with flexibility in the number of charging spaces they can provide. As illustrated in Exhibit 625.1, wireless power transfer equipment (WPTE) still requires a maximum 25-foot cable length from where the cable exits the control box to where it enters the primary wireless charging pad.

(D) Interconnecting Cabling Systems. Other cabling systems that are integral parts of listed EVSE and are intended to interconnect pieces of equipment within an EVSE system using approved installation methods shall be permitted.

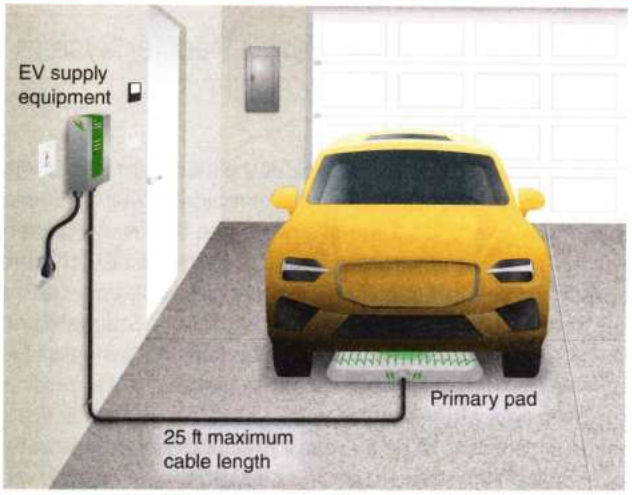

EXHIBIT 625.1 Wireless power transfer equipment (WPTE) allowing the transmission of energy between the premises wiring system and the electric vehicle without physical electrical contact, such as plugging in a supply cord connector.

625.22 Personnel Protection System. EVSE shall have a listed system of protection against electric shock of personnel. Where cord-and-plug-connected equipment is used, the interrupting device of a listed personnel protection system shall be provided according to 625.17(A). A personnel protection system shall not be required for EVSE that supplies less than 60 volts dc.

The listed personnel protection system may consist of one or more components that provide protection against electric shock for different portions of the EV supply equipment circuitry, which might be operating at frequencies other than 50/60 hertz, at direct-current potentials, and/or voltages above 150 volts to ground. Standard GFCI devices do not provide the range of protection needed for the various types of charging systems available. For systems operating above 150 volts to ground, the protective system may include monitoring systems to ensure that proper grounding is provided and maintained during charging.

Part III. Installation

Δ **625.40 Electric Vehicle Branch Circuit.** Each outlet installed for the purpose of supplying EVSE greater than 16 amperes or 120 volts shall be supplied by an individual branch circuit.

Exception: Branch circuits shall be permitted to feed multiple EVSEs as permitted by 625.42(A) or (B).

Δ **625.41 Overcurrent Protection.** Overcurrent protection for feeders and branch circuits supplying EVSE and WPTE, including bidirectional EVSE and WPTE, shall be sized for continuous duty and shall have a current rating of not less than 125 percent of the maximum load of the equipment. Where noncontinuous loads are

supplied from the same feeder, the overcurrent device shall have a current rating of not less than the sum of the noncontinuous loads plus 125 percent of the continuous loads.

Δ **625.42 Rating.** The EVSE shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings, unless the overall rating of the installation can be limited through controls as permitted by 625.42(A) or (B).

N **(A) Energy Management System (EMS).** Where an EMS in accordance with 750.30 provides load management of EVSE, the maximum equipment load on a service and feeder shall be the maximum load permitted by the EMS. The EMS shall be permitted to be integral to one piece of equipment or integral to a listed system consisting of more than one piece of equipment. When one or more pieces of equipment are provided with an integral load management control, the system shall be marked to indicate this control is provided.

N **(B) EVSE with Adjustable Settings.** EVSE with restricted access to an ampere adjusting means complying with 750.30(C) shall be permitted. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear on the rating label with sufficient durability to withstand the environment involved. EVSE as referenced shall be permitted to have ampere ratings that are equal to the adjusted current setting.

