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Any HEADING is for reference only and has no regulatory effect.

A capitalised and italicised word in this document is defined in the FIA International Sporting Code (*Code*), the National Competition Rules (*NCR*), including their Appendices or this document.

INFORMATION FOR ORGANISERS AND OFFICIALS

This document is to provide information for an Electric Vehicle (*EV*) participating in a *Competition*. This information is for the development of *Event* specific Safety Plans and for the *Event* officials to familiarise themselves with the safety considerations when dealing with an *EV*.

The information in this document is to be read in conjunction with the *FIA* requirements for an Electrically Powered Vehicle in Appendix J, Articles 251 and 253 to the *Code* at www.fia.com:

For the technical requirements for an *EV* refer to Electric Vehicle Appendix - Technical Regulations.

INFORMATION NOTE:

EV's are common in everyday society in different forms, such as trains, trams, buses and golf karts. A *Series Production EV* is built with more safety systems than the domestic power supplies in our houses and work places. The regulations applicable to a *Competition EV* incorporate these safety systems for the safety of others. These *EV* safety systems and the information contained within this document are designed to enable effective risk management for a range of scenarios to be implemented by an *Organiser*.

STANDING REGULATIONS

DEFINITIONS

Electric Vehicle (*EV*)**:** An *EV* uses one or more electric motors or traction motors for propulsion. An *EV* may also utilise forms of regenerative charging to recharge and propel or retard (brake) the vehicle.

Series Production EV**:** an *EV* produced by a manufacturer, approved for and able to be registered for general road use which is used in a *Competition*.

Competition EV**:** an *EV* produced solely for the purpose of *Competition* or a *Series Production EV* in which the *EV* components, equipment and/or systems have been modified outside of the standard manufacturer specification/s.

An *EV* may be:

> ***Hybrid EV*****:** the electric motor provides tractive force to move the *Automobile* in conjunction with or independent of an internal combustion (*IC*) engine. The *IC* engine, in conjunction with a generator, provides the charging for the battery pack.
>
> ***Plug-In Hybrid EV*****:** the battery pack is rechargeable by being plugged into an external power source. The tractive force to move the *Automobile* may then be provided by the electric motor or supplemented by an IC engine, which may also provide charging through a generator.
>
> ***Battery EV*****:** the battery pack is rechargeable by being plugged into an external power source. The tractive force to move the *Automobile* is provided only by an electric motor

Other definitions for the components of an *EV* are contained in *FIA* Appendix J Article 251 and 253.

Other definitions may be added as required.

Electric Vehicle Response (EVR)

The following are the requirements for an *Organiser* and when an official responds to an incident involving an *EV*. Each *Organiser* is to utilise these requirements in the preparation of the EV Safety Plan for each *Event* which is to include *EV*'s.

1. PERSONAL PROTECTIVE EQUIPMENT (*PPE*)

Direct contact with an EV power source may cause serious injury.

PPE is designed to provide protection for the wearer against electric shock as a result of contact with an EV power source.

If the Electrical Status of an *EV* is not confirmed as "safe", any official required to touch it must wear PPE.

Table 1: PPE Items and Standards

Item and Standard	Who / Where	Reason	Example
Gloves complying with AS2225 (ASTM D120, IEC/EN 60903) providing protection up to 1000 volts. Recommended to be worn with an inner cotton glove and outer leather glove for additional protection.	Including: Medical Intervention and extrication responder. Fire/rescue official. Service Park or Pit/Paddock/Grid official. Recovery official.	Protection against electrical shock where the electrical status is unknown or not confirmed as "safe". i.e. stalled car, during a recovery	Glove with outer leather glove  Inner cotton glove 
Face shield - helmet mounted or visor style.	Including: Medical Intervention and extrication responder. Fire/rescue official.	A face shield is designed to protect the face of the wearer from potential electrical "arc flash". A face shield is required by any official involved in the first intervention at an incident.	

