# Loss Prevention Standards

## Electric and Hybrid Vehicle Awareness

### Introduction

This guide is intended to be used in conjunction with and complement your Motor, Liability and Property insurance policy documentation. Use the information to evaluate your current motor trade operational policies and procedures and to highlight any potential deficiencies in them.

Driven by the need for lower emissions, better fuel economy and higher efficiency, electric and hybrid vehicles are growing in popularity and are a common sight on the road network.

The three main types of electric vehicle are:

- Battery electric vehicle (BEV)*, which is powered solely by a rechargeable battery
- Hybrid electric vehicle (HEV)*, which is driven by both an electric motor and an internal combustion engine, with the ability to recharge the battery whilst in motion
- Plug-in hybrid electric vehicle (PHEV)*, like a HEV although having a much larger battery with an extended range, and can be charged via the electricity network

**The above are referenced throughout this document as EV or E&HV.*

In all cases, a high voltage lithium-Ion battery is used to store electrical energy (currently up to 650 volts direct current) which could lead to serious injury and a real danger of death if not handled correctly.
This technology, whilst ground-breaking, is already challenging the Motor Industry to introduce new systems of work, particularly around the recovery, repair and storage of damaged vehicles.

### Risks of Working with Electric and Hybrid Vehicles

There are many additional workplace hazards imposed on the motor trade; these include:

- The potential for the electrical systems on the vehicle to affect medical devices such as pacemakers
- The presence of high voltage components and cabling capable of delivering a fatal electric shock
- The storage of electrical energy with the potential to cause explosion or fire
- The potential for increased battery temperature, thermal runaway and fire
- Components that may retain a dangerous voltage even when a vehicle is switched off
- Electric motors or the vehicle itself that may move unexpectedly due to magnetic forces within the motors
- Manual handling risks associated with battery removal and replacement
- The potential for the release of explosive gases and harmful liquids if batteries are damaged or incorrectly modified
- The possibility of people being unaware of vehicles moving as when electrically driven they are silent in operation

### Working Safely with Electric and Hybrid Vehicles

Additional skills and training will be necessary to allow employees to work safely with E&HVs. The levels of competency required will vary greatly and are dependent on the type of work that people are expected to undertake. For example, an awareness of the additional risks is likely to be all that is required for employees who undertake vehicle sales or valeting, but employees involved in the recovery of damaged or disabled vehicles and their subsequent repair and maintenance are likely to need a much greater level of competence. Specific training with qualifications awarded by organisations such as Thatcham Research, The Institute of Vehicle Recovery and The Institute of the Motor Industry may be necessary.

Five categories of work activities have been identified that require additional knowledge and training:

- Incident response, including emergency services and vehicle recovery
- Working on high voltage electrical systems
- Maintenance and repair, excluding high voltage electrical systems
- Storage, salvage and transportation of damaged batteries
- Valeting, sales and other lower risk activities

The level and type of training required for each category of work should be determined as part of your risk assessment process.

## Incident Response Including Emergency Services and Vehicle Recovery

Vehicles should be visually checked for signs of damage to high voltage electrical components or cabling (usually coloured orange). Consider whether the integrity of the battery is likely to have been compromised; *high voltage batteries are often mounted in vulnerable areas of the vehicle, such as under the boot floor and are particularly susceptible to damage in rear-end road traffic collisions.* Shorting or loss of electrolyte may present ignition sources in the event of fuel spillage. If the vehicle is damaged or faulty, and if safe to do so, isolate the high voltage battery system using the isolation device on the vehicle. Refer to the manufacturer's instructions for guidance.

When placing the disabled vehicle onto the recovery truck, the ignition key, often referred to as the remote operation key, should be removed from operational distance and the standard 12/24v battery disconnected to prevent the vehicle from being activated/started.

Recovery operative should have prior knowledge, where possible, that the disabled vehicle is an EV and have access to reliable sources of safety information for that vehicle. Avoid towing an E&HV unless it can be determined that it is safe to do so, as dangerous voltages can be generated by movement of the drive wheels.

When an EV/hybrid vehicle is or has been submerged, it may result in damage to the high-voltage batteries, significantly increasing the risk of electric shock. It is essential that EV/hybrid vehicles are treated as though there is still high voltage present.

## Maintenance of High Voltage Electrical Systems

It is imperative that maintenance operatives refer to vehicle specific information from the manufacturer (and trade bodies) to identify precautions needed to work safely.

Remote operation/ignition keys should always be kept away from the vehicle, to prevent any accidental operation of electrical systems and/or movement of the vehicle. Keys should be locked away with access controlled by the person working on the vehicle. If the key is required, the person working on the vehicle should check that the vehicle is in a safe condition before the key is retrieved and used.

Visually check the vehicle for signs of damage to high voltage electrical components or cabling (usually coloured orange).

High voltage systems should be isolated (i.e. the power disconnected and secured so that it cannot be inadvertently switched back on) and proven to be isolated by testing before any work is undertaken. Always isolate and lock off the source of electricity in accordance with manufacturer's instructions. Even when isolated, vehicle batteries and other components may still contain large amounts of energy and retain a high voltage for some considerable time. Refer to manufacturer's data on how to discharge stored energy. Approved tools and test equipment should be used; these may include electrically insulated tools and test equipment compliant with GS38: *Electrical test equipment for use on low voltage electrical systems,* a guidance note published by the Health and Safety Executive.

There may be circumstances (e.g. after collision damage) where it has not been possible to fully isolate the high voltage electrical systems and to discharge the stored energy in the system. Refer to the manufacturer's instructions for further control measures to be implemented before attempting to carry out further remedial work.