Three methods for EV power transfer — referred to as Level 1, Level 2, and DC fast charging, sometimes called Level 3 — cover the range of power levels anticipated for charging EVs. EV charging loads are considered to be continuous loads for the purposes of applying 625.42.

Level 1 allows broad access to charge an EV, often by plugging into a grounded 120-volt electrical receptacle (NEMA 5-15R or 5-20R). Level 1 chargers are commonly a portable style, likely provided by an EV manufacturer with the vehicle, which means they would need to be connected to the premises wiring system by one of the means listed in 625.44(A). Although it is most common for portable chargers to be plugged into a 120-volt receptacle outlet, the *NEC* permits receptacle outlets as large as 50 amperes and 250 volts, single phase.

Level 2 is the primary method of EV power transfer at both private and public facilities. It requires special equipment and connection to an electric power supply dedicated to EV power transfer. Fastened-in-place and fixed EVSE have ratings of 120/240 volts, 208Y/120 volts, and even 480Y/277 volts in some cases. Equipment can be manufactured in both single- or three-phase configurations. See 625.41 for sizing overcurrent protective devices (OCPDs), which are required to have a rating of not less than 125 percent of the maximum load of the equipment.

DC Fast Charging (DCFC) is the EV equivalent of a commercial gasoline dispensing station. Initially, DCFC were called Level 3 because they exceeded UL 2594, *Standard for Electric Vehicle Supply Equipment*, thresholds for Level 2. Although sometimes still referenced as Level 3, manufacturers have moved toward referencing this level of EV power transfer as DCFC. This high-speed, high-power method charges an EV in about the same time it takes to refuel a conventional vehicle. Because of individual supply requirements and available source voltages, exact voltage and load specifications for DCFC have not been defined in the same way that Level 1 and Level 2 have. These power requirements are specified by the equipment manufacturer, but at present the maximum current is specified as 400 amperes with 350 kilowatts of continuous power supplied, at a rate that continues to grow.

Connection of electric vehicle supply equipment (EVSE) to an energy management system (EMS) can preclude the need for a service or feeder upgrade to an existing electrical installation. Where an EMS is utilized for EVs, it is required to be installed in accordance with 625.42, which provides requirements around the load management of EMS. An EVSE equipped with restricted access to a means that adjusts the output can be utilized, provided that the requirements listed in 625.42(B) and 750.30(C) are met. Where utilized, special attention should be paid to the adjusted ampacity marking requirements, as listed in 625.42(B). Where the EVSE is determined to be a continuous load, the adjusted rating should be calculated as such, and the rating of the circuit conductors and the OCPD must be sized accordingly.

625.43 Disconnecting Means. For EVSE and WPTE 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. If the disconnecting means is installed remote from the equipment, a plaque shall be installed on the equipment denoting the location of the disconnecting means. The disconnecting means shall be lockable open in accordance with 110.25.

625.44 Equipment Connection. EVSE and WPTE shall be connected to the premises wiring system in accordance with one of the methods in 625.44(A) through (C).

Some manufacturers produce 125-volt, single-phase, 15- or 20-ampere portable charging units for convenience charging. These charging units can be stored in the vehicle. Fastened EVSE and WPTE rated up to 250 volts and 60 amperes may be cord-and-plug-connected under the specified conditions. All other EVSE and WPTE must be mounted as fixed-in-place, which requires using fasteners that require a tool for removal, and permanently (direct) wired.

