Lithium-ion Batteries – 15 Top Tips

Lithium-ion batteries are used in a wide range of applications.

This document provides 15 top tips to help reduce the risks of fire, the associated damage to property and trading impacts.

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Introduction

Lithium-ion batteries are used in a range of commercial applications, from portable power tools; portable computers and tablets; Electronic Point of Sale (EPOS) equipment; torches and temporary lighting; communications and scanning equipment, through to E-Bikes, E-Scooters, electric delivery vans and vehicles.

Lithium-ion batteries in the workplace introduce a fire hazard that, as with any power storing and generating equipment, requires careful management to help reduce the potential for fire events.

Damaged, faulty, misused, modified, or aged batteries can be more vulnerable to ignition, with the resultant fires being particularly volatile and difficult to suppress, and often automatically reigniting sometime after the original fire has been extinguished. The resultant fire can spread to buildings, contents, and impact trading, as well as potentially leading to contamination and pollution as a result of fire water run-off.

As a result, the following top tips are presented to help ensure lithium-ion batteries and/or equipment powered by such batteries are used, handled, stored, and disposed of safely, and are not unduly exposing the property, the business activities, and the surrounding environment to fire related damage.

For a more in-depth understanding of the exposures and what risk management measures to take, please see Aviva's other lithium-ion and rechargeable battery related Loss Prevention Standards:

- **Electric Bicycles**
- **Electric Scooters**
- **Lithium-ion Batteries - General Considerations**
- **Lithium-ion Batteries - Storage and Transit**
- **Lithium-ion Batteries - Portable Tools**
- **Damaged, Returned, Recycled and Rechargeable Batteries**

Note: This document is focussed on property loss prevention in relation to wind events. It is not intended to address liability exposures. The presumption is that all regulatory requirements, Fire Risk Assessments, and compliance with requirements placed by the local authority having jurisdiction which would include licencing, building permissions, regulations, codes, or standards, have or will be met.

15 Top Tips to Help Reduce the Risks and Consequences of Fire

1. **Broker and Property Insurer.** Discuss your battery related usage and disposal methods with your Broker and Property Insurer. They can provide bespoke guidance and risk management solutions to help reduce the risks of ignition and fire spread.
2. **Risk Assessments.** Ensure all relevant regulatory and business focussed risk assessments, including the premises Fire Risk Assessment, and where applicable, Explosive Atmospheres Regulations such as the Dangerous Substances and Explosive Atmospheres Regulations 2002, are reviewed and revised to consider the use, handling, storage and/or disposal of lithium-ion batteries.
   - ✓ Ensure any corrective or remedial actions are addressed.

3. **Management of Change**. Management of Change protocols may need to be followed to ensure minimal impacts/exposure to the existing site activities and arrangements, e.g., changes to layout to accommodate charging stations and risk management controls.

4. **Management Policy and Standard Operating Procedures.** Implement a management policy in relation to the use, charging, handling, storage and disposal of lithium-ion batteries, or equipment/goods featuring such batteries.
   - ✓ Communicate to all employees, and other applicable stakeholders, e.g., contactors, visitors etc., along with corresponding Standard Operating Procedures (SOP's) and Emergency Operating Procedures (EOP's) outlining rules and protocols.

5. **Procurement.** Ensure lithium-ion batteries and equipment/goods featuring such batteries are only sourced from reliable vendors/sources.

6. **Acceptance Arrangements.** Any lithium-ion batteries or equipment/goods containing such batteries delivered to site should be inspected immediately for signs of damage.
   - ✓ Any stocks appearing damaged, or displaying signs of damage such as odours, high temperature, leaks, smoking, or vibration should be rejected and removed to a secured area at least 10m from buildings, valuable assets, or combustible goods pending removal or collection by a haulier, or reputable waste recycling company.
   - ✓ Use of a thermographic camera for checking battery health from arrival through to regular checks during charging and general usage is recommended.

7. **Aftermarket Batteries.** Do not permit aftermarket, modified or recycled batteries to be used or stored at the premises. This includes batteries within employees' and/or visitors E-Bikes, E-Scooters etc.

