SAFETY & HEALTH AWARENESS SHEET

LITHIUM-ION BATTERY SAFETY

This Safety & Health Awareness Sheet addresses the potential hazards of using rechargeable lithium-ion batteries and the steps on how to mitigate those risks. Always consult with Production Management for additional guidance, requirements, and safety policies for the charging, use, and storage of lithium-ion batteries at the worksite.

The use of lithium-ion batteries in motion picture industry workplaces has increased significantly over the past decade. They provide power for wireless phones, laptop computers, power tools, production lighting equipment, microphones, e-bikes, e-scooters, electric vehicles (EVs), and many other battery-powered devices. When designed, manufactured, and used properly, lithium-ion batteries are a safe, high-energy-density power source for devices in the workplace.

While lithium-ion batteries are normally safe, they may cause injury or property damage if they have design defects, are made of low-quality materials, are assembled incorrectly, are used or recharged improperly, recharged using mismatched chargers, or are damaged. When lithium-ion batteries fail to operate safely or are damaged, they may present a fire and/or explosion hazard.

Heat released during cell failure can damage nearby cells, releasing more heat in a chain reaction known as a thermal runaway. The high energy density in lithium-ion batteries makes them more susceptible to these reactions. Depending on the battery chemistry, size, design, component types, and amount of energy stored in the cell, cell failures can result in chemical and/or combustion reactions, which can also result in heat releases and/or over-pressurization.

There are many types of lithium-ion batteries utilizing different chemistries. You may not be able to choose the type of lithium-ion batteries that are supplied with equipment. Each battery chemistry has its own characteristics that can help in determining the level of safety required. Always check with your supervisor, Production Management, or the manufacturer's operating manual for any additional safety precautions or individual company requirements.

Lithium-Ion battery safety and injury prevention tips:

- Ensure lithium-ion batteries, chargers, and associated equipment are tested in accordance with an appropriate test standard (e.g., Underwriters Laboratories [UL] 2054) and, where applicable, are certified by a Nationally Recognized Testing Laboratory (NRTL) and are rated for their intended uses.

- Follow manufacturer's instructions for storage, use, charging, and maintenance.

- Be aware that charging lithium-ion batteries unattended or overnight is not recommended unless allowed by the manufacturer's instructions, or steps are taken to prevent potential damage or fire, such as charging on a fire-resistant surface located at a safe distance from flammable and/or combustible materials or using a fire-resistant battery charging cabinet. Additional safety precautions may be required by the stage/operations management, building owner/property manager, or the Authority Having Jurisdiction (AHJ).

- If required by the manufacturer's instructions, remove lithium-ion powered devices and batteries from the charger once they are fully charged.

- Only charge e-bikes and e-scooters, if allowed onsite at the workplace, outdoors and away from anything flammable and/or combustible.

- When replacing batteries and chargers for an electronic device, ensure they are specifically designed and approved for use with the device, and they are purchased from the device's manufacturer or a reputable manufacturer-authorized reseller.

- Never use aftermarket batteries or chargers or mix different manufacturer's batteries, or use batteries with different charge levels, within one device.

- Be aware that counterfeit lithium-ion batteries continue to increase in the marketplace because of their lower prices. These types of batteries are usually not listed or certified by a NRTL and are more prone to failure. Some counterfeit lithium-ion batteries can be difficult to distinguish from the Original Equipment Manufacturer (OEM) batteries. To avoid these batteries, only purchase from authorized dealers and distributors. UL provides the following information on how to identify counterfeit batteries:
    1. Price is well below the cost of OEM replacement batteries
    2. Misspellings on the packaging or labeling
    3. Missing numbers
    4. Serial numbers on printed labeling, instead of being etched into the casing
    5. Inconsistent battery performance
    6. False claims such as "high performance and safety approved"

- Store lithium-ion batteries and devices in dry, cool locations and away from flammable and\or combustible materials. Check the manufacturer's instructions for optimal storage, charging, and operating temperatures that will help prevent overheating and extend the life of the lithium-ion battery.

- Do not store the battery in a container with loose metal objects, such as coins, keys, or nails, which may contact and short out the battery terminals.

- Never modify, disassemble, or tamper with a lithium-ion battery.

- Avoid damaging lithium-ion batteries and devices. Inspect them before use for signs of damage, such as bulging/cracking, hissing, leaking, rising temperature, or smoking, especially if they are wearable. Only if safe to do so, immediately remove a device or battery from service and place it in an area away from flammable and/or combustible materials if any of these signs are present.

- If batteries are damaged, remove them from service, place them in fire-resistant containers (e.g., metal drum) with sand or other extinguishing agent, and dispose in accordance with local, state, and federal regulations. Contact Production Management, or your designated safety representative, or refer to your studio's hazardous waste protocols for disposal instructions.

- It may be necessary to evacuate the area and contact emergency response services in the event of a battery fire and/or thermal runaway. Depending on the battery chemistry, a fire may generate hydrogen fluoride gases, methane, carbon monoxide, and other hazardous airborne contaminants.

- If you are qualified and authorized by your employer, follow manufacturer's guidance on how to extinguish small battery fires, which could include submerging the battery in a sturdy container filled with water, sand, or both; using ABC dry chemical extinguishers; or using Class D fire extinguishers (for lithium metal). Avoid direct contact with the battery by using a tool such as a long-handled shovel, and use appropriate PPE to protect your face, hands, and body.

Perform battery inspections regularly

Regularly inspect lithium-ion batteries before use. Stop using the battery if you notice any odor, change in color, too much heat, change in shape, leaking, or strange noises. If it is safe to do so, move the faulty device away from anything that can catch fire. Also look for loose or damaged wires, conditions of misuse, and swelling relative to its original shape.

Regulations for shipping

There may be instances when productions need to ship lithium-ion batteries or equipment that contain lithium-ion batteries. Lithium-ion batteries are regulated as hazardous material under the U.S. Department of Transportation's (DOT) Hazardous Materials Regulations (HMR) 49 C.F.R. Parts 171-180. Lithium-ion batteries must conform to all applicable HMR requirements when offered for transportation or transported by air, highway, rail, or water.

The production company should know the applicable regulations for the proper packaging, restrictions on passenger aircraft, requirements for cargo-only aircraft, or shipping by land or sea. The penalties for improper shipping of these lithium-ion batteries can be severe. Always check with Production Management before shipping any lithium-ion batteries or equipment containing lithium-ion batteries.

Regulations for use and safety

The majority of lithium-ion battery fires involve micromobility devices such as e-bikes, e-scooters, and hoverboards. As a result, some local jurisdictions are beginning to regulate lithium-ion battery-powered equipment. Laws in some jurisdictions, such as New York, prohibit the use, sale, lease, or rental of powered mobility devices and the batteries for these devices that do not meet UL 2849, UL 2272, and UL 2271 standards. Comply with all applicable laws and regulations for the area in which the production is located.

Additional resources

- The NFPA has an e-bike and e-scooter safety sheet that can be downloaded here: https://go.nfpa.org/e-bike-e-scooter-safety.
- Other NFPA resources: Lithium-Ion Battery Safety | NFPA
- OSHA: Preventing Fire and/or Explosion Injury from Small and Wearable Lithium, Battery Powered Devices (osha.gov)
- UL: Enhance Workplace Lithium-Ion Battery Safety | UL Solutions