(A) Portable Equipment. Portable equipment shall be connected to the premises wiring system by one or more of the following methods:

(1) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 125 volts, single phase, 15 or 20 amperes
(2) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 250 volts, single phase, 15 or 20 amperes

(3) A nonlocking, 2-pole, 3-wire or 3-pole, 4-wire grounding-type receptacle outlet rated at 250 volts, single phase, 30 or 50 amperes, or 125/250 volts, single-phase, 30, 50, or 60 amperes
(4) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 60 volts dc maximum, 15 or 20 amperes

(B) Fastened-in-Place Equipment. Equipment that is fastened-in-place shall be connected to the premises wiring system by one of the following methods:

(1) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated 125 volts or 250 volts, single phase, up to 50 amperes
(2) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated 250 volts, three phase, up to 50 amperes
(3) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated 125/250 volts, single phase, 30, 50, or 60 amperes
(4) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated 60 volts dc maximum, 15 or 20 amperes

(C) Fixed-in-Place Equipment. All other EVSE and WPTE shall be permanently wired and fixed-in-place to the supporting surface.

625.46 Loss of Primary Source. 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 625.48.

625.47 Multiple Feeder or Branch Circuits. Where equipment is identified for the application, more than one feeder or branch circuit shall be permitted to supply equipment.

See also

225.30(A)(7) for correlating permission regarding electric vehicle power transfer systems that are listed, labeled, and identified as being able to be supplied by more than one branch circuit or feeder

Δ **625.48 Interactive Equipment.** EVSE or WPTE that incorporates a power export function and that is part of an interactive system that serves as an optional standby system, an electric power production source, or a bidirectional power feed shall be listed and marked as suitable for that purpose. When used as an optional standby system, the requirements of Parts I and II of Article 702 shall apply; when used as an electric power production source, the requirements of Parts I and II of Article 705 shall apply. EVPE that provides a receptacle outlet as its point of power export shall be in accordance with 625.60.

Informational Note No. 1: See UL 1741, *Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources*, for further information on supply equipment.

Informational Note No. 2: See UL 9741, *Bidirectional Electric Vehicle (EV) Charging System Equipment*, for vehicle interactive systems.

Informational Note No. 3: See SAE J3072, *Standard for Interconnection Requirements for Onboard, Utility-Interactive Inverter Systems*, for further information.

N **625.49 Island Mode.** EVPE and bidirectional EVSE that incorporate a power export function shall be permitted to be a part of an interconnected power system operating in island mode.

625.50 Location. The EVSE shall be located for direct electrical coupling of the EV connector (conductive or inductive) to the electric vehicle. Unless specifically listed and marked for the location, the coupling means of the EVSE shall be stored or located at a height of not less than 450 mm (18 in.) above the floor level for indoor locations or 600 mm (24 in.) above the grade level for outdoor locations. This requirement does not apply to portable EVSE constructed in accordance with 625.44(A).

625.52 Ventilation. The ventilation requirement for charging an electric vehicle in an indoor enclosed space shall be determined by 625.52(A) or (B).

Where the EV charging operation is conducted in outdoor or open locations, the resulting off-gassing of hydrogen does not pose the same risk of creating an ignitible environment as in indoor locations. The lighter-than-air hydrogen readily diffuses into the atmosphere. In addition to driveways and parking lots, structures with adequate natural ventilation — such as carports and open parking structures — do not require mechanical ventilation. NFPA 88A, *Standard for Parking Structures*, provides a quantifiable definition of the term *open parking structure*.

(A) Ventilation Not Required. Where electric vehicle storage batteries are used or where the equipment is listed for charging electric vehicles indoors without ventilation, mechanical ventilation shall not be required.

Most batteries used in EVs do not emit hydrogen gas in quantities that could cause an explosion. Preventive measures such as mechanical or passive ventilation are not required, because the EV batteries and charging systems are designed to prevent or limit the emission of hydrogen during charging. The Society of Automotive Engineers (SAE) recommended practice SAE J1718, *Measurement of Hydrogen Gas Emission from Battery-Powered Passenger Cars and Light Trucks During Battery Charging*, can be used to assess suitability for indoor charging. This recommended practice includes procedures for tests during normal charging operations and potential equipment failure modes.