Battery packs are susceptible to high temperatures. The vehicle will typically be labelled advising of its maximum temperature and this should be considered when undertaking operations such as painting, where booth temperatures may exceed this limit. Working on live electrical equipment should only be considered when there is no other way for work to be undertaken. Even then it should only be considered if it is both reasonable and safe to do so and following a full assessment of the risk, and where necessary work on live electrical systems should only be undertaken by those competent to do so and should be subject to an appropriate permit to work and lock out procedures. Refer to manufacturer's instructions for precautions when working live, including their personal protective equipment (PPE) requirements.

It may be necessary to locate the vehicle within an EV 'safe working zone', to ensure that people who could be put at risk are not able to approach the vehicle. Warning signs should be used to make people aware of the dangers.

## Maintenance and Repair Excluding High Voltage Electrical Systems

Prior to any work commencing on the vehicle, the safety precautions listed previously in this guidance should be observed, even for non-electrical maintenance tasks. Determine the locations of high voltage cables before carrying out tasks such as panel replacement, cutting or welding, and take appropriate precautions to prevent them from being damaged.

## Storage, Salvage and Transportation of Damaged Batteries

Following the recovery of the disabled E&HV, an assessment should be carried out to determine the level of damage, if any, to the high voltage system, including battery. Where such damage is detected, a risk assessment should be carried out to determine whether the vehicle should be removed to a safe storage zone, preferably outside in the open, due to the increased risk of fire.

Whilst in storage, high voltage batteries should be kept dry, not exposed to high temperatures and segregated from all other combustible items. These processes should be included in your fire risk assessment.

Batteries should be stored in such a manner to avoid crushing or puncturing of the casing and segregated by battery type, and must be disposed of in accordance with Environment Agency guidance and the EU Battery Directive. Please also see the Aviva Loss Prevention Standard regarding Lithium Battery Storage and Recycling.

The transportation of used lithium and lithium-ion cell batteries falls under the scope of ADR Regulations if the weight exceeds 25kg (a typical mid-sized vehicle EV battery will weigh in excess of 400Kg). It is assumed therefore, that the transportation of such batteries will be carried out via approved ADR contractors.

## Valeting, Sales and Other Lower Risk Activities

All non-technical employees should receive training with regards to the hazards of E&HVs and the control measures that must be taken, relevant to their exposure to such vehicles.

To prevent the vehicle from accidentally moving, remote operation/ignition keys that only need to be in the proximity of the vehicle for it to be powered-up should be removed from operational distance. Employees who move E&HVs around the workplace should be aware that others may not hear the vehicle approaching. Employees need to be informed of the potential that E&HVs may move without warning.

Pressure washing has the potential to damage high voltage electrical components and cables. Refer to guidance from manufacturers before valeting in any under body areas, including the engine bay.

## Checklist

A generic Electric and Hybrid Vehicles Checklist is presented in Appendix 1 which can be tailored to your own organisation.

## Additional Information

- RISCAuthority: RC59 – Risk Control - Fire Safety When Charging Electric Vehicles
- Aviva Loss Prevention Standard: Motor Trade Waste Management

Further risk management information can be obtained from Aviva Risk Management Solutions

Please Note
This document contains general information and guidance and is not and should not be relied on as specific advice. The document may not cover every risk, exposure or hazard that may arise and Aviva recommend that you obtain specific advice relevant to the circumstances. AVIVA accepts no responsibility or liability towards any person who may rely upon this document.

# Appendix 1 – Electric and Hybrid Vehicles Checklist

| | |
|---|---|
| Location | |
| Date | |
| Completed by (name and signature) | |

| | Electric and Hybrid Vehicles | Y/N | Comments |
|---|---|---|---|
| 1. | Is there a person responsible for the management of E&HV safety? | | |
| 2. | Have specific risk assessments been carried out with regards to E&HV work activities such as recovery, isolation, repair, maintenance, body shop, valet, etc. and are they regularly reviewed and updated? | | |
| 3. | Have safe systems of work been devised for all relevant tasks in relation to E&HVs? | | |
| 4. | Have all staff received training relevant to their roles and responsibilities in relation to EV/hybrid vehicles? | | |
| 5. | Is there a permit to work procedure if work is required on a live EV/hybrid vehicle? | | |
| 6. | Is there a safe storage zone available for the parking of disabled/damaged vehicles? | | |
| 7. | Do your risk assessments include the risk of fire from E&HVs and their components? | | |
| 8. | Are facilities suitable for the safe and correct storage of high voltage batteries? | | |
| 9. | Are damaged and/or defective high voltage batteries quarantined and stored away from sources of ignition or combustible materials? | | |
| 10. | Have precautions been identified and corrective actions taken to ensure batteries do not overheat, whilst the vehicle is being repaired, i.e. whilst in a spray booth/oven or during battery recharging? | | |
| 11. | Has the use and storage of E&HVs and batteries been included in the fire risk assessment for the site? | | |

| | Electric and Hybrid Vehicles Contd. | Y/N | Comments |
|---|---|---|---|
| 12. | Have fire fighting procedures been reviewed to accommodate the likely presence of batteries and electrical equipment? | | |
| 13. | Has suitable PPE been identified and issued to all relevant staff? | | |
| 14. | Are adequate first aid arrangements in place? | | |
| 15. | Is manufacturers technical information readily available for employees involved in the recovery and maintenance of E&HVs? | | |
| 16. | Have any specific tools/equipment recommended by the manufacturers been provided? | | |
| 17. | Additional comments: | | |