

**Overview**

This standard is designed for those who provide a first response to a broken-down or accident damaged electric vehicle, for example, those working for the emergency services and roadside recovery operators; the standard would also be appropriate for those involved in the dismantling and disposal of electric vehicles. It covers the working practices and knowledge needed to carry out a risk assessment and work safely around an electric vehicle that may have damage to its high and/or low voltage systems.

For the purposes of this standard, an electric vehicle is any vehicle that is in part or wholly electrically propelled. This would include:

- Hybrid (HEV) - to include mild/micro hybrid vehicles where the voltage is considered dangerous.
- Plug-in Hybrid (PHEV)
- Extended Range Electric Vehicle (ER-EV) or Range Extended Electric Vehicle (RE-EV)
- Battery Electric Vehicle (BEV) or Pure Electric Vehicle (PEV)
- Fuel Cell Electric Vehicle (FCEV).

**This standard does not deem someone competent to maintain, service or repair an electric vehicle's high voltage systems and their components.**

**Performance  
criteria**

You must be able to:

- P1 Identify the electric vehicle type and collect relevant information about the **vehicle and associated hazards**
- P2 Wear personal protective equipment (PPE) and use safety equipment in line with your working procedures and appropriate to the work activities you are carrying out. **Please note, this does not include specific PPE for working on the high voltage system.**
- P3 Carry out a dynamic risk assessment to identify the **potential hazards** presented by the electric vehicle, assess the risks and formulate an agile mitigation plan
- P4 Follow the correct procedures to make the **vehicle** safe prior to starting any work activities. **If the procedure to do this is NOT within your level of training, competence and authority, refer to the relevant person.**
- P5 Carry out work activities in a way that minimises risks to yourself, other people and the environment
- P6 Recognise when the **vehicle** has problems you cannot deal with yourself, refer to a relevant person and follow their instructions
- P7 Record and report the work activities you have carried out on or near the **vehicle** to relevant person.
- P8 Follow a robust, documented/logged handover procedure

## Knowledge and understanding

You need to know and understand:

### Use of technical information

- K1 How to identify an electric **vehicle** and its type
- K2 How to find, interpret and use sources of information applicable to electric vehicles as appropriate to your job role
- K3 How to identify high voltage electrical components in an electric vehicle

### Legislative and organisational requirements and procedures

- K4 The health and safety legislation, industry codes of practice or guidelines and workplace procedures relevant to working on, near or with electric vehicles, and the safety of the working environment
- K5 How to carry out a dynamic risk assessment on damaged and broken-down electric vehicles
- K6 How to formulate an agile plan to mitigate any risks
- K7 The manufacturer's and your workplace procedures for:
  - K7.1 assessing and managing the risks associated with damaged and broken down electric vehicles
  - K7.2 identifying the **indicators** associated with unstable electric vehicles
  - K7.3 ensuring that the **vehicle** has been made safe as appropriate to the work you are carrying out, within your level of training, competence and authority
  - K7.4 referring/reporting problems when working with electric vehicles, including when the actions required fall outside of your level of responsibility/authority
  - K7.5 recording and reporting work carried out on electric vehicles
- K8 Organisational procedures that must be followed in the event of electric shock
- K9 The procedure to follow if the situation includes electric vehicle supply/charging equipment (EVSE)
- K10 The importance of adhering to a robust, documented handover procedure

### High voltage component construction and layout

- K11 The fundamental features and principles of high voltage components, including battery modules, electric motors, associated components and auxiliary systems

You need to know

and understand:

- K12 How to identify the location of high voltage cables and components, for example, by labelling and colour
- K13 **The fundamental features and principles** of alternative fuel sources and systems on electric vehicles, including hydrogen fuel cells

#### **Vehicle system operation**

- K14 The main differences between an electric vehicle and a non-electric vehicle and its basic operation, including regeneration
- K15 The charging systems associated with electric vehicles and how to use them safely, including the use of plug-in charging equipment
- K16 The specific manufacturer's guidelines and the precautions necessary when charging, connecting an auxiliary power source to or **moving** an electric vehicle
- K17 How to safely mobilise/relocate an electric vehicle
- K18 **How to safely and effectively immobilise an electric vehicle within your level of authority/competency**
- K19 **When vehicle systems may self-operate**

