



ELECTRIC VEHICLE CHARGING AREAS

Property conservation guidelines

October 2023

Understanding the risk

Vehicle fires have always been a challenge, and until now have been isolated to internal combustion engine vehicles.

Over the past few years, there has been an increase in the number of electrical and hybrid vehicles (EV) which utilise lithium-ion batteries for power. These batteries, due to their fire behaviour, pose specific challenges when it comes to fighting fires in this new category of vehicles.

Fires involving the battery packs can take a long time to control and extinguishment is not always complete. The battery's overall energy density can give rise to re-ignition, well after the initial fire is thought to be extinguished.

The major causes of a lithium-ion battery fire are:

- manufacturing defects,
- overheating due to improper use/charging, or
- mechanical damage.

These initial fires tend to cascade through the surrounding battery cells within the pack in a reaction called thermal runaway.

Once initiated, a thermal runaway reaction cannot be readily controlled by normal firefighting techniques. Thermal runaway is a relentless and continuous release of intense heat and toxic smoke that will only end upon the total consumption of the fuel or extreme cooling of the reaction.

This poses the following significant challenges for firefighters (and charging asset owners) in the management of the incident including:

- toxic smoke production;
- rapid rate of fire spread;
- heat release rate of EV fire;
- intervention and suppression resources in proximity to the location

- effectiveness of automatic and manual fire protection systems (where relevant for charging infrastructure that are located within built structures).

This guide provides some good practices to consider when installing charging facilities at your premises.

This document provides general guidance regarding fire prevention and protection for electrical vehicle charging areas. This is not intended to be a comprehensive guide.



Managing the risk

Location

When selecting a location, consider accessibility for manual firefighting, not impeding evacuation paths, and maintaining ample clear space from exposures.

There are also business continuity considerations: if there is a fire, it will normally take a certain amount of time until the fire brigade can control it. Depending on the charging location a prolonged fire event could affect onsite operations.

- Due to the difficulty of controlling a lithium-ion battery fire, it is recommended to install chargers in areas that are easily accessible to emergency services, preferably close to the garage entrances, and to avoid installation in the lower levels of garages.
- Spacing between charging points should provide sufficient space for parking and the charging process.
- Outdoor or indoor, the recommended distance from combustible materials is 10 meters. If there are any hazardous or critical installations nearby (flammable liquids, gas tanks, waste storage, transformers, etc.) consider relocation of the chargers away from these items.
- If located outdoors, the chargers should be as far as possible from relevant buildings, structures, and utilities. This measure is paramount when combustible construction materials such as foam-insulated sandwich panels or wooden finishes are present.
- It is recommended to locate indoor charging areas in a separate fire compartment with a minimum of 60-120-minutes of fire resistance (including structural elements), depending on the hazards presented by the occupancy of the building.
- If in a basement is unavoidable, a 120-minute fire resistance rating is recommended due to the increased intervention difficulty. When this is the case, those areas shall not be used for any other activities (including storage).
- Provide adequate ventilation. Battery failure and thermal runaway events may involve the release of flammable gases and if this occurs in a confined area, the gases may accumulate and develop into an explosion hazard.
- Accessibility should always be discussed with the emergency services/fire brigade before implementation.

Electrical installation

Ensure that charging systems are installed and used in compliance with the manufacturer's specifications, local regulations, and requirements. The charging systems should be installed by a certified/authorised company.

- AS/NZS 3000 Electrical Installations “Wiring Rules”, Appendix P Guidance for Installation and Location of Electrical Vehicle Socket-Outlets and Charging Stations.

- The electrical circuit should be dedicated to the chargers, separated from the general main, and fitted with circuit breakers and surge protection.
- It is likely possible to manually isolate the charging equipment in case of emergency, failure, etc. If so, this should be actioned from a safe and accessible location, preferably continuously manned.
- The chargers should require a manual reset after an alarm. They should not be permitted to automatically re-energize after the alarm is acknowledged or silenced.
- The power supply to the chargers should automatically be interrupted in the case of equipment malfunction or activation of any fire protection installations available (fire detection, sprinklers, etc.).

Inspection and maintenance

Ensure that manufacturer instructions regarding usage and maintenance are followed.

