

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
- 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

Glossary

Additional Information

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.

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