8. **Charging.**
   - ✓ Ensure formal charging arrangements are in place, reflecting the potential for fire spread to other goods or equipment in proximity due to battery size, battery numbers etc.
   - ✓ Segregate battery charging within fire resisting compartments to help contain fire events and reduce the potential for catastrophic fire spread throughout the premises wherever possible. A minimum of 60 minutes fire resistance is recommended, however this should be increased to 90 to 120 minutes for higher risk charging activities, or as advised within fire or other risk assessments.
   - ✓ If any charging equipment is damaged or is faulty it should immediately be removed from use, repaired, or discarded and the charging equipment isolated safely as necessary.
   - ✓ Ensure chargers are suitably rated and compatible for the usage.
   - ✓ Ensure charging rooms or compartments are maintained clear of combustible goods or equipment. These areas should be sterile.
   - ✓ If possible, charge larger items of equipment such as lift trucks, delivery vehicles etc., externally, and as far from buildings or other valuable assets, and combustible goods as possible. In most cases at least 10 metres separation is recommended. The use of protective, non-combustible canopies should be considered to protect charging equipment and equipment under charge externally from the environment.
   - ✓ Charging equipment should be located at a suitable height to prevent water ingress in the event of flooding, escape of water incidents.

- ✓ Proprietary storage/charging cabinets and containers should be used for portable tool batteries ,other similar batteries and/or small devices containing such batteries. These should have a recognised fire resistance period and be located in a safe area at least three metres clear of combustible goods, traffic movements and hazardous trading activities. Demarcation using hatching to specify clearance distances is recommended and impact protection may be necessary in areas with significant vehicular movements.
- ✓ Ensure chargers are suitably rated and compatible for the usage.
- ✓ Never override any Battery Management Systems and ensure overcurrent, under current and surge protection is in place.

9. **Storage.**
   - ✓ Segregate lithium-ion batteries or equipment/goods containing such batteries within dedicated, fire resisting stores where possible.
     - A minimum of 60 minutes fire resistance is recommended.
     - This should be increased to 90 to 120 minutes for higher risk charging activities, or as advised within fire or other risk assessments.
   - ✓ Where this is not viable, separate stocks of batteries as far as achievable from other stock items and combustible goods.
     - In most cases five metres separation is recommended for free standing goods.
   - ✓ For stock held in pallet beam racking or on shelving systems, the stocks of lithium-ion batteries or equipment/goods containing such batteries should be separated to reduce the accumulation of risk and stored on higher levels of racking/shelving to help reduce the risk of vertical fire spread to other stock.
   - ✓ The maximum storeroom/warehouse temperatures should be assessed against the safe temperature range of the batteries.
     - Cooling and/or heating systems should be configured to automatically operate prior to recommended battery temperature thresholds being met.
     - Assess the expected environment to ensure the cooling/heating equipment is suitable for potentially explosive environments.
   - ✓ Under no circumstances should lithium-ion batteries be disposed of in recycled battery bins, as seen in many retail outlets, with other battery types.

10. **Ventilation.** To minimise the potential for fire, explosion and/or undue smoke contamination, appropriate mechanical means of ventilating storage or charging rooms should be installed.
    - ✓ The potential explosivity of emitted gases during a thermal runaway event should be assessed, and ventilation systems rated as suitable for use in explosive atmospheres as appropriate.

11. **Damaged, Faulty or Returned Batteries.** It is imperative there is a policy for reporting battery issues.
    - ✓ Employee's or other relevant stakeholders should report damaged batteries; dropping incidents that may cause internal damage and subsequent failure of the battery or inappropriate use to responsible persons.
    - ✓ Damaged, faulty, returned batteries, or goods featuring such batteries, should be removed to a secured area at least 10m from buildings, valuable assets, or combustible goods.
    - ✓ Standard and Emergency Operating Procedures should detail the safe storage arrangements, and responsibilities for prompt collection by a reputable waste recycling company.

12. **End-of-Life Battery Management.** Do not use batteries that have exceeded their recommended lifecycle rating.
    - ✓ Ensure replacement batteries and accessories are sourced from the original manufacturer of the equipment, or an official agent of the manufacturer.
13. **Self-Inspection**. Batteries within lithium-ion battery powered equipment, accessories, charging equipment, charging areas and stores should be subject to a recorded inspection programme, carried out at least monthly.
    - ✓ This can help identify damage; modifications; use of aftermarket or incompatible batteries or accessories; housekeeping concerns; adequacy of charging arrangements; damage or fault to the charging and/or storage area; fittings; fire protections and ventilation equipment.
    - ✓ Thermographic camera inspections can also be used to check for hot spots or overheating for batteries in storage and on charge.
14. **Emergency Response.** Produce an emergency response plan to outline key responsibilities and actions in an emergency event involving lithium-ion batteries.
    - ✓ Ensure workers and other relevant stakeholder are aware of the plans/procedures.
    - ✓ Liaison with the local Fire and Rescue Services is recommended where significant volumes of lithium-ion batteries are present.

