UMEÅ UNIVERSITET

INSTRUCTIONS FOR THE USE OF LITHIUM-ION BATTERIES AND BATTERY CHARGING AT UMEÅ UNIVERSITY

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1. Description

These instructions are intended to ensure safe charging, handling, storage and transportation of lithium-ion batteries at Umeå University. The goal is to completely eliminate or otherwise minimise injury to life, health, property and the environment.

2. Background

Several laws and regulations (see Section 2.1) regulate preventive measures for reducing the risks of fire and explosions in workplaces. In addition to legislation, Umeå University must comply with the terms and conditions of the business insurance provided through the Legal, Financial and Administrative Services Agency. Section 1.9 on Safety Requirements states that "*To prevent or limit damage, the authority must ensure that lithium-ion batteries used with forms of transport, such as bicycles, electric scooters and similar, and other lithium-ion batteries larger than 10 Ah are stored, handled and/or charged safely in a room designated for the purpose that is separate from other activities. The room must have a minimum fire class of EI60 and be equipped with smoke detection.*"

Deviations or changes from the terms and conditions of the insurance policy risk reducing or nullifying coverage in the event of damage or loss. University lease agreements also require compliance with provisions and terms and conditions of the business insurance.

2.1 Relevant legislation

- Work Environment Act (1977:1160)
- Design of Workplaces (AFS 2023:12)
- Civil Protection Act (2003:778)
- Transport of Dangerous Goods Act (2006:263)
- Civil Protection Ordinance (2003:789)
- Risk Management by Government Authorities Ordinance (1995:1300)
- SRVFS 2004:3
- MSBFS 2020:9

3. Responsibility

Responsibility for compliance with these regulations follows the delegation of authority and lies with the department or unit that owns the risk unit.

4. Information about lithium-ion batteries

Lithium-ion batteries can be found in everything from tools and vehicles to technical equipment. It is important to take measures to reduce the risk of fire in lithium-ion batteries. There have been reported cases where lithium-ion batteries, such as those in electric scooters, computers and mobile phones, have caught fire, which in some cases has resulted in an explosive fire with heavy smoke and toxic gases. Fires in lithium-ion batteries generate a variety of hazardous substances (gases) that can be dangerous for people in the vicinity and for emergency service personnel.

4.1 Risks with lithium-ion batteries

Lithium-ion batteries have an optimal operating temperature and a specific voltage range where the battery is stable. Batteries can be damaged by overcharging, deep discharge or short circuiting, for example. Stress on the battery can lead to a chemical reaction inside the battery cell called thermal runaway. A thermal runaway is an uncontrolled and irreversible increase in temperature in the battery. One consequence of a thermal runaway can be that the battery starts to burn, often violently. The fire can then spread to nearby batteries, which in turn can lead to additional thermal runaways. Particular risks with lithium-ion batteries include:

- A fire in a lithium-ion battery can cause violent fires with a lot of smoke, which also poses a risk to emergency services personnel.
- The fire is very difficult to extinguish. This is because it is difficult to access the battery cells.
- A steady supply of water is required to cool the battery long enough to prevent thermal runaway from occurring again.
- Burnt batteries can re-ignite many hours after the fire was initially extinguished. This makes it important to relocate an extinguished battery to a place where a new fire in the battery will not cause major damage.
- If an electric vehicle is charged indoors and a battery fire begins, hazardous gases will fill the space where the vehicle is located.

5. Directions for charging, handling and storage

This chapter explains how to handle, charge and store lithium-ion batteries at Umeå University.

5.1 Basic principals

1. Employees, students and others authorised to be present may only charge electrical equipment provided by the University within the University's premises. The exception to this is private mobile phones, laptops and tablets. Charging may only be done using the manufacturer's recommended charger.

2. Charging or storing private forms of transport/electric vehicles is not permitted within Umeå University premises. Exceptions apply to assistive vehicles. If assistive vehicles need to be charged and stored, this is to be risk assessed and relevant measures are to be taken to minimise risks. Charging private batteries for electric vehicles may only occur in designated outdoor locations.

