



SNZ Workshop

Electric Vehicle Charging and Safety Implications

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Who am I?



A little about me

Joe Bablo

Principal Engineering Manager for E-Mobility and Energy Storage Team

Background

- 25 years at UL
- 18 years in Principal Engineering Organization
- Principle Engineer for Automotive Equipment and Associated Technologies
- Responsible for many mobility categories – electric vehicle charging equipment
- Serve as Chair of Code Making Panel 12 of the National Electrical Code and Convenor of IEC/TC23/SC23H/MT8

Automotive Equipment and Associated Technologies



Principal Engineers

Principal Engineers are considered the technical experts for their areas of responsibility

Main job of the Principal Engineer:

- **Develop requirements for safety certification**
- **Drive consistent application of requirements globally**
- **Act as thought leaders**



Agenda

Current State

- Charging equipment
- Increasing EV use and its concerns

Future Trends

- Where EV charging is headed
- Overview of innovation

Potential Safety Implications



Current State



Cord connected, ac output devices

UL2594

This document addresses all versions of this product.



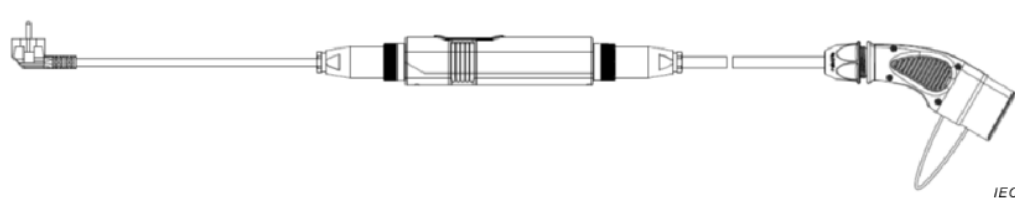
[5 Best Home EV Charging Stations in 2021 \(daplife.com\)](https://daplife.com/5-Best-Home-EV-Charging-Stations-in-2021/)

IEC 61851-1 or IEC 62752

- Both documents cover this product
 - 61851-1 calls for 62752 protection systems
 - 62752 calls for 61851-1 pilot functions

For IEC, the main differences are around construction options

For IEC, the correct standard is based on customer request



Permanently connected, ac output devices

UL2594 / IEC 61851-1:

- These documents cover all versions of this equipment type.
- Typically used for public infrastructure
- Typically, higher power levels than residential models.



DC chargers

UL 2202

Covers all versions of this equipment including liquid cooled products



<https://pasoroblesdailynews.com/fast-ev-chargers-now-available-along-highways-in-central-california/120728/>



<https://www.deltaww.com/en-US/products/08/4865/>

IEC 61851-1 and IEC 61851-23

Covers products complying with the definition of System A, B or C only; and includes liquid cooled products.

Interoperability is a big industry concern



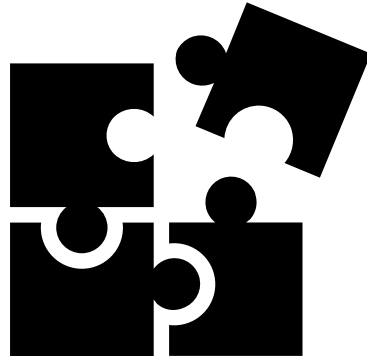
<https://www.thewashingtonpost.com/tesla-to-open-supercharger-network-to-other-ev-drivers-later-this-year/>

Increasing use of EVs



- Limitations of available infrastructure – the more cars charging, the more infrastructure that will be needed.
- Building preparation in anticipation of EV charging – Some building codes, such as in California, require all new construction to be EV ready.
- Concerns around fire in established buildings – In buildings that were constructed prior to EV charging, there is some concern that they are not prepared to interact with EV charging
- Lessons to be learned – Lessons around flame propagation and first responder awareness have been in the news.

Future Trends



Megawatt Charging

UL TBD / IEC 61851-1 and IEC 61851-23 and IEC 61851-23-3:

- No images to show since it does not yet exist
- Anticipated to use different coupler configurations for interconnection to the vehicle (also new development)
- Is intended to be manually connected, but automatic connection means will probably also exist.
- Ratings currently maxed out at 1500 Vdc, 3000 A.
- New hazards associated with the very high current will exist.
- Considered to be a long-term effort – years away



Wireless Power Transfer

UL 2750 / IEC 61980-1 and IEC 61980-2 and IEC 61980-3:

- IEC focuses on electrical safety and interoperability as a key measure
- UL 2750 focuses on electrical safety
- Field exposure is controlled by system and vehicle
- Power levels are low for now, but this will increase
- Current standards cover static WPT but dynamic WPT is also starting to be developed
- Static WPT is a short-term effort; dynamic WPT is a medium-term effort