    Note: The explosive potential of lithium-ion batteries is increased when enclosed within compartments, particularly when oxygen levels increase suddenly, such as when compartment doors are opened. Access into such compartments during a fire event should ideally be limited to appropriately trained persons.
15. **Fire Protections.**
    - ✓ Automatic fire detection should be provided throughout any building storing or charging any lithium-ion batteries or lithium-ion battery powered equipment.
    - ✓ Where an existing automatic sprinkler system is installed, the design should be adequate for any changes in risk profile. A suitably accredited sprinkler maintenance company, such as one approved to LPCB Loss Prevention Standard LPS 1048: Requirements for the approval of sprinkler system contractors in the UK and Ireland, should be asked to confirm the sprinkler density, water supply demand and water supply duration are likely to be adequate and provide recommendations for enhancing the protection where necessary.
    - ✓ Alarms associated from the above should raise a site fire alarm to ensure there is an appropriate emergency response and escalation if needed.
        - If not already in place, consider connecting the alarm to a constantly attended location or an approved Alarm Receiving Centre.
    - ✓ The actuation of any of fire protections and alarms should be interlocked to de-energise the power supplies and isolate charging equipment.
    - ✓ Fire extinguishers specified for use in tackling lithium-ion battery fires are available, however whilst potentially providing some benefit require very early application and may not fully extinguish a developing battery fire or prevent the batteries reigniting. Given other life safety concerns, their use should be carefully considered within the premises Fire Risk Assessment.
    - ✓ Ensure any impairments relating to fire detection and protection systems are reported to your Insurer and Broker. Temporary changes may be necessary to some arrangements whilst impairments are ongoing.

Specialist Partner Solutions

Aviva Risk Management Solutions can offer access to a wide range of risk management products and services at preferential rates via our network of Specialist Partners, including:

- Fire risk assessment: Cardinus Risk Management
- Explosion/DSEAR Risk Assessments: Bureau Veritas
- Charging cabinets: Denios
- Thermographic imaging and PAT testing: PASS
- Automatic fire detection and portable extinguishers: SECOM
- Business continuity: Horizonscan

For more information please visit: Aviva Risk Management Solutions – Specialist Partners.

Sources and Useful Links

- The Dangerous Substances and Explosive Atmospheres Regulations 2002.
- The Regulatory Reform (Fire Safety) Order 2005.
- The Fire Safety (Scotland) Regulations 2006.
- The Fire (Scotland) Act 2005.
- The Fire and Rescue Services (Northern Ireland) Order 2006.
- Risc Authority document RC61 Recommendations for the Storage, Handling, and use of Batteries.
- Risc Authority document RE2 Need to Know Guide Lithium-ion Battery Use and Storage.

Note: Whilst UK standards and legislation are referenced in this document, other international standards and legislation should be referenced where applicable.

Additional Information

Relevant Aviva Loss Prevention Standards include:

- **Electric Bicycles - Property Risk Management**
- **Electric Scooters - Property Risk Management**
- **Lithium-ion Batteries - Storage and Transit**
- **Lithium-ion Batteries - Portable Tools**
- **Lithium-ion Batteries - General Considerations**
- **Damaged, Returned, Recycled and Rechargeable Batteries**
- **Business Continuity**
- **Contamination Following a Fire - Property**
- **External Building Areas - Usage and Safety**
- **Fire Compartmentation**
- **Fire Doors, Fire Shutters and Fire Dampers**
- **Fire Safety Inspections**
- **Fire Safety Legislation**
- **Heat and Smoke Venting Systems**
- **Managing Change - Property**
- **Smoke Contamination**
- **Thermographic Surveys**
- **Managing Contractors - Property**

To find out more, please visit Aviva Risk Management Solutions **or speak to one of our advisors.**

Email us at riskadvice@aviva.com or call 0345 366 6666.*

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