

BUILT ENVIRONMENT BEB INFO NOTE



Electric Vehicles and charging facilities in and around Multi-storey Commercial and Residential Buildings

1. Purpose and background

1.1 Purpose

- ❖ To highlight the potential risk that the introduced hazard of electrical vehicles (EV) and EV charging facilities may bring to a site if not properly understood and considered at the time of installation.
- ❖ To provide fundamental guidance to assist the planning and design for the installation and ongoing use of EV charging facilities and EV's in consideration of occupant life safety.

While the focus of this position is on Class 2 to 9 buildings, the considerations may also be applicable to Classes 1 and 10. The National Construction Code (NCC) 2022 of Australia provides minimum requirements for buildings based on their size, height, use and classification. NCC 2022 Clause E1D17 and E2D21 and any State laws and regulations should also be understood and considered.

DFES Built Environment Branch (BEB) also publishes guidance in the Fire and Emergency Services (FES) Commissioner's Operational Requirement Guideline (ORG), [10 Compartmentation and Structural Integrity](#), [8 Smoke Detection and Smoke Hazard Management](#), [7 Sprinkler Installations](#) and [3 Information](#).

This Info Note does not directly address the potential hazard posed by personal and industrial light electric vehicles such as e-scooters, electric bicycles, forklifts, etc. However, similar considerations can be applied for where these may be stored and/or charged.

1.2 Background

The presence of EV's or plug in hybrid EVs (HEV or PHEV) across Australia and New Zealand is increasing significantly. There are several industry, societal and governmental initiatives that are driving a transition from internal combustion engine-powered vehicles (ICE) to electrically powered vehicles. The competition in the production and supply of EV's and battery energy storage system (BESS) market revolves around the intellectual property associated with lithium-ion battery chemistries.

This represents an increase in the varying levels of hazards and risks needing to be considered and understood by the community and by first responders and emergency service personnel when attending incidents involving EV's and EV charging facilities.

DFES is an emergency member agency of the Australasian Fire and Emergency Service Authorities Council (AFAC) and as such under Principle 2 of AFAC's Position on Fire Safety, states fire agencies have a role in the regulatory chain of responsibility to minimise fire risk in the built environment.

Refer to AFAC guideline on Electric Vehicles (EV) and EV charging equipment in the built environment [Electric Vehicles \(EV\) and EV charging equipment in the built environment](#) for further recommendations.



2. Hazards with Electric Vehicles

A failure event within an EV lithium-ion battery (such as mechanical, thermal abuse, rapid discharge, or internal cell failure) has the potential to lead to a thermal runaway within the EV battery, which may pose significant challenges for firefighters. Whilst firefighters are trained to respond quickly and decisively, an EV fire and its location may result in a prolonged and potentially difficult to manage (4+ hours) incident. At times an EV may need to burn until completely consumed.

2.1 Potential hazards

- Fire event impact on structural integrity of the structure due to potential for long duration burning;
- Toxic and combustible vapour production, including vapour cloud explosion;
- Increased rate of fire spread due to prolonged burning and potential for lateral flame projection from burning battery in contrast to flame characteristics of an ICE vehicle;
- Reignition and off gassing;
- Stranded electrical energy and hazardous waste material for removal and/or disposal.

Charging facilities external to structures and separate from other combustibles will generally allow for safer evacuation of occupants and ease of incident mitigation by emergency responders. This is a particular consideration for where light electric vehicles are being charged.

3. Considerations for EV and EV charging facility locations


It is important to consider the scale of the EV installation and the type of building. The considerations below should be discussed with relevant stakeholders, including the local government and DFES, during the planning and design phase. However, not all proposals will require a discussion with DFES. DFES would generally only expect to be directly involved where the potential hazard, due to the scale of installation or location, is potentially increased, or when the design considerations below cannot be accommodated. Examples when DFES might be involved at planning and design phase:

- multiple charging stations;
- installation/s occurring in basement or enclosed car parks; and/or
- a sprinkler system is not planned to be installed.

3.1 Considerations

The design considerations listed below are not exhaustive.

- **Structural:** Location of EV's and charging facilities external from structures allows ease of access and dissipation of heat and should be considered as a first option. Locations internal or in covered areas (basement car parks or near structures) requires appropriate construction materials and fire resistance levels with consideration of the hazard. E.g. quantity / stacking of EV's and/or charging stations.
- **Separation and impact protection:** Provisions to restrict fire spread and accidental damage. E.g. fire separation of areas, bollards and spatial locations.
- **Occupant escape and firefighter access:** Proximity of EV's and charging facilities to exit stairs, doors and evacuation / entry routes. Consideration of hydrant location and water supply. Establishment and practice of an emergency response plan.
- **Fire Safety System suitability:** Dependent on number and location of the EV charging facility/ies. E.g. fire hydrants (with a minimum of 4 hours supply), fire sprinklers installed and sufficiently sized



for the hazard, fire detection and occupant warning system, automatic power isolation of EV charging stations under general fire alarm, suitable ventilation / smoke hazard management, etc.

- **Fire Brigade Response and Information:** Local Fire Brigade capability is to be considered. For example, metropolitan response in contrast with a regional response. Identification signage and ease of access to the EV and EV charging stations. Remote isolation points installed and identified.
- **Installation, Maintenance and Post-Incident:** EV charging facilities to be installed by licensed electricians and to be included in facility management maintenance schedules - Refer to *AS/NZS 3000:2018 Electrical installations* for further guidance. Fire water run-off containment and removal of fire affected vehicles to be considered.

4. Final Matters

DFES recognises that compliance with the relevant electrical regulations does not consider fire safety risks and operational needs of the fire authorities. DFES therefore recommends the approach presented in this Info Note be taken to consider the hazards and reduce risk to the community and emergency services personnel.

The same approach should occur whether installing EV charging infrastructure in new, or existing buildings.

Note*¹ *This document excludes the environmental, social and economic issues associated with EVs and charging infrastructure and does not provide any judgments on the values or otherwise of any particular EV and/or charging facility.*



5. Supporting information

- Australasian Fire and Emergency Service Authorities Council, 2022, Incidents Involving Electric Vehicles (AFAC Publication No. 3096). AFAC, Melbourne, Australia.
- Australasian Fire and Emergency Services Authorities Council, 2019, Fire Safety in the Built Environment (AFAC Publication No. 2047). AFAC, Melbourne, Australia
- Australian Renewable Energy Agency, Australian Government, 2022, <https://arena.gov.au/>, retrieved 7 October 2022
- FM Global DS7-42 Vapour Cloud Explosions Data Sheet, 2019
- Light Electric Vehicle Association (LEVA), <https://levassociation.com/>, retrieved 7 October 2022
- National Construction Code 2022 Volume One, <https://ncc.abcb.gov.au/editions-national-construction-code>, retrieved 7 October 2022
- National Fire Protection Association (NFPA) 921 *Guide for Fire and Explosion Investigations*, 2021
- National Fire Protection Association (NFPA) Energy Storage Systems Fact Sheet, <https://www.nfpa.org/~media/Files/Code%20or%20topic%20fact%20sheets/ESSFactSheet.pdf>, retrieved 7 October 2022
- National Fire Protection Association (NFPA) *Stranded Energy within Lithium-Ion Batteries Project Summary*, 2022
- Standards Australia, AS/NZS 3000:2018 Electrical installations (known as the Australian/New Zealand Wiring Rules): Appendix P, 2018, Standards Australia
- [Link to DFES webpage - Lithium-ion batteries](#)

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