ACD for legacy DC output devices

UL TBD / IEC 61851-1 and IEC 61851-23 and IEC 61851-23-1

Intended to cover pantograph type connection systems

Note, connection means is not required to be on top of the vehicle

Standard will address additional concerns associated with this interface

Considered to be a short-term effort

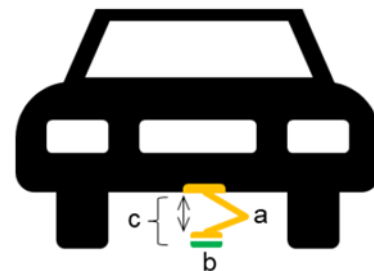
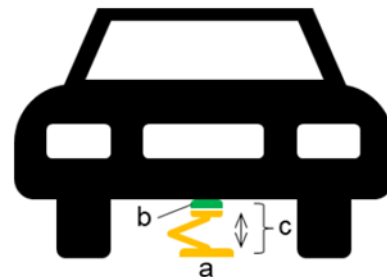


<https://www.smartcitiesworld.net/news/news/bus-charging-interoperability-premieres-in-hamburg--846>

ACD for devices (AC or DC) other than Part 23 chargers

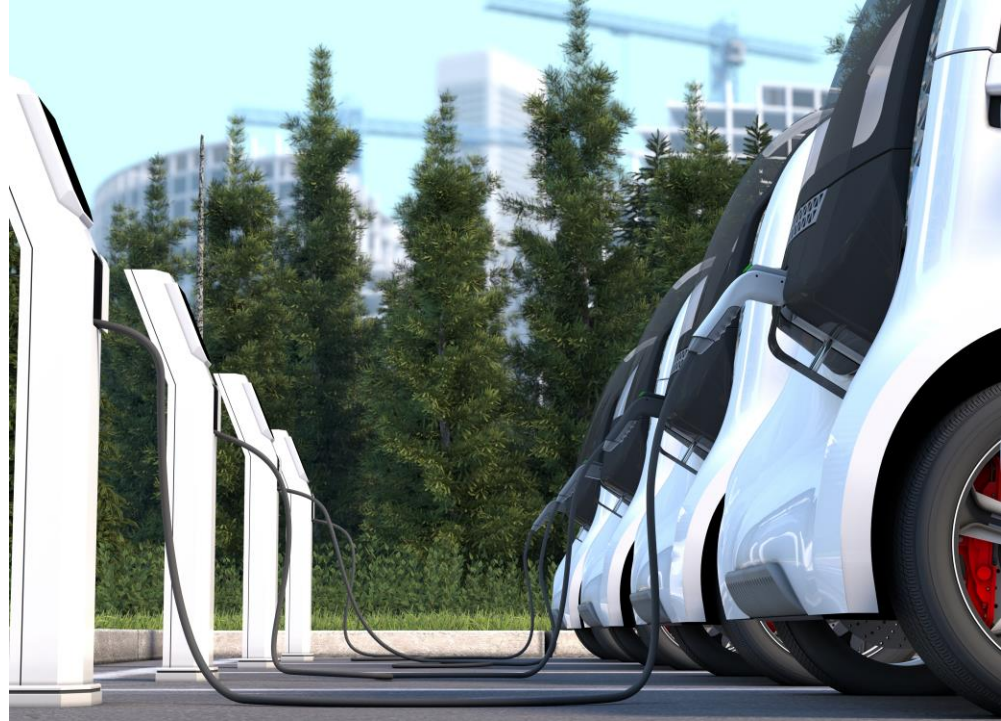
UL TBD / IEC 61851-26 or IEC 61851-27:

- No images to show since it does not yet exist
- Currently in the early working draft stage.
- Part 26 is intended to cover interfaces that are not aligned to IEC 62196
- Part 27 is intended to cover interfaces that are aligned to IEC 62196
- North American standards development is also beginning
 - Most likely will treat the connection means as a “connector”
 - One document will cover all the configurations
 - Will build on concepts of safety in UL 2251
- Scope is limited to underbody connection means
- This is considered a long-term effort – years away.



Smart Charging

- I. The concept of smart charging is not new. However, it has not been standardized in any way.
- II. Makes use of data sharing between user, asset, asset owner and potentially the utility in order to control, monitor and manage the power consumption
- III. Utilized as a method of load management and control
- IV. Has capability of also acting as bi-directional grid connected equipment.
- V. Considered a short-term effort



Battery Swapping Kiosk

UL TBD / IEC 62840-1 and IEC 62840-3

- A secondary battery swapping technology is associated with LEVs.
- The kiosk is used to allow the general public to swap a battery for their LEV (e.g., scooter).
- Development in underway within UL and within the IEC battery swapping group and is considered a short-term effort.



<https://electrek.co/2019/09/23/check-out-gogoros-giant-new-battery-swap-stations-for-its-electric-scooters/>



Potential Safety implications



Potential safety concerns

- Increases on electrification – as more products become energized, there is a need for more charging infrastructure and, of course, more batteries in localized areas
- Increased fire concerns – when batteries are not handled with care, thermal runaway events can occur. This can easily propagate into a major incident, especially when located around people and/or property
- First responder issues – First responders need to be aware and understand what is occurring in order to fight the fires safely
- General public safety perception – the more incidents occur, the more public perception is damaged



Questions and Answers





Thank you!