Face mask/respirator complying with the industry standard for firefighting (i.e. P3 - AS/NZS1716)	Including: Fire official.	A face mask/respirator assists in preventing fumes when responding to a fire. Note: The fumes from an EV fire may be toxic.	 
Footwear complying with the industry standard for electric shock protection (i.e. AS/NZS 2210)	Including: Medical Intervention and extrication responder. Recovery official. Fire/rescue official.	Protection against electrical shock where the electrical status is unknown or not confirmed as “safe”.	

1.1 PPE – Further information

Electrical Protection Gloves

Australian Standard 2225 compliance inspections are required and must be clearly recorded on each glove.

The electrical protection gloves are fragile and susceptible to damage and must:

- preferably not be worn unless required;
- be stored as per the manufacturers requirements as they can be affected by external conditions;
- be maintained as per the manufacturer’s requirements;
- be regularly inspected for cuts and tears;
- not be used if found to be defective.

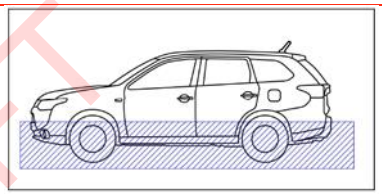
If a glove is suspected to be damaged it can be pressure tested for pinholes by sealing the entry to the glove and compressing the air trapped. Any loss of air indicates the glove is defective.

In addition to the electrical protection glove, an outer leather glove such as those worn by riggers, are recommended to be worn to give protection against damage of the electrical protection glove. A poly cotton glove may also be worn under the electrical protection glove for extra comfort during long periods – they are excellent for absorbing perspiration and also for hygiene. A cotton glove must not be shared and disposed of by the wearer at the end of the *Event*.

2. SAFETY AND RESPONSE EQUIPMENT

Table 2: Safety and Response Equipment

Item	Who / Where	Reason	Example
High voltage rescue hook providing protection up to 1000 volts	Including: Medical intervention vehicle. Service Park or Pit/Paddock area in the vicinity of the *EV*.	Used in case of paralysing electrical shock to pull an individual away from the electrical power source.	

Automatic External Defibrillator (*AED*)	Including: Medical intervention vehicle. Venues. Service Park or Pit/Paddock area.	Available for electric shock and other medical emergency resuscitation.	
Fire Extinguisher	Including: Fire official. Venues. Service Park or Pit/Paddock area.	For a fire which may have an electrical hazard. Encapsulator Agent extinguisher systems are available which may present organisers with the most suitable extinguisher system for an EV fire.	See further fire extinguisher information below.
Water bath	Venues	Reduce cell thermal runaway by submersing in high volumes of water. The practicality of a water bath can be challenging as it may also require lifting equipment with the ability to lift and lower the vehicle into the body of water. An alternative is to have a high-volume water supply available capable of quenching the cells for a sustained period.	
Emergency Response Guide (*ERG*)	Including: *Organiser*. Medical intervention and extrication responder. Recovery official. Fire official.	*EV* manufacturer produced *ERG* to be available for each *EV* competing at an *Event*. For *Production EV* these are commercially available e.g. ANCAP Rescue APP https://www.ancap.com.au/apps	

2.1 Safety and Response Equipment – Further Information

Rescue hook – HV

The use of a rescue hook is essential to protect a responder when retrieving a person suffering a paralysing electric shock. Each rescue hook must be maintained in accordance with the manufacturer's instructions.

A rescue hook must be available to any person likely to respond to an *EV* incident and in any *Reserved Area* where an *EV* is located.

Automatic External Defibrillator (*AED*)

An *AED* is a portable electronic device used to help those experiencing certain types of cardiac arrest, e.g. as a result of a high voltage electric shock. It must be available and clearly marked with the sign below to any person likely to respond to an *EV* incident and in any Reserved Area where an *EV* is located.

Training in the use of the device is recommended for any official likely to be involved in an *EV* incident response.

