



ACT
Government



ACT FIRE & RESCUE FIRE SAFETY GUIDELINE

ELECTRIC VEHICLES (EV) & EV CHARGING EQUIPMENT IN THE BUILT ENVIRONMENT

FSG-22

JUSTICE AND COMMUNITY SAFETY DIRECTORATE
EMERGENCY SERVICES AGENCY ACT FIRE AND RESCUE
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FOREWORD

The inclusion of electric vehicles (EV) and EV Charging Facilities within buildings introduces a new hazard into the built environment. ACTF&R support the Australasian Fire and Emergency Service Authorities Council Limited (AFAC) Procedural Position for Electric Vehicles and EV charging equipment in the built environment available at www.afac.com.au. This position has been adopted by ACTF&R and forms the basis of this fire safety guideline.

PURPOSE

To provide guidance to relevant persons on the process for managing and addressing hazards associated with electric vehicles (EV) and EV charging infrastructure in the built environment.

EV BATTERY FAILURE

EV manufacturers use a variety of battery types to store energy. The most common type of battery used is a lithium-ion (or Li-ion) battery, a type of rechargeable battery in which lithium ions move from the negative electrode (anode) through an electrolyte to the positive electrode (cathode) during discharge, and back when charging.

EV battery failure events are currently reported to be occurring at a low frequency, however the hazard posed by a thermal runaway event may be of high consequence. The increase in the uptake of EV is anticipated to incrementally impact the frequency of failure events.

A failure event within an EV battery (such as mechanical, thermal abuse, rapid discharge, or internal cell failure) has the potential to lead to a thermal runaway event within the EV battery, which may pose significant challenges for firefighters in the management of the incident.

The types of hazards that may be represented at a failure event include but are not restricted to:

- Potential for the fire event to impact on the structural integrity of the structure.
- Exposure to high voltage direct current (DC) and alternating current (AC) electricity.
- Toxic and combustible vapour production.
- Potential for vapour cloud explosion.
- Potential for a rapid rate of fire spread.
- Significant fire duration (4+ hours) and protracted incident.
- Potential for secondary ignition.
- Potential for stranded electrical energy.
- Potential for contaminated run-off from firefighting water streams.
- Post-fire management of potentially hazardous waste material.

POSITION NEW BUILDINGS

ACTF&R consider the implementation of the National Construction Code (NCC) Clauses E1D17 (E1.10 NCC 2019) and E2D21 (E2.3 NCC 2019) as appropriate mechanisms by which to document and address the requirements for proposed installations of electric vehicle charging equipment and electric vehicles within the building.

For any new building/project containing a carpark (Class 7a building or part of a building) ACTF&R will require the completion of a risk assessment in the form of a 'Special Hazard Report' to be submitted to ACTF&R as part of the existing Building Approval process. Section 19 Building Regulation, 2008 (ACT). This does not apply to a class 1 building that contains a garage.

SPECIAL HAZARD REPORT

The Special Hazard Report is to identify the risks associated with the presence or potential presence of EV's and/or EV Charging facilities within the subject building and determine the required safety measures to mitigate these risks so far as is reasonably practicable (SFAIRP). The considerations in this document should be used when preparing a Special Hazard Report. The Special Hazard Report is to be prepared by person/s qualified or with experience in fire safety, risk assessment and electric vehicles.

The strategies and protective measures identified below are examples of risk mitigation measures that have been proposed and supported by stakeholders as part of the special hazard report - risk assessment process on projects submitted to ACTF&R to date. The strategies and protective measures below are not prescriptive requirements. They are included to provide guidance to consultants preparing special hazard reports and to developers and builders planning these projects.

The special hazard report risk assessment is required to generally follow the principles of ISO 31000 – Risk Management Guidelines.

As a relevant stakeholder ACTF&R will engage in the consultation process to assist in determining the level of risk and mitigation strategies applied, to establish what is considered reasonably practicable (SFAIRP).

The NCC is primarily a life safety document. The Special Hazard Report should focus on the life safety of building occupants and emergency services personnel and should recognise that due to the nature of the hazard there may be difficulties created for fire brigade intervention which should be considered.

As a minimum it is expected that the ABCB recommendations to support safer EV charging, identified in Figure 1 will be implemented. This does not negate the need to prepare a Special Hazard Report for a new building.