(B) Ventilation Required. Where the equipment is listed for charging electric vehicles that require ventilation for indoor

charging, 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 vehicle charging 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 625.52(B)(1) through (B)(4).

(1) Table Values. For supply voltages and currents specified in Table 625.52(B)(1)(1) or Table 625.52(B)(1)(2), the minimum ventilation requirements shall be as specified in Table 625.52(B)(1)(1) or Table 625.52(B)(1)(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 625.52(B)(1)(1) or Table 625.52(B)(1)(2), the

TABLE 625.52(B)(1)(1) *Minimum Ventilation Required in Cubic Meters per Minute (m^3/min) for Each of the Total Number of Electric Vehicles That Can Be Charged at One Time*

	Branch-Circuit Voltage							
		Single Phase			3 Phase			
Branch-Circuit Ampere Rating	DC ≥ 50 V	120 V	208 V	240 V or 120/240 V	208 V or 208Y/120 V	240 V	480 V or 480Y/277 V	600 V or 600Y/347 V
15	0.5	1.1	1.8	2.1	—	—	—	—
20	0.6	1.4	2.4	2.8	4.2	4.8	9.7	12
30	0.9	2.1	3.6	4.2	6.3	7.2	15	18
40	1.2	2.8	4.8	5.6	8.4	9.7	19	24
50	1.5	3.5	6.1	7.0	10	12	24	30
60	1.8	4.2	7.3	8.4	13	15	29	36
100	2.9	7.0	12	14	21	24	48	60
150	—	—	—	—	31	36	73	91
200	—	—	—	—	42	48	97	120
250	—	—	—	—	52	60	120	150
300	—	—	—	—	63	73	145	180
350	—	—	—	—	73	85	170	210
400	—	—	—	—	84	97	195	240

TABLE 625.52(B)(1)(2) *Minimum Ventilation Required in Cubic Feet per Minute (cfm) for Each of the Total Number of Electric Vehicles That Can Be Charged at One Time*

	Branch-Circuit Voltage							
		Single Phase			3 Phase			
Branch-Circuit Ampere Rating	DC ≥ 50 V	120 V	208 V	240 V or 120/240 V	208 V or 208Y/120 V	240 V	480 V or 480Y/277 V	600 V or 600Y/347 V
15	15.4	37	64	74	—	—	—	—
20	20.4	49	85	99	148	171	342	427
30	30.8	74	128	148	222	256	512	641
40	41.3	99	171	197	296	342	683	854
50	51.3	123	214	246	370	427	854	1066
60	61.7	148	256	296	444	512	1025	1281
100	102.5	246	427	493	740	854	1708	2135
150	—	—	—	—	1110	1281	2562	3203
200	—	—	—	—	1480	1708	3416	4270
250	—	—	—	—	1850	2135	4270	5338
300	—	—	—	—	2221	2562	5125	6406
350	—	—	—	—	2591	2989	5979	7473
400	—	—	—	—	2961	3416	6832	8541

minimum ventilation requirements shall be calculated by means of the following general formulas, as applicable:

(1) Single-phase ac or dc:

$\text{Ventilation}_{\text{single-phase ac or dc}}$ in cubic meters per minute (m^3/min) =

$$\frac{(\text{volts})(\text{amperes})}{1718} \quad \textbf{[625.52(B)(2)a]}$$

$\text{Ventilation}_{\text{single-phase ac or dc}}$ in cubic feet per minute (cfm) =

$$\frac{(\text{volts})(\text{amperes})}{48.7} \quad \textbf{[625.52(B)(2)b]}$$

(2) Three-phase ac:

$\text{Ventilation}_{\text{3-phase}}$ in cubic meters per minute (m^3/min) =

$$\frac{1.732(\text{volts})(\text{amperes})}{1718} \quad \textbf{[625.52(B)(2)c]}$$

$\text{Ventilation}_{\text{3-phase}}$ in cubic feet per minute (cfm) =

$$\frac{1.732(\text{volts})(\text{amperes})}{48.7} \quad \textbf{[625.52(B)(2)d]}$$

(3) Engineered Systems. For an 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 equipment and shall remain energized during the entire electric vehicle charging cycle. Equipment receptacles rated at 125 volts, single phase, 15 and 20 amperes shall be switched and the mechanical ventilation system shall be electrically interlocked through the switch supply power to the receptacle. Equipment supplied from less than 50 volts dc shall be switched and the mechanical ventilation system shall be electrically interlocked through the switch supply power to the equipment.