Pic 4: AED Sign

Fire Extinguishers / Water bath

(a) Firefighting equipment for extinguishing electrical fires must be provided by the *Organiser* – refer Table 3.

(b) For an initial incident response, which involves the extrication of occupants from an *Automobile* the use of ABE Powder or Encapsulate Agent is recommended to minimise the risk of electrocution. CO^2 Extinguisher may present a risk to occupants of automobiles due to the concentration of CO^2 in a confined space.

(c) In the case of a lithium-ion or lithium-polymer battery cell:

a significant amount of water may be necessary to extinguish a fire noting that this type of battery is susceptible to fire re-ignition for an extended period. The use of a water bath may be effective in these situations. The runoff of such water and any potential environmental impact needs to be considered.

OR

the use of an Encapsulate Agent type extinguishers, such as F-500 (http://f500ea.com.au/), has been demonstrated to be effective in the control of a lithium-ion battery fire. This is a water type extinguisher mixed with the encapsulate agent and therefore this extinguisher is not to be used on AC (100V AC or higher) electrical fires.

NOTE: most EV's utilise DC not AC except where charging from a power source originating from an AC supply.

In some cases, such a fire may be better managed to burn itself out in a controlled environment.

NOTE: A fire can generate toxic smoke and fumes.

Table 3: Extinguisher types

Extinguisher Type	Use	Suitable for EV
	Suited for live electrical equipment CO^2 Extinguisher may present a risk to occupants of automobiles due to the concentration of CO^2 in a confined space.	YES
	Suitable for live electrical equipment May damage electronic and other components due to ingress of powder	YES
Encapsulator Agent (i.e. F-500 EA at: http://f500ea.com.au/)	Suitable for the containment of lithium-ion battery fires. This extinguisher is not to be used on AC (100V AC or higher) electrical fires.	YES

Water Bath	Thermal cell runaway – used to contain a lithium-ion or lithium-polymer battery fire where there is a likelihood of re-ignition.	YES
	Not suitable for live electrical equipment fires	NO
	Not suitable for live electrical equipment fires	NO

Emergency Response Guides

A range of *Series Production EV ERG* are available at:

https://www.ancap.com.au/apps

www.nfpa.org/Training-and-Events/By-topic/Alternative-Fuel-Vehicle-Safety-Training/Emergency-Response-Guides - American information site, may not have all relevant *ERG* applicable to Australia

Information concerning an emergency response for an *EV* can be found in the documentation provided by the *Competitor* to the *Organiser* – refer EV Technical Regulations.

The *ERG* must include details of the Status or Safety Indicator and the method of isolating the *HV* system (e.g. disconnection of a main *HV* system plug, cutting of a cable) that is applicable to that *EV*.

3. INCIDENT NOTIFICATION

An *Organiser* must be aware of the requirements of any Authority as a result of an incident involving an *EV* including:

(i) Notifiable incident under Workplace Health and Safety legislation.

(ii) Environmental management of chemical waste and/or other by-product.

(iii) Any report required by *Motorsport Australia*.

4. SIGNAGE

Each *EV* must have signage for component identification, affixed in accordance with the Electric Vehicle Appendix – EV Technical Regulations, in addition to any other compulsory signage requirements.

Table 4: Signage - examples

Sign	For	Location
	**High Voltage (*HV*)** Identify any HV component.	At each *HV* component.

	**Emergency Stop Switch (*ESS*)** A safety switch when activated isolates the general circuit breaker and each HV component.	For a closed *Competition EV*, one switch inside the cockpit and another outside.
	**Electric Vehicle (*EV*)** External identification that the vehicle is an *EV*.	Must be fitted in the vicinity of the vehicle competition number. Each side of the triangle must be 150mm. For Rally/Road Competition an additional triangle of 80 mm side in the vicinity of the front and rear registration number plate.
	**HV Cable** Identification of each *HV* cable	Each *HV* cable is to be coloured orange.