POSITION EXISTING BUILDINGS

ACTF&R recommends the same approach be taken to consider the hazards and reduce risk to the community and emergency services personnel when installing EV charging infrastructure to both new and existing buildings. ACTF&R recognise that in an existing building the ability to make significant changes to the building and the buildings fire safety systems may be limited and may be prohibitively expensive to the point that these are not considered reasonable mitigation measures. As a minimum it is expected that the ABCB recommendations to support safer EV charging, identified in Figure 1 will be implemented.

Failure to consider and mitigate the hazard from EV and EV charging infrastructure in the built environment may potentially render the existing buildings active and passive fire safety systems as no longer fit for purpose and as such not correctly maintained as required by the Emergencies Act, 2008 (ACT). Additionally, not addressing the new hazard in the building may result in a Person Conducting Business or Undertaking (PCBU) failing to provide a safe environment for occupants and workers within the built environment as required by Work Health and Safety Act, 2011 (ACT).

CONSIDERATIONS

Considerations	Strategy and protective measures *
<p>Location of EV charging stations and the proximity to other vehicles, exits, other fire safety systems, building utilities and critical infrastructure.</p>	<p>Consideration given to:</p> <ul style="list-style-type: none"> • Proximity to Fire Exits • Separation of Vehicles/Charging Points – either by adequate space or physical barriers • Location of Vehicles/Charging Points in relation utility/services infrastructure
<p>Suitability of fire safety systems and their location in proximity to the risk, including fire hydrants, fire detection systems, occupant warning systems, automatic fire sprinkler systems, and ventilation and smoke hazard management systems</p>	<p>AS2118.1 sprinkler system with additional provisions:</p> <ul style="list-style-type: none"> • Flow rate of 90L/min across 12 head design area. This equates to a discharge density of 7.5mm/min/m² when applied across 12 heads spaced at the maximum coverage area of 12m² per head as per AS2118.1:2017 • Fast response heads • Dual water supply (fed from 2 x town mains connections) <p>AS 1670.1:2018 smoke detection system in circulation spaces on a 10m spacing with AS 1670.4:2018 EWIS or AS1670.1:2018 BOWS; or AS 3786-2014 Interconnected Thermal Loop to all SOU sounder bases.</p> <p>Manual call points for fire alarm adjacent to each exit from the basement (including all fire stair exits and non-fire stair exits).</p> <p>Carpark ventilation system to AS 1668.1:2015</p> <ul style="list-style-type: none"> • Fans, drive, connections, control gear and wiring to be constructed for capable continuous operation at a temperature of 200°C for not less than 30 minutes (consistent with specification E21 of the BCA for smoke exhaust systems). • Be designed electrically as essential emergency equipment as required under clause C3D14 of the BCA and relevant electrical standards. • Provision for manual or automatic (acoustic dependent) operation to Full System Capacity over Full Ventilation Rate • Consideration to increased fan/system capacity over required Full Ventilation Rate <p>Consideration to smoke separation (lobbies) for Fire Stairs and Internal Lift Shafts</p>

Considerations	Strategy and protective measures *
<p>Establishing that the appropriate fire resistance (FRL) is applied to building elements.</p>	<p>Minimum FRL 120/120/120 – no concessions applied under S5C19 / S5C22 / S5C25</p> <p>AS2118.1 sprinkler system with additional provisions:</p> <ul style="list-style-type: none"> • Increased discharge density to minimum 7.5mm/min/m² • Fast response heads • Dual water supply (fed from 2 x town mains connections) <p>Consideration to increased FRL's (180 or 240 minutes)</p>
<p>The adequacy of vehicle separation to prevent fire spread with respect to directional flame jetting in EV fires. This includes special considerations for vehicle access in stacked parking arrangements or automatic vehicle parking systems.</p>	<p>Separation of Vehicles/Charging Points – either by adequate space or physical barriers</p> <p>AS 2118.1:2017 sprinkler system</p> <ul style="list-style-type: none"> • Increased discharge density to minimum 7.5mm/min/m² • Fast response heads <p>Dual water supply (fed from 2 x town mains connections)</p>
<p>Intervention capabilities of the local fire authority</p>	<p>Emergency (Manual or Automatic) shutdown controls for EV charging stations located within the FDCIE.</p> <p>EV charging points/stations indicated on the Block plans located at the FDCIE.</p> <p>Increased access points to Carpark Levels.</p>
<p>Provision of remote emergency shutdown controls and/or automatic shutdown for EV charging stations.</p>	<p>Emergency (Manual or Automatic) shutdown controls for EV charging stations located within the FDCIE.</p> <p>Provision of plans identifying the location of all EV charging stations, EV distribution boards and location of EV emergency shut down controls.</p>

