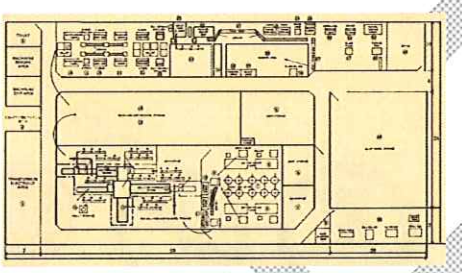
INFORMATION FOR RESCUE & EMERGENCY SERVICES
1st & 2nd Fire Responders

LITHIUM-ION BATTERIES

IN A STORAGE FACILITY



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General safety symbols:

INFORMATION FOR RESCUE & EMERGENCY SERVICES

LITHIUM-ION BATTERIES

IN A STORAGE FACILITY

NAME & LOCATION of the FACILITY

Detailed address: XXX **Info in case of emergency: XXX** **Contact Person: XXX**	Version: **25/04/2014**

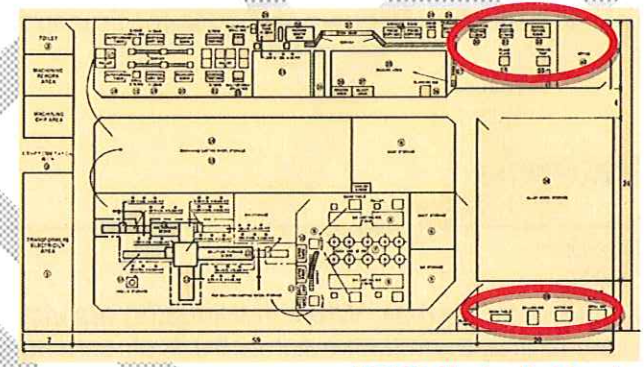
1. GENERAL INFORMATION : type of batteries in STORAGE

A) Picture of the location of the HV Lithium-Ion battery in the facility (example): XXX

ILLUSTRATIVE EXAMPLE ONLY

HV= High Voltage Battery Storage Area

AREA I . High Voltage (HV) Batteries Lithium-Ion > 36.0 V



AREA II : Individual cells and Battery Packs Lithium-Ion Batteries < 36.0 V

Batteries types	Location : XXX	Info: Approximative Quantity
1. High Voltage (HV) Battery Storage Area	**LOCATION AREA 1**. To be specified.	XX UNITS of 346 Volt **Lithium-ion (Li-ion)** battery pack consisting of 3.6 Volt cells connected in a series-parallel circuit.
2. Pallets of Power Packs & Drums with individual cells	**LOCATION AREA 2**. To be specified.	YY UNITS of pallets with 0.5 Tonnes each of mixed Lithium-Ion Batteries

B) General considerations in the event of damage to or fire Lithium-Ion Batteries.

B.1. High Voltage Battery Storage Area 1. 

- Warn all responders and dispatch/inform that a High Voltage battery may be involved in the fire.
- Always assume that the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, (orange) wires, and HV batteries present potential HV shock hazards even when the battery is partially or fully discharged.

- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable liquids and gases with a risk of fire.
- Venting/off-gassing HV battery vapours are potentially toxic and flammable, they could contain toxic Fluor-based substances.
- Leaking electrolyte from a **Li-ion battery** gives a typical sweet/ether-like odour.

B.2. All types of Lithium-Ion Batteries.

- When **Li-ion batteries** have been mechanically damaged there is a risk of fire as a result of a rapid temperature elevation in the battery due to e.g. an internal or external short circuit.

- The by-products of combustion of a Lithium-Ion battery can be toxic and all individuals should be directed to move to a safe distance upwind and uphill from the vehicle fire and out of the way of oncoming traffic.
- **other info: XXX**

C) Classification

Lithium-Ion Batteries are classified as Dangerous Goods for Transportation under UN3480 and UN3481.

Class of Hazard: **Class 9 (others).**
NFPA Code: XXX

D) General first aid measures:

- Inhalation: take victim directly in to fresh air. When individual(s) are victim of a fire involving Lithium-Ion batteries, it is necessary to give them, immediately fresh air coming or not from a SCBA gear.
- Skin/clothing contact: remove affected clothing and rinse skin for at least 20 min with water
- Eye contact: rinse eye (s) plenty with water for at least 20 min.
- Ingestion: immediate medical assistance is needed, do not induce vomiting, gently wipe or rinse mouth with water.
- Always contact medical assistance refer to any relevant information such as Battery Information Factsheet.