- Complete and record regular inspections on the chargers and supporting equipment:
 - Daily visual inspection to detect damaged chargers, cables, or connectors
 - Annual electrical inspections and infra-red thermography
- On detection of any damaged or malfunctioning chargers, cables, connectors, etc., the chargers should be shut off, locked, and labelled as "OUT OF SERVICE" until they have been repaired and re-certified by an authorised company.

Fire protection

Ensure a complete fire strategy/pre-fire plan is in place, reviewed by, and agreed to by the emergency services. This plan should be practiced and updated at least annually.

- Automatic sprinkler protection is recommended for areas used to charge vehicles, particularly when installations are located in less accessible areas. Australian Standard 2118 may no longer be adequate to meet the demands on EV fires and it is recommend that fire engineering advice is obtained when undertaking any renovation or new construction.
- The sprinklers will not fully extinguish the shielded fire within the vehicle, but they will provide cooling and wetting of other exposures. The sprinklers' cooling and wetting of the adjacent areas and items can also mitigate fire spread beyond the vehicle of origin thus facilitating manual intervention efforts.

- Indoor areas should be fitted with automatic fire detection and alarm signalling systems. The alarm should be transmitted to a continuously occupied location
- Water used during fire control efforts will be contaminated. It is recommended to retain this firefighting water to mitigate the risk of environmental contamination, and water damage to other areas of the building.
- The power supply to the chargers should automatically be interrupted in case of equipment malfunction or activation of any fire protection installations available (fire detection, sprinklers, etc.).

Fire prevention

The site and emergency plans should include the locations of all chargers, any electrical shut-off points, access routes, containment areas, etc. The electrical shut-off points should be marked and labelled. They should be remotely located from the charging areas they control. Each of these items is to benefit the fire department responders.

- Vehicle charging should be avoided within premises when outside of business hours.
- Charging units need to be physically protected against mechanical damage by barriers, bollards, or similar structures. Cable holders should be arranged to avoid the wear and tear of cables. Consider additional protection is needed when there is public access to the chargers (for example in exterior parking areas with uncontrolled access).
- Provide adequate training to staff for the use of charging equipment, detecting and reporting issues with the charging units, and actions to be taken in the event of a thermal event involving the charger and or the vehicle being charged.
- Add signage indicating the type of vehicles that can be charged, any necessary instructions, etc. next to the chargers. Instructions on what to do in case of fire should also be available nearby.
- In some cases, especially when there is public access to the parking spaces with chargers, it would be beneficial to ensure coverage of the area by the CCTV system.
- Provide mechanical ventilation systems for all enclosed parking structures capable of providing a minimum of 300 L/min per square metre of floor area during hours of normal operation (Mechanical ventilation is not required for open parking structures).
- Provide ground hatching or other marking schemes to indicate individual EV charging bays to allowing vehicles to park close to the charging station and prevent stretching of the charging cables.
- The hatched or marked area should provide sufficient space for vehicles to gain access/entry to the EV space.

Summary

This document has provided some recommended guidelines regarding fire prevention and protection for electric vehicle charging areas. Note that this is not an exhaustive list of guidance or recommendations, but is considered to be a helpful starting point to better understand and evaluate the risk and consequences of electric vehicle charging areas to your property.

For more information and customised guidance contact your Account Manager.

References and resources

1. Risk Authority. "RC59 Recommendations for fire safety when charging electric vehicles", FPA, 2021
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3. DEFS - Lithium-ion-batteries - <https://www.dfes.wa.gov.au/hazard-information/fire-in-the-home/lithium-ion-batteries>
4. ACT FIRE & RESCUE FIRE SAFETY GUIDELINE ELECTRIC VEHICLES (EV) & EV CHARGING EQUIPMENT IN THE BUILT ENVIRONMENT FSG-22 - [FSG - 22 Electric Vehicles \(EV\) and EV Charging Equipment in the Built Environment.pdf \(act.gov.au\)](https://www.act.gov.au/act-fire-and-rescue/files/2022/07/FSG-22-Electric-Vehicles-(EV)-and-EV-Charging-Equipment-in-the-Built-Environment.pdf)
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9. SP Technical Research Institute of Sweden, edited by Petra Andersson and Björn Sundström "Proceedings from 4th International Conference on Fires in Vehicles - FIVE 2016", Baltimore, USA - October 5-6, 2016)

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