Considerations	Strategy and protective measures *
<p>Application of any best practice standards for EV charging equipment.</p>	<p>There is no Australian Standard for EV charging equipment.</p> <p>Commercially available EV chargers used in the proposed building will either be:</p> <ul style="list-style-type: none"> • Type 1 (SAE J1772 commonly use in the US and Japan); or • Type 2 (IEC 62196 commonly used in Europe)
<p>Implementation of a regular maintenance schedule for EV charging equipment.</p>	<p>EV charging equipment will be subject to maintenance requirements as per the specific manufacturer requirements. The building owner/strata manager/owner's corporation are to implement a maintenance regime in accordance with the specific manufacturer's specifications.</p>

*The strategies and protective measures identified above are examples of risk mitigation measures that have been proposed and supported by stakeholders as part of the Special Hazard Report - risk assessment process. The strategies and protective measures are not prescriptive requirements. They are included as possible examples to provide guidance to consultants preparing special hazard reports and to developers and builders planning these projects. Buildings are different and the risk mitigation measures should consider the individual building characteristics and the specific hazards within the building. The above measures may not be applicable to all buildings. Risk mitigation measures should be prepared by a fire safety professional preparing the Special Hazard Report in conjunction with all stake holders.

ACTF&R PERFORMANCE SOLUTION CONSIDERATIONS

Several previously supported Performance Solutions may not be supported dependent upon the mitigation strategies implemented addressing the above considerations. These include:

- Carpark travel distances
- Omission of required Stair Pressurisation to Basement Levels
- Internal Discharge of Fire Stairs
- Separation of Rising & Descending Stairs
- Provisions/location for End-of-Trip Facilities

Figure 1: ABCB recommendations to support safer EV charging.

To support safer EV charging, the ABCB recommends:

 <p>Master isolation Provide a master isolation switch with signage at fire indicator panel/Fire Detection Indicator Control Equipment (FDCIE) or building entrance.</p>	 <p>RCM Tick compliance Use chargers that have the Regulatory Compliance Mark (RCM).</p>	 <p>Emergency services information pack (ESIP) ESIPs developed for each site and provided for first responders.</p>
 <p>Break glass fire alarm Provide additional break glass unit (BGU).</p>	 <p>Placarding site Provide placarding/signage to identify each EV charge points.</p>	 <p>Collision protection Provide vehicle impact bollards or stops.</p>
 <p>Block plans Block plans should be updated for existing sites and implemented for new builds to clearly show the location of charging hubs and master isolation.</p>	 <p>AS/NZS 3000 App P compliance Mode 3 and 4 chargers should only be installed by a qualified person and in accordance with AS/NZS 3000 Appendix P.</p>	 <p>Proximity to evacuation routes and flammable risks Carefully assess proximity to avoid blocking evacuation routes or placing chargers too close to other flammable risks.</p>
 <p>Regular maintenance Ensure the owner of the charging unit understands and meets their maintenance obligations.</p>	 <p>Complex buildings Complex buildings and higher-risk environments should seek comprehensive, specialist fire safety assessment and advice.</p>	 <p>Directional signage Directional signage to be provided – to the charging units and to the emergency exits.</p>
 <p>Smart charging Where possible, prioritise the use of 'Smart charging' to enable remote monitoring and access to disconnect power supply to a connected EV. This gives emergency responders another potential method of shutdown from unit to EV. Encourage operators to monitor for faults and provide early intervention when detected.</p>	 <p>Placarding at site entrance Sites with 5 or more Mode 3 or 4 chargers to install ground level or other appropriate level placards to indicate which entrance is most closely located to EV charging hub.</p>	 <p>Pre-incident plans (PIP) Where 5 or more chargers are installed, then building owners should invite local fire crews to attend a site familiarisation visit in order to develop a pre-incident plan (PIP).</p>

VERSION CONTROL

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AMENDMENT HISTORY

Version	Description of changes
1.0	First edition: January 2003
1.1	Recognition of ABCB EV guidance document. Minor Editorial Changes/Transfer to new template.



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