NOTE: Additional signage may be required at the discretion of *Motorsport Australia* or the *Organiser*.

5. ELECTRIC VEHICLE STATUS INDICATOR

Each *EV* has display lamps which advise the *Driver*/crew and officials of the status of the *Automobile*, its safety and if it is in a powered and ready to move state.

Status indicators may differ from one *EV* to another.

The *Organiser* must be familiar with the Status Indicators and their meaning for each *EV* competing, as detailed in the EV Technical Regulations, and that this information is available to each official and is included in any officials' briefing.

5.1 Safety Indicator – Series Production EV

The **SAFE** status as described in the *ERG* is that which means that the *Automobile* is not engaged to move through *EV* tractive force.

5.2 Safety Indicator – Competition EV

RED means danger

During incident management the *Automobile* must be considered as "electrically live" when the **RED** status is indicated, and the necessary steps taken to manage the risk of electric shock.

GREEN means safer

When the **GREEN** status is indicated the *Automobile* can be considered as safe to undertake any necessary response or work. Attention is still required when working in the vicinity of the electrical components of the *Automobile*.

The activation of any Emergency Stop Switch will render the *Automobile* **SAFE** and its status **GREEN**.

5.3 Ready to Move indicators – Series Production EV

Series Production EV are generally fitted with Daytime Running Lights (*DRL*) or similar which when illuminated indicate that if the accelerator pedal is depressed it will move.

5.4 Ready to Move Indicators – Competition EV

Competition EV are fitted with a White light at the front and an Orange light at the rear which when illuminated indicate that if the accelerator pedal is depressed it will move.

6. EV RESPONSE (EVR) PLAN

The potential for an electric shock must be considered in attending any *EV* incident.

6.1 The 3 Step Electric Vehicle Response "PROCESS"

In general, the process for attending an incident involving an EV can be summarised in 3 steps.

1 – APPROACH

Approach the cockpit location from the side.

Ensure that all attending are wearing the required PPE and have the necessary equipment, e.g. rescue hook.

2 – CHECK STATUS

Series Production EV

Check the Status Indicator in accordance with the *ERG* for that *EV*.

If **SAFE Status** is displayed, proceed.

If **UNSAFE Status** is displayed:

(i) immediately advise others in the vicinity that the status is **UNSAFE**.

(ii) check if the Ready to Move Indicators is illuminated, and if so, follow the procedure in the relevant *ERG*. If this requires opening a door or similar (e.g. to disconnect an *HV* system plug, cut a cable), proceed with caution.

Competition EV

If the status light is **GREEN**, proceed accordingly.

If the status light is **RED** or **OFF**:

immediately advise others in the vicinity that the status is **RED;**

check if the Ready to Move Indicators is illuminated, and if so;

firmly depress the **Emergency Stop Switch** and if fitted the **Battery Isolator Switch**. If as a result of these actions the **GREEN** light is illuminated proceed accordingly.

Status Notification

The status of the *EV* must be communicated to any person who may be involved at a later time, e.g. the Clerk of the Course, Recovery/Tow officials, Fire officials, Scrutineers, team personnel.

Status not confirmed

If the status of the *EV* cannot be confirmed **SAFE**, the *HV* systems of the *EV* must be treated as live.

3 – RECOVERY

Provided the appropriate *PPE* is worn and if the status is confirmed **SAFE**, *EV* recovery may proceed accordingly. Collection of any damaged part must be carried out with care.

It may be required to disengage any drive gear, e.g. activating any neutral switch marked "N" which may be located on the external body work or within the cockpit.

Be aware that the status may change during any recovery procedure in which case it must be reported immediately to the *Organiser.*

Important Points

Do not put yourself in danger, assess each situation before proceeding.

Ensure that all PPE is ready to use and in good condition.

The HV parts may not be isolated so the use of *HV* gloves provides a level of protection until such time as the *EV* is deemed **SAFE** to touch.