#### **Hazards associated with electric vehicles**

- K20 The **hazards** associated with high and low voltage systems including batteries and other high voltage electrical vehicle components
- K21 The **implications and effects** of **electricity** through the human body
- K22 The **hazards** associated with alternative fuel systems, including hydrogen fuel cells
- K23 The **hazards** associated with electric vehicles when exposed to extreme temperatures, impact and other adverse conditions
- K24 **The indicators of thermal runaway**
- K25 **The implications and hazards of remote vehicle control**

**Scope/range**

1. **Vehicle** - any vehicle that is in part or wholly electrically propelled. This would include
  - 1.1. Hybrid (HEV) - to include mild/micro hybrid vehicles where the voltage is considered dangerous.
  - 1.2. Plug-in Hybrid (PHEV)
  - 1.3. Extended Range Electric Vehicle (ER-EV) or Range Extended Electric Vehicle (RE-EV)
  - 1.4. Battery Electric Vehicle (BEV) or Pure Electric Vehicle (PEV)
  - 1.5. Fuel Cell Electric Vehicle (FCEV)
2. **Hazards** may include:
  - 2.1. High voltage
  - 2.2. Unpredictable vehicle movements
  - 2.3. Gases
  - 2.4. High-voltage system residual charge
  - 2.5. Highly magnetic components
  - 2.6. Fuel explosion
  - 2.7. Hazardous materials
  - 2.8. Leaking electrolytes
  - 2.9. Pressurised systems
3. **Indicators** may include:
  - 3.1. Visual vehicle warning alerts
  - 3.2. Audible vehicle warning alerts
  - 3.3. Smoke or vapour emission
  - 3.4. 'Popping', 'crackling' or 'hissing' sound
  - 3.5. Burning smell
  - 3.6. Strong odour
  - 3.7. Physical impact damage

**Additional  
Information****Glossary**

*This section contains examples and explanations of some of the terms used but does not form part of the standard.*

**Dynamic risk assessment** - the practice of continually mentally observing, assessing and analysing an environment while working, to identify and remove risk. The process allows individuals to identify a hazard on the spot and make quick decisions in regard to their own safety.

**Handover procedure** – to include mark up of vehicle and detailed incident record, including hazards encountered and actions taken.

**Hazards associated with high voltage electrical vehicle components** - exist not only during work on high voltage systems, as specified above, but also on all other high-power electrical drive systems and high-pressure storage systems. Vehicle and equipment manufacturers' guidance should be followed at all times.

**High voltage** – Regulation No 100 of the Economic Commission for Europe of the United Nations (UNECE) — Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train, states that: 'High Voltage' means the classification of an electric component or circuit, if its working voltage is  $> 60 \text{ V}$  and  $\leq 1\,500 \text{ V DC}$  or  $> 30 \text{ V}$  and  $\leq 1\,000 \text{ V AC}$  root mean square (rms). Electricity at Work Regulations (1989), and associated HSE guidance should be followed at all times.

**N.B. Some electric vehicles may operate at voltages below or above industry recognised standards.**

**Relevant person** - May be someone within your organisation, or other authority.

**Relocate** - Minimal movement to facilitate a rescue.

**Sources of information applicable to electric vehicles** - Examples include **manufacturer guidance**, hard copy manuals, **online data** and data obtained from on-board diagnostic displays. **It may also include control room or other personnel,**

---

the vehicle driver or passengers.

**Work activities** – dealing with electric vehicles in the course of an emergency first response or recovery.

FINAL DRAFT

<b>Developed by</b>	IMI
<b>Version number</b>	3
<b>Date approved</b>	December 2020
<b>Indicative review date</b>	December 2023
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating organisation</b>	IMI Ltd
<b>Original URN</b>	IMIEV2
<b>Relevant occupations</b>	Emergency First Responders; Firefighters; Police; Vehicle Recovery Operator (Automotive); Roadside Assistance Senior Operator (Automotive); Roadside Assistance; Roadside Assistance Manager (Automotive); Vehicle Recovery Technical Operator (Automotive); Supervisory Vehicle Recovery Technical Operator (Automotive); Vehicle Dismantler; Vehicle Recycler
<b>Suite</b>	Electric and Hybrid Vehicles; Vehicle Recovery; Roadside Assistance
<b>Key words</b>	Electric Vehicle; recovery; assistance; breakdown; accident; damage