E) Content of chemical products:

- The battery contains the following substances (in % by weight of the battery: **XXX** %).
- Total weight battery : **XXX**

NAME:XXX	Weight %:	UN Nr:XXX	CAS #:XXX
NAME:XXX	Weight %:	UN Nr:XXX	CAS #:XXX
NAME:XXX	Weight %:	UN Nr:XXX	CAS #:XXX
NAME:XXX	Weight %:	UN Nr:XXX	CAS #:XXX
NAME:XXX	Weight %:	UN Nr:XXX	CAS #:XXX

2. HAZARD ASSOCIATED WITH LEAKING Lithium-Ion BATTERIES

Under **normal conditions** of use, the battery does not present any risk of exposure to its content.

LEAKING BATTERIES and SPILLAGE

Specific Attention

- The electrolyte used in the **Li-ion battery** cells contains a flammable organic solvent and a corrosive substance.
- Leaking electrolyte from a **Li-ion battery** gives a typical sweet/ether-like odour.

Inhalation in non fire situations

- Contact with organic electrolyte or acidic vapour caused by reaction of the electrolyte with moisture may irritate the eyes, nose, throat, and skin.

The vapor may contain hazardous fluor-based substances!

- **other info: See § 1.D. General Safety Measures**

Safety Measures

When approaching leaking Lithium-Ion batteries:

- Wear splash shield or safety goggles.
- Gloves, boots, apron suitable for organic solvents.
- Protective mask for acidic vapors or Self-Contained Breathing Apparatus SCBA.

Absorption/neutralisation see chapter 4: **Environmental aspects.**

- **other info: XXX**

3. Hazards Associated with a Lithium-Ion Battery Fire

FIRE

Specific Attention

- If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling or bubbling sounds from a Lithium-Ion battery storage area, anticipate a potential battery fire.
- Wear always full Personal Protective Equipment suitable for an organic solvents fire and Self-Contained Breathing Apparatus (SCBA).

Fire involving a Lithium-Ion Battery in a Storage Area.

- The battery contains a combustible organic solvent of the type: Dimethyl Carbonate.
- When one cell ignites there is a risk a propagation of the fire to neighbour cells (Thermal runaway).
- Parts of the battery (e.g. cells) may be ejected as projectile. When the inside cells of the battery are damaged flammable liquid may be expelled from the battery,

Inhalation in Fire Situations

- Toxic gases are emitted as by-products of combustion.
- Vapour emitted in case of a fire contains CO, CO2 and hazardous fluorinated substances!

- **other info: XXX**

Safety Measures   	**Precautionary recommendations.** - Keep distance from the fire source and evacuate people upwind from the fire area. - Keep any person not involved in the rescue, 15 meters away from the fire zone, - **To avoid serious injury or death from severe burns or electric shock, never breach or remove the high voltage battery assembly cover under any circumstance.** **1st Objective** - In case of a large fire >>> cool down the battery with an overflow of water or class A foam in order to reduce the temperature of the battery. **2 st Objective:** - Shutting off the oxygen supply to the fire: using if possible (dry) sand or other suitable mineral agents (e.g. vermiculite…). **Offensive attack** - Copious quantities of water or water-based class A foam can be used to cool down burning Li-ion cells and batteries. - During application, caution should be exercised as flammable particles may be ejected from the fire. **Defensive attack** - Pull back at safe distance and allow the Li-ion battery cells to burn themselves out. - Fire crews may utilize a water stream or fog pattern to protect exposures or to control the path of smoke - **other info: XXX**

4. Environmental Aspects

4.1. IN ABSENCE OF FIRE

Specific Attention

Liquids

- In case of abundant use of water, care should be taken to confine and neutralise the liquid outflow.
- After intervention, neutralise and rinse the affected areas with water adequately.
- See 4.3.2. Below.

- other info: **XXX**

4.2. IN CASE OF FIRE

Specific Attention

- Keep people away from fire zone,
- As with any fire, the by-products of combustion can be toxic and all individuals should be directed to move to a safe distance upwind and uphill from the vehicle fire and out of the way of oncoming traffic.
- After intervention, neutralise and rinse the affected areas with water adequately.
- See 4.3.2. Below.
-
- **other info: XXX**

4.3. IN ALL CASES

Safety Measures

4.3.1. Absorbent materials.

- To confine the spillage of liquids and the fire: use dry materials such as sand or mineral absorbing agents.

- Handle Li- ion spills using the following personal protective equipment (PPE)
  - Splash shield or safety goggles.
  - Rubber gloves, boots, apron suitable for organic solvents
  - Protective mask for acidic vapours or SCBA.
- Perform gross decontamination by removing affected clothing. Wash skin with water and soap.