If the status is not confirmed proceed with caution and if touching the *EV* only use *HV* gloved hands.

For electric current to flow it must have a pathway, or circuit, to follow. This may be to the ground or back to the vehicle. A single insulated point of touch will limit the ability to create a circuit for the current to flow.

7. EV SERVICE AND CHARGING

7.1 Charging

(a) Charging must be by conductive means.

(b) Charging an *EV* directly from a general-purpose alternating-current (AC) electric power supply (i.e. mains or domestic power general power point) at an *Event* is prohibited.

(c) Any *EV* charging station installation must be installed by a licenced person following the Code of Practice for Electrical Vehicle Charging and subject to an Installation Certificate of Compliance applicable to the local legislation.

(d) The charging system must be automatic and must ensure that the battery cannot be overcharged or damaged if left permanently connected to the charger.

(e) The use of a diesel or petrol generator is strongly discouraged.

(f) An *EV* which is being serviced or is undergoing a recharge must be isolated and identified as being in a service or recharge condition.

(g) Each *Competitor* must ensure the necessary policies, procedures and PPE are utilised when undertaking any work on their EV.

For specific technical specifications and requirements for EV charging refer to the *Motorsport Australia* Electric Vehicle Appendix - EV Technical Regulations.

7.2 Isolation

An isolated area must be set aside for servicing and charging and delineated by bollards with rope, tape or similar and clearly marked as a NO GO zone for any person not otherwise involved.

7.3 Signage

Any *EV* must be clearly identified with a sign/s when undergoing service or charging. The signage must include the High Voltage warning sign and the words KEEP CLEAR.

i.e.

8. PERMITTED COMPETITIONS

A *Series Production EV* is permitted in a Rally/Road, Auto Test or Speed *Competition*.

A *Series Production EV* may be permitted in other *Events* subject to the approval of *Motorsport Australia* and which may include other or different conditions to those below.

A *Competition EV* is only permitted with the approval of *Motorsport Australia*.

When applying for an *Organising Permit*, the *Organiser* must submit an EV Safety Plan and Venue/Property Owner Approval for the participation of an *EV* in accordance with the EV Standing Regulations.

8.1 Rally / Road

(a) For a Rally/Road *Competition,* the EV Safety Plan must include:

(i) the requirements for emergency response including MIV and any responding personnel. The *Organiser* must ensure that the emergency response provider is briefed on the participation of an *EV*;

(ii) Information regarding any Civil emergency response plan (e.g. fire service) which includes confirmation that such providers have been advised that an *EV* is participating and noting any conditions that those providers may require.

(iii) The requirements for PPE and Safety and Response Equipment to suit the *Event*, ensuring coverage of the *EV* risk to those responding to an incident and for the protection of the *Event* venue.

(b) Information for Competitors

Provide advice (briefing or otherwise) to each *Competitor* and their crew that an *EV* is participating and any safety management criteria which may need to be addressed if they are the "first on scene" at an incident involving an *EV*. This must include access to the relevant *ERG* for each *EV* participating to assist in such a response.

8.2 Auto Test / Speed

(a) For an Auto Test or Speed *Competition*, the EV Safety Plan must include:

(i) the requirements for the emergency response providers including any responding personnel. The *Organiser* must ensure that the emergency response provider is briefed on the participation of an *EV*;

(ii) Information regarding any Civil emergency response plan (e.g. fire service) which includes confirmation that such providers have been advised that an *EV* is participating and noting any conditions that those providers may require.

(iii) The requirements for PPE and Safety and Response Equipment to suit the Event, ensuring coverage of the EV risk to those responding to an incident and for the protection of the Event venue.

(b) Information for Competitors

Provide advice (briefing or otherwise) to each *Competitor/Driver* that an *EV* is participating and any safety management criteria which may need to be addressed regarding an incident involving an *EV*. This must include access to the relevant *ERG* for each *EV* participating to assist in such a response.