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PLANNING FOR ELECTRIC VEHICLES

With all the recent strides in automotive engineering, you may be considering buying an electric vehicle or a plug-in hybrid vehicle. (We'll refer to both types as "EVs.") EVs will help lessen reliance on imported fuels, but they do require another power source – electricity. They are powered by a large battery pack that needs a home-based charging system in order to "re-fuel." In some models, the charger is installed in the vehicle; in other brands, the charger might be located in a garage or in a weatherproof unit that stands outdoors, along the driveway. Regardless of placement, most garages and some older houses will need to be rewired to accommodate the charging equipment.

The EV charger should be on a '"dedicated" circuit, with no other fixture or appliance on that circuit (so the circuit breaker doesn't trip when someone uses the garage door opener or turns on the lights when the car is charging.) The National Electric Code® (NEC) details a number of safety requirements, including over-current trip, leakage current to ground protection (GFCI), and an automatic shut-off when – not if – someone drives off with the cable still plugged into the car.

Because the charger is operating for hours at a time, the 2011 NEC® specifies that *"Electric vehicle supply equipment shall have sufficient rating to supply the load served. For the purposes of this article, electric vehicle charging loads shall be considered to be continuous loads."* That means that the electric service to your home (from the pole to the house) must carry enough power to supply a constant charge to the vehicle. You should consult a licensed electrician to evaluate the capacity of your electric system to ensure that you are ready to install an EV charger. Heavier wiring to the garage, and possibly to the house, may be required.

Charging methods have been standardized by the Society of Automotive Engineers (SAE). Approved in 1996, SAE Standard J1772 specifies three levels of chargers. Recent updates describe the design of a standard connector (plug) for attaching power to the EV at Levels 1 and 2.

Approved plug for Level 1 and Level 2 charging
(© Society of Automotive Engineers)

Level 1 – A Level 1 charger is rated at 120 VAC and 20 amperes (amps) and will plug into grounded electrical receptacle outlets. At this level, fully charging an EV could take 8 to 24 hours, depending upon battery size and its discharge level. This is not meant as the primary charging technique. SAE suggests that EVs carry a portable Level 1 unit that can be plugged into any available 120 VAC grounded receptacle for emergency or "top-off" charging.

Level 2 – A Level 2 charger is to be used for everyday EV charging. It is rated to run from a single-phase branch circuit (similar to an electric dryer circuit) operating at 240 VAC and 30 amps. Charging time to fully charge the EV at this rate will generally range from 4 to 10 hours, depending on battery size and discharge level.

Level 3 – The Level 3 standard is for "Fast Charging," similar to refueling at a service station. The charger is supplied by 480-VAC, three-phase equipment, designed to reach a 50% charge in 10 to 15 minutes. A separate connector would supply DC from the off-board charger directly to the battery.

(continued)

After many fits and false starts, it appears that the EV era is now with us. Several models of EVs are now being sold in the U.S., and other manufacturers have products that will soon come to market. As in the early days of gas engine vehicles, people are constructing homebuilt EVs from existing cars, motorcycles, and trucks.

This means that people who are considering electrical updates to their homes might wish to include sufficient capacity for charging EVs, even if the technology is still being developed. Your electrician should be able to advise you.