



# Parking and charging electrical vehicles

## What is the hazard?

Statistics show that the probability of fire in electrical vehicles during charging is not higher than the likelihood of a fire in a vehicle fuelled with gasoline or diesel. This is of course affected by the age of the vehicles, and the development over time as the electrical vehicle fleet ages will be followed closely in the coming years. Full scale fire tests on vehicles have shown that the peak heat release rate and the total heat release rate is similar between vehicles independent of how they are powered, i.e. the thermal exposure on buildings etc is comparable.

## So what is different?

The experience is that when there is an electrical fault in the battery, or if a fire reaches the battery, combustible contents of the battery will likely ignite. Even if the initial fire is extinguished, chemical reactions in the battery cells continue and may result in re-ignition in the battery. This makes the complete extinguishment of fires in vehicles with batteries difficult to verify/ensure. Fires have been reported to occur in collided vehicles up to two weeks after the collision. Measurements have also shown that toxic by-products, e.g. Hydrogen fluoride (HF) is formed in higher concentrations in vehicles with Li-Ion batteries. HF is an occupational hazard for the rescue services and will affect their ability to effectively fight a vehicle fire indoors.



## How to reduce the risk

### Battery charging facilities:

- Charging stations for Li-ion operated vehicles should be of approved design and installed according to best practice by a professional electrician, in accordance to guidelines from Original Equipment Manufacturers (OEM).
- Chargers installed should be MODE 3 or MODE 4, in accordance with the International standard for electrical vehicle conductive charging system (IEC 61851).

Charging using MODE 2 with common outlets (and plugs) should be discouraged as there are no built-in controls and safety functions. Allowing the use of common outlets will necessitate dedicated circuits protected with 10A surge protection and earth fault protection relay type B (NEK 400:2018) As it will be very hard to distinguish those from other common outlets not having these characteristics all common outlets will need to be protected in the same way.

- The use of extension cables (leads) should be banned.
- Chargers should be mounted on a stable non-combustible wall.
- Indoor charging stations should preferably be located near the building entrance, so the access route for the fire brigade to the vehicle is as easy as possible in case of fire.
- Cables and connectors should be protected from physical damage using load balancers (spring reels) or other means to keep them from the floor.
- Clear signs should be provided indicating a charging area is present in the garage.

### Safety equipment at battery charging facilities:

- Garages with charging stations should have automatic fire detection installed, preferably with smoke detection. This is to facilitate early warning of developing fires. Most fires are not expected to start in the battery, and it may take 20 – 30 minutes until the fire reaches the battery depending on where the fire starts.
- The increased energy content in cars has resulted in increased material damage caused by parking garage fires. It is important to distinguish between parking garages above ground and underground. While automatic water sprinklers are highly recommended for all indoor parking facilities above ground level, it should be mandatory in underground parking garages.
- Garages with charging stations should have means for smoke & heat ventilation prepared, to be able to remove smoke and toxic gases in case of fire.
- Portable fire extinguishers should be available near the entrances.
- The extinguishers should be suitable for use on electrical fires.
- There should be the possibility to disconnect electricity to the charging unit from a remote location.



## Maintenance:

- Make sure the vehicle, battery, and charger are inspected and maintained according to OEM instructions.
- If a vehicle has been involved in a collision or has had its undercarriage impacted, avoid parking the vehicle indoors until it has been investigated according to OEM routines. Meanwhile, park outside at a safe distance from other vulnerable assets.
- Use only spare parts for charging stations in accordance with OEM instructions.

## Housekeeping:

- Avoid storage of combustible materials including tyres in the garage.

## In case of fire:

- Avoid inhalation of smoke from batteries
- If possible, move the burning vehicle to the outside, or remove combustible materials near it.

Given the unpredictability of Li-ion fires regarding their intensity, the toxic and corrosive fumes produced, as well as the risk of re-ignition after extinguishing it is strongly recommended that you contact one of our risk engineers should you wish to deviate from the above recommendations.

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