3. Charging, storage and handling of 10Ah and higher capacity lithium-ion batteries is to be risk assessed and appropriate measures are to be taken to maintain an acceptable level of safety. Support can be requested from a supplier procured by the Property Management Office if deemed necessary.

4. Lithium batteries intended for forms of transport, such as electric bicycles, electric scooters and similar vehicles, may not be charged, stored or otherwise handled within university premises other than according to one of the following alternatives:

    a. Outdoors, at an appropriate distance from buildings, where charging devices and batteries are protected from the weather. Normally, batteries may not be charged in extreme cold or heat, unless otherwise instructed to by the manufacturer.
    b. In a detached building with well-ventilated rooms. The detached building is located at such a distance from other buildings that there is no risk of fire spreading in the event of a fire.
    c. Indoors in a well-ventilated room intended for the purpose, separated from other activities with a minimum fire protection class of EI60, equipped with a smoke detector and that complies with other legal and/or insurance requirements for the room's design.

5. If lithium-ion batteries are used during repair or construction work or similar, charging, handling and storage must be done in such a way that the battery does not cause a fire or other incident.

5.1.1 General measures to consider

- Charging must not occur in or near emergency exit routes.
- Charging should generally be done during the day and under supervision unless special measures are taken, such as charging batteries in special fire-rated cabinets designed specifically for battery charging. Measures should be demonstrated in a risk assessment. Examples of possible exceptions are electrical items that are designed to be plugged into a continuous power source, such as laptops.
- Charging should be done according to the manufacturer's instructions and guidelines, and the charger should be appropriate for the battery. Voltage and current are specified in user manuals. Manuals also indicate recommended times for leaving chargers plugged into wall outlets.
- Chargers, electrical products and batteries must be CE marked. Also check that the product and equipment are CE marked and that the CE mark states the manufacturer of the product.
- Flammable materials (such as paper and cardboard) may not be stored in or near the charging location. This also applies when charging in cabinets or similar.
- Specially designated charging areas should be clearly signposted with information that batteries are being charged.
- Batteries should not be stored close together to avoid a possible fire in one battery spreading to another battery. Risk assessment may determine that deviations from this may be permitted, such as in fire-safe battery cabinets, if the risk assessment shows that the risk of fire does not increase through storage.
- If the product becomes very hot in any position, charging must be stopped immediately. The product then needs to be inspected.
- Firefighting equipment must be available in or next to rooms. This is so users can quickly react to limit the spread of the fire.

- There should be protective equipment nearby (for example, heat-resistant gloves or claws) that can be used when it is possible to extinguish the fire without risk of personal injury.

5.1.2 If a battery catches fire

In case of a battery fire, quick action is important!

- Rescue, warn and alert people that there is a fire.
- Only take action if you can do so without putting yourself in danger. This means not risking inhalation of the gases created by a battery fire or not risking being burnt. If there is heavy smoke, go outside and close the door to the space. Call 112.

5.1.3 If a battery becomes abnormally hot

- Never attempt to address the situation if you are in the slightest doubt about your own safety and never put yourself in danger. Fires can be explosive, resulting in heavy smoke and toxic gases.
- Stop the charging by turning off/disconnecting the power source if the battery is charging.
- Move the object outdoors if possible.

5.1.4 Instructions on how to deal with damaged batteries

With battery fires, the fire risks rapidly progressing and spreading toxic smoke. A damaged battery should be immediately removed from service and preventive measures taken.

5.1.5 Instructions for waste management.

Lithium batteries found in electronic or other equipment slated for destruction are handled in accordance with recommendations from the University's contracted waste management provider.

5.2 Changes in premises needs

If an organisation has changes in premises needs, such as an adaptation of premises for the storage of lithium-ion batteries, contact Umeå University's Property Management Office. Property owners may have their own guidelines to consider.

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