Safe use of lithium batteries

The hazards of lithium batteries

- Physical damage, electrical issues such as overcharging, high temperature environments and manufacturing defects can all cause thermal runaway in lithium batteries.
- Once an individual cell within the battery becomes compromised, it can cause the release of toxic and flammable gases.
- Leaking cells can ignite spontaneously, generating large amounts of heat and producing more toxic gases, including HF.
- Modern batteries contain features such as pressure relief vents and thermal insulation to help prevent the failure of one cell rupturing neighbouring cells within the battery and causing a chain reaction, but older batteries are less likely to have these features.

General use of devices containing lithium batteries

- Always read and follow the manufacturers instructions.
- Use a charger approved for use with the device by the device manufacturer.
- Ensure the charger is suitable for use in the UK, do not use chargers with conversion plugs.
- Be aware of counterfeit charging devices available online. They often will be considerably cheaper than the proper chargers and as such have a much lower build quality.
- Do not wait until the batteries are fully discharged before re-charging them. Lithium batteries can be more dangerous when charging if they have been allowed to fully discharge.
- Do not use devices that appear to be damaged or swollen.
- Charge items on flat surfaces and away from flammable materials.
- Do not cover the batteries or devices while charging.
- Do not leave batteries or devices in direct sunlight, and avoid storing, using, or charging them in areas which high very high or low ambient temperatures.
- Do not leave lithium batteries to charge unattended or overnight.
- Avoid leaving batteries on charge once they have reached full charge.
- Ensure any smoke alarms in the vicinity are fully functional.
- Do not charge batteries or devices in a location where they would obstruct a fire escape route.
- Do not dispose of lithium batteries in general waste bins, or recycling bins. Dispose of them using specialist waste electronics routes designed to handle lithium batteries.

Research involving the use of lithium batteries, where they are the subject of the research

- All research of this nature must be thoroughly risk assessed, and the potential failure modes understood before starting the work.
- Where there is an increased risk of battery failure and ignition, the research facility must be designed to allow safe burnout of the batteries or cells, with an extract system capable of safely removing any toxic or flammable gases that may be generated.
- When designing cells or batteries, consideration must be given to preventing cascade failure, and ensuring the battery is designed to minimise the risk to the operator.
- If the cells and/or batteries will be left unattended or overnight, the experimental set-up must be completely fail-safe, and not reliant on human intervention in any emergency scenarios.

Research involving the use of lithium batteries, where they are NOT the subject of the research

- Always read and follow the manufacturers instructions.
- Ensure the batteries in use are suitable for the application.
- Do not use more powerful batteries than are required.
- Ensure they are not stored near any combustible or flammable materials.
- Do not wait until the batteries are fully discharged before re-charging them. Lithium batteries can be more dangerous when charging if they have been allowed to fully discharge.
- Ensure the batteries do not get too hot during use. The set-up must be designed to ensure the batteries are not stacked directly on each other, and that any heat generated can be safely dissipated.

Compromised lithium batteries

Please note, that for research involving lithium batteries, a robust emergency procedure must be produced as part of the risk assessment procedure. The following guidance is for unexpected lithium battery failures in non-research settings.

For swollen batteries

- Carefully place the compromised lithium battery in a non-combustible container if possible, covering with sand if there is any available.
- Place the container outside, in an area not routinely accessed by the public, and alert everyone to the risk. The container must be covered to prevent rain ingress, but readily able to vent gas.

- Contact the Safety Department to arrange for removal and disposal. If the above steps are not possible, please contact the Safety Department as soon as possible.

Process for smoking/ignited batteries

- If the battery starts to smoke or ignites during the disposal process, try to place it in the non-combustible container if safe to do so (very small wisp of smoke, surface not too hot to handle, can be put into the box within a few seconds).
- Once the battery is in the box, or if the battery is smoking excessively and releasing gas, activate the fire alarm and evacuate the building immediately.
- Once outside, contact Security immediately to explain the issue.

If the battery ignites, do not attempt to extinguish the fire with any type of fire extinguisher – the vast majority will not have any noticeable effect until the reaction subsides, by which time a significant amount of toxic and flammable gases could have been generated.