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## 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 roadside recovery operators and the emergency services; 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.**

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## Performance criteria

### You must be able to:

P1 Identify the electric **vehicle** type and collect relevant information about the **vehicle** and associated electrical hazards

P2 Wear personal protective equipment (PPE) and use vehicle protection equipment (VPE) appropriate to the work activities you are carrying out

P3 Identify the hazards and assess the risks presented by the electric vehicle

P4 Follow the correct procedures to make the **vehicle** safe prior to starting any work activities, including where necessary, isolating high voltage electrical systems, within your level of authority

P5 Carry out work activities in a way that minimises risks to yourself and other people

P6 Refer any problems with the **vehicle** that you cannot deal with yourself to a relevant person in your organisation and follow their instructions

P7 Record and report the work activities you have carried out on or near the **vehicle** to relevant colleagues.

## 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, including the appropriate personal protective equipment and its use, and the safety of the working environment

K5 The hazards associated with high and low voltage systems including batteries and other high voltage electrical vehicle components

K6 The manufacturer's and your workplace procedures for:

K6.1 assessing and managing the risks associated with damaged and broken-down electric vehicles

K6.2 ensuring that the **vehicle** has been made safe as appropriate to the work you are carrying out, including isolating high voltage systems when necessary within your level of training

K6.3 referring/reporting problems when working with electric vehicles

K6.4 recording and reporting work carried out on electric vehicles

K7 How to carry out a dynamic risk assessment on damaged and broken down electric vehicles, including components and cabling, battery integrity, shorting and loss of coolant

K8 The implications of electrical conductivity through the human body

K9 The implications of strong magnetic fields and the effects on medical devices

K10 Organisational procedures that must be followed in the event of electric shock

K11 The hazards associated with electric vehicles when exposed to extreme temperatures, impact and other adverse conditions

K12 What to do in an emergency, including fires and submersion of the **vehicle** in water

### High voltage component construction and layout

K13 The fundamental features and principles of high voltage components, including battery modules, electric motors, associated components and auxiliary systems

K14 How to identify the location of high voltage cables and components, for example, by labelling and colour and their associated voltages

K15 The different types of energy storage systems and voltages associated with electric vehicles

K16 The components of alternative fuel sources and systems on electric vehicles, including hydrogen fuel cells

K17 The hazards associated with alternative fuel systems, including hydrogen fuel cells

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### **Vehicle system operation**

K18 The main differences between an electric vehicle and a non-electric vehicle and its basic operation, including regeneration

K19 How to safely operate an electric **vehicle**

K20 The charging systems associated with electric vehicles and how to use them safely, including the use of plug-in charging equipment

K21 The specific manufacturer's guidelines and the precautions necessary when charging, connecting an auxiliary power source to or towing an electric vehicle

K22 How to mobilise an electric vehicle safely

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## 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)

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## 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 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 regards to their own safety.

**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.

### Sources of information applicable to electric vehicles

Examples include hard copy manuals, data on computer and data obtained from on- board diagnostic displays.

**Status of vehicle** – broken down, with damage which may present a hazard, end of life.

**Work activities** – recovering, collecting or dealing with electric vehicles as part of a first response.

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