

# **Guidance on managing the Fire Risk Presented by Lithium-ion Batteries**

## **1. Introduction**

This document provides guidance for Faculties and Divisions on managing the potential fire risk presented by lithium-ion batteries and electrical equipment that contains them.

Lithium-ion batteries are found in mobile phones, vaping devices, laptops, digital cameras and other household items that are also used on campus. They are used in research projects by some Faculties.

They allow us to live more sustainably and when used for the purpose for which they are intended, lithium-ion batteries present little risk. However, they do present a fire hazard if they are used incorrectly, become damaged, are of significant age, become overcharged or are submerged in water.

Lithium-ion battery fires differ from a typical fire scenario as they can go into thermal runaway. Once this process has started, it is almost impossible to stop it, unless intervention is initiated at a very early stage. The thermal runaway process creates high levels of toxic and explosive gases.

## **2. Scope**

This guidance is applicable to the use of all commercially available electrical equipment powered by lithium-ion batteries on University grounds or during activities under the control of the University.

The guidance does not cover any third-party organisations operating on campus where any battery-operated equipment is solely under their control, or any bespoke, purpose-built installations such as research projects.

Whilst this guidance is not specifically aimed at third party organisations on campus, they may follow this to support them in their own arrangements if they choose to.

### 3. Definitions

**Lithium-ion battery** – A type of rechargeable battery that uses lithium ions as the main component of its electrochemical cells. When discharging, lithium ions move from a negative electrode in the battery, through an electrolyte, to a positive electrode, and back again during charging.

**Overcharge** – Charging a battery beyond its recommended voltage level, which can cause the battery to produce excess heat, potentially leading to thermal runaway.

**Thermal runaway** – Heat producing (exothermic) reaction started by an increase in temperature, which triggers a further increase in temperature. The temperature change can lead to fires and/or explosion and is particularly so of lithium-ion batteries.

### 5. Preventative Measures

- Always use the charger that came with the electrical equipment that is powered by a lithium-ion battery e.g. original branded phone charger.
- Replace damaged chargers with original branded replacements from a reputable supplier. Many counterfeit variants fail to meet UK safety requirements and can increase the risk of an incident that leads to a fire and subsequent injury. Only purchase Lithium-ion batteries, and electrical items containing them, that display the UKCA marking.
- Avoid storing, using or charging lithium-ion batteries at very high or low temperatures. This can cause the battery to degrade more quickly than usual.
- Protect lithium-ion batteries from becoming damaged e.g. from being crushed, punctured or immersed in water.
- Don't leave lithium-ion batteries continuously on charge. Once the charge cycle is complete, unplug the battery. Aim to keep the battery charged between 20-80% as this will preserve its life.
- When charging lithium-ion batteries, ensure that the battery or equipment it is contained within has suitable ventilation around it. For example, never charge a laptop whilst it is in a bag.
- Charge lithium-ion batteries on a hard surface, where there is good air circulation. This will prevent them from overheating.
- Avoid charging aged or low-performing lithium-ion batteries.
- Lithium-ion batteries must not be charged in escape routes such as corridors and stairwells.
- Avoid charging lithium-ion batteries on exit routes from rooms (i.e. between you and the exit door) in case they catch fire and block your escape.
- When travelling, keep items containing lithium-ion batteries stowed separately from one another wherever possible. If one item catches fire, this will reduce the risk of it causing other items to also go into thermal runaway.



- Avoid positioning battery collection container points on corridors and by fire exits. If a fire starts, they could block a potential exit route for building occupants.
- Don't position battery collection container points outside, unless they are designed for outdoor use, as this may result in batteries becoming submerged in water during poor weather.
- Ensure battery collection container points are clearly labelled with the types of battery accepted, so that users know where they can dispose of their batteries responsibly.
- In research, consider use of lithium-ion batteries in your research risk assessment and keep in mind that you may also need to carry out risk assessments considering [COSHH](#) and [DSEAR](#) risks.

## 6. Disposal of Lithium-ion Batteries

- Lithium-ion batteries must be disposed of responsibly through hazardous waste.
- No battery should be disposed of through the general waste stream found in places on campus such as offices.
- You can dispose of batteries at suitably located battery collection points on campus, but make sure you place batteries in compatible collection containers of like type.
- If you are part of the Faculty of Science, Engineering and Medicine (FoSEM), you can also contact your Faculty Health and Safety Team to discuss disposal.
- If you are not part of FoSEM, you can contact [estateshelpdesk@sussex.ac.uk](mailto:estateshelpdesk@sussex.ac.uk) to discuss disposal through Waste Electrical and Electronic Equipment (WEEE) waste.

## 7. Incident Response

- If a lithium-ion battery begins to overheat, hisses, pops or bulges, immediately move the battery away from flammable materials and place it on a non-combustible surface, if safe to do so. If available, also place the battery into a non-combustible container, such as a metal tray.
- Ideally, place the battery in a metal tray (if available) and remove the battery from the building, moving it to a safe outdoor location, but only if you won't be putting yourself or others at risk.
- Keep in mind that agitating a lithium-ion battery after it has gone into thermal runaway can cause re-ignition and the process to start again for up to 10 hours after it originally started.
- Stop using a lithium-ion battery and/or its charger if the temperature of either of them rises more than 10°C above their normal operating temperature when on a regular charge. Other signs to look out for include either piece of equipment feeling too hot to touch.
- In research, incorporate thermal runaway within your research risk assessment and identify control measures such as specific extinguishers or containment pouches. Due to the risk associated with thermal runaway (heat and products of combustion) the time you have to act will be very limited.

**See also:**

- [Fire Safety](#)
- [Dangerous Substances and Explosive Atmospheres](#)
- [HS P300 Safe Management of Equipment Policy](#)
- [HS G302 Guidance for the Safe Management of UPS and DSEAR](#)

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