The sufficient diffusion and dilution of hydrogen gas from gas-emitting batteries prevent a hazardous condition. During the charging process, certain batteries used in some EVs emit hydrogen gas, which is colorless, odorless, tasteless, nontoxic, and flammable. At atmospheric pressure, the flammable range for hydrogen is 4 to 75 percent by volume in air.

NFPA 69, *Standard on Explosion Prevention Systems*, establishes requirements to ensure safety with flammable mixtures. Section 8.3, Design and Operating Requirements, of NFPA 69-2019 specifies that combustible gas concentrations be restricted to 25 percent of the lower flammable limit to provide a safety margin for personnel. Safety is accomplished by keeping the concentration of hydrogen below 25 percent of the lower flammability limit. That is 1 percent (25 percent × 4 percent = 1 percent) hydrogen by volume in air, or below 10,000 parts per million (ppm) hydrogen.

A ventilation system for a typical residential-type garage includes both supply and mechanical exhaust equipment and is permanently installed. The system brings outdoor air into the space, circulates the air through the space, and exhausts the air directly to the outdoors. Typically, the equipment includes a passive vent for intake on one side of the enclosed space and an exhaust fan vented to the outside on the other side.

In enclosed commercial garages and other structures, additional ventilation is not required if the exhaust, as required by the building code for carbon monoxide or other purposes, is greater than the quantity listed in the table. Other engineered EV ventilation systems are allowed as part of the building ventilation system.

The ventilation system and the charging system must be interlocked to prevent charging if the ventilation is not operating. This charging arrangement can be used with EVs equipped with a self-contained charging system in which activation of the charging system does not depend on a signal from the EV. A manually operated switch controls the receptacle used to supply the vehicle charging system, and it is also interlocked with the power supply to the ventilation fan. This arrangement ensures that the ventilation fan is operating whenever the vehicle charging receptacle is energized.

Δ **625.54 Ground-Fault Circuit-Interrupter Protection for Personnel.** All receptacles installed for the connection of electric vehicle charging shall have ground-fault circuit-interrupter protection for personnel.

Portable and fastened-in-place EVSE and WPTE that are permitted to be cord-and plug-connected must be supplied through a GFCI-protected receptacle. This includes all the single- and three-phase receptacle configurations specified in 625.44(A) and (B). The outlet supplying direct-connected EVSE is not required to be GFCI protected, unless specified in the manufacturer's instructions.

625.56 Receptacle Enclosures. All receptacles installed in a wet location for electric vehicle charging shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed. An outlet box hood installed for this purpose shall be listed and shall be identified as extra duty. Other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood shall not be required to be marked extra duty.

625.60 AC Receptacle Outlets Used for EVPE. AC receptacles installed in electric vehicles and intended to allow for connection of off-board utilization equipment shall comply with 625.60(A) through (D).

EVs equipped with a receptacle(s) for the purposes of exporting power to supply utilization equipment must follow similar safety requirements as required by the *NEC* for other sources, such as portable generators. Product certification, receptacle configuration limitations, overcurrent protection, and ground-fault circuit-interrupter protection for personnel are features required for

receptacles that will be used to supply portable utilization equipment or to supply power to a premises as a standby (alternate) or stand-alone power source. The requirements for power export receptacles, like similar safety features required by Article 445 for portable generators, provide a safe interface for users of these electric vehicle power export equipment (EVPE) receptacle outlets.

