



## Underwriters Laboratories Electric Vehicle Infrastructure

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Standards Development Activities

## Standards development activities

UL is the key North American developer of safety-related EV Standards. We also actively cooperate with other standards developing organizations in sharing our EV safety expertise. A few of our contributions to EV safety standards include:

### UL Standards

#### **UL 2202, the Standard for Safety of Electric Vehicle (EV) Charging System Equipment**

This Standard covers conductive and inductive charging system equipment intended to be supplied by a branch circuit of 600 volts or less for recharging the storage batteries in over-the-road EVs. In an

inductive charging system, there is no direct metal-to-metal electrical connection between the charger and the vehicle. Instead, electrical power is passed through an electromagnetic field between the primary winding of a transformer, which is usually located off board the vehicle, to the secondary winding of the transformer which is usually located on board the vehicle. Conversely, in a conductive charging system, power is passed from the charger to the vehicle through direct metal-to-metal contact by way of a coupler or a plug and receptacle suitable for EV charging.

#### **UL 2231, the Standard for Safety of Personnel Protection Systems for EV Supply Circuits**

This Standard covers devices and systems intended for use in accordance with the *National Electrical Code*<sup>®</sup> (*American National Standards Institute/National Fire Protection Association 70*), to reduce the risk of electric shock to the user from accessible parts, in grounded or isolated circuits for charging EVs.

#### **UL 2251, the Standard for Safety of Plugs, Receptacles, and Couplers for EVs**

This Standard covers plugs, receptacles, vehicle inlets, and connectors rated up to 800 amperes and up to 600 volts ac or dc, intended for conductive connection systems, for use with EVs in accordance with the *National Electrical Code*<sup>®</sup> for either indoor or outdoor nonhazardous locations.

#### **UL Subject 2594**

UL Subject 2594 covers electric vehicle (EV) supply equipment, rated a maximum of 250 V ac, with a frequency of 60 Hz, and intended to provide power to an electric vehicle with an onboard charging unit. Subject 2594 covers electric vehicle supply equipment intended for use where ventilation is not required. The products covered by Subject 2594 include EV Power Outlets, EV cord sets and EV charging stations, Level 1 & 2. EV cord sets may be designated as portable cord sets or stationary cord sets and may be designated for indoor or outdoor use. EV charging stations may be designated as either movable or permanent charging stations and may be designated for indoor or outdoor use. The products covered by Subject 2594 are intended for use in accordance with the National Electrical Code (NEC), ANSI/NFPA 70.

### Other codes and practices

#### **SAE J1718, Recommended Practice for Measurement of Hydrogen Gas Emissions from Battery-Powered Passenger Cars and Light Trucks During Battery Charging**

UL research developed data and information that aided in the development of the hydrogen emission testing procedure in the recommended practice. This recommended practice describes a procedure for measuring gaseous hydrogen emissions from the aqueous battery system of battery-powered passenger cars and light trucks. The purpose of the procedure is to determine what concentrations of hydrogen gas an EV, together with its charger, will generate, and whether or not forced air ventilation is required when a particular EV and its associated battery and charging system are used in a residential garage. Research at UL developed data and information on EV charging systems with respect to hydrogen gas emissions and ventilation requirements that

aided in the development of the National Electrical Code® (1996 edition), Article 625 -- Electric Vehicle Charging System Equipment. The article covers electrical conductors and equipment external to an EV that connect an EV to a supply of electricity by conductive or inductive means, and the installation of equipment and devices related to EV charging.

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