(A) Type. The receptacle outlet shall be listed.

(B) Rating. The receptacle outlet shall be rated 250 volts maximum, single phase 50 amperes maximum.

(C) Overcurrent Protection. Electric vehicles provided with receptacle outlets for power export shall be provided with overcurrent protection integral to the power export system. The overcurrent protection shall have a nominal rating sufficient for the receptacle it protects. The overcurrent protection shall also be sufficiently rated for the maximum available fault current at the receptacle and shall be included in the interactive equipment evaluation. See 625.48.

(D) GFCI Protection for Personnel. Ground-fault circuit-interrupter protection for personnel shall be provided for all receptacles. The ground-fault circuit-interrupter indication and reset shall be installed in a readily accessible location.

Informational Note: There are various methods available to achieve ground-fault circuit-interrupter protection.

Part IV. Wireless Power Transfer Equipment

625.101 Grounding. The primary pad base plate shall be of a nonferrous metal and shall be connected to the circuit equipment grounding conductor unless the listed WPTE employs a double-insulation system. The base plate shall be sized to match the size of the primary pad enclosure.

625.102 Installation.

(A) General. The control pad, if included in the WPTE configuration, shall comply with 625.102(B). The primary pad shall comply with 625.102(C).

Δ **(B) Control Box.** The control box enclosure shall be suitable for the environment and shall be mounted at a height not less than 450 mm (18 in.) above the floor level for indoor locations or 600 mm (24 in.) above grade level for outdoor locations. The control box shall be mounted in one of the following forms:

(1) Pedestal
(2) Wall or pole
(3) Building or structure
(4) Raised concrete pad

Δ **(C) Primary Pad.** The primary pad shall be installed secured to the surface or embedded in the surface of the floor with its top flush with the surface or below the surface, all per manufacturer's instructions and the following:

(1) If the primary pad is located in an area requiring snow removal, it shall not be located on or above the surface.

Exception: Where installed on private property where snow removal is done manually, the primary pad shall be permitted to be installed on or above the surface.

(2) The primary pad enclosure shall be suitable for the environment. If the primary pad is located in an area subject to severe climatic conditions (e.g., flooding), the enclosure shall be suitably rated for those conditions.

Δ **(D) Protection of Cords and Cables to the Primary Pad.** The output cable to the primary pad shall be secured in place over its entire length for the purpose of restricting its movement and to prevent strain at the connection points. If installed in conditions where drive-over could occur, the cable shall be provided with supplemental protection.

Where there is no control box, the cord or cable supplying power to the primary pad shall be secured in place in order to restrict movement and to prevent strain at the connection points. Where subject to vehicular traffic, supplemental protection shall be provided.

(E) Other Wiring Systems. Other wiring systems and fittings specifically listed for use on the WPTE shall be permitted.

ARTICLE 626 Electrified Truck Parking Spaces

Part I. General

626.1 Scope. This article covers the electrical conductors and equipment external to the truck or transport refrigerated unit that connects nonpropulsion electrical elements of trucks or transport refrigerated units to a supply of electricity, and the installation of equipment and devices related to electrical installations within an electrified truck parking space.

Stringent federal and state mandates to reduce diesel engine emissions have led to using electric power for operation of transport truck heating and refrigeration equipment necessary to maintain their loads, as well as convenience power to the cab for the driver, while the truck is parked and not running. Exhibit 626.1 shows an electrified truck parking space that is providing non-vehicular power to the vehicle. Because much of the transport industry is interstate commerce, this article provides for standardization of truck parking space equipment so that driver interface with electrical connection devices can be safely accomplished from coast to coast.

626.3 Other Articles. Wherever the requirements of other articles of this *Code* and Article 626 differ, the requirements of Article 626 shall apply. Unless electrified truck parking space wiring systems are supported or arranged in such a manner that they cannot be used in or above locations classified in 511.3