4.3.2. Treatment of Waste Water.

- Confine the effluent or the contaminated material and collect it as hazardous waste (water) for appropriate treatment.
- Pick up and transfer to properly labelled containers.
- Dispose of in accordance with local waste management legislation and emissions regulations.
- **other info: XXX**

5. Damaged Lithium-Ion batteries: additional precautionary measures – reactivation of the battery.

RE-ACTIVATION OF LI-ION BATTERY	
Specific Attention   	**Heat evolution and fire** - When a damaged Li Ion battery needs to be transported/ stored be aware of the possibility of a reactivation of the fire within a damaged battery. - Keep the damaged damaged battery under supervision and control. WARNING: There is a possibility for delayed ignition or re-ignition of a lithium-ion battery fire even after it is believed to be extinguished. This may remain an issue until the lithium-ion battery is properly handled/ managed/ conditioned by a qualified person. Re-ignition may appear even after a few days. **The HV battery assembly cover should never be breached or removed under any circumstances including fire. Doing so may result in severe electrical burns, shock, or electrocution.**

6. Specific requirements for packaging, storage and transportation of damaged Lithium-Ion batteries.

Safety Measures after an incident involving a fire. 	- Keep monitoring any evolution of heat and potential reactivation of fire for 24 hours minimum. - Store the damaged battery in a place where it is not exposed to rain (humidity) and high temperature (direct sunlight). - Protect battery from any additional potential damages. - Use if possible an Infra-Red Camera to control regularly the temperature of the battery. - When available cover the battery with a Fire Containment Cover (FCC) which is fire resistant. - Call for a trained person to control the state of the battery. - Before being offered for transport, the cells or batteries shall be inspected by a qualified person to evaluate its physical status: mechanical integrity, temperature, signs of rupture, venting, disassembly and leakage or open circuit voltage... etc. - Damaged or defective batteries can only be transported according to the UN Regulation for the transport of dangerous goods (UN 3480). - Only trained persons are allowed to offer a damaged or defective battery for transport.

- Alternatively place the battery in a metal container,
  - Fill the container to the top with a non-combustible and non-conductive thermal insulation material (sand, vermiculite, glass, mineral agent…)
- Store the container with the battery in a safe place for several days.
- Maintain monitoring by a qualified person.

Remark: Trained personnel (for fire) should always accompany the transport of the damaged vehicle/battery to the safe place.

7. Other Requirements

1.1. Storage (Good Practice Guidance)

- Store new batteries in original packaging.
- Do not mix new and used batteries.
- Segregate batteries from other hazardous materials
- Segregate batteries by type: segregate Lithium Primary (Lithium-Metal) from Lithium Rechargeable (Lithium-Ion) and from Pb-acid, Ni-MH and Ni-Cd.
- Keep in a dry, cool and well-ventilated place, check the recommended storage temperature usually reported in the users manual prepared by the manufacturer (e.g. 25°C to 35°C).
- Keep away from heat sources (max 60°C) and sources of ignition.
- Protect from direct exposure to sunlight.
- Keep away from water and condensation (humidity in general).
- Store in closed container and packaging, in such a way to prevent short circuits and damages during storage or transportation.
- In case of mixed storage of goods and articles, organize separate storage area for lithium-ion batteries and lithium-metal batteries, e.g. by maintaining a distance of 2.5 meters between the Lithium-ion batteries storage area and other goods and batteries.
- Store in limited quantities and in isolated area under external surveillance.
- Infra-Red cameras may be used to detect any excessive heat (hotspot) development in a storage area, e.g. > 85°C.
- Storage shall be organized in an area covered by sprinklers.

It may be advisable to store limited quantities in a given area (E.G. <10 m2), the quantity should not be larger than 6 euro pallets or an equivalent of 6.0 m3 of batteries or equipment containing batteries. The storage of the pallets should not be higher than 2 meters.

Safety measures for storage shall be organized with the relevant safety team at the plant. It shall be adapted to the local Emergency Response Capacity.

It can be mentioned that the EU Batteries Directive 2006/66/EC, in its Annex 2 Part A, Treatment § 2. requires...

"treatment and any storage including temporary storage at treatment facilities shall take place in sites with impermeable surfaces, and suitable weatherproof covering or in suitable containers."

8. WARNING.

Author: XXX
Sources: *XXX*

Following text may never be deleted!

Template made by Kurt Vollmacher Project Leader at International CTIF Commission for Extrication and New Technology. Specialised area: extrication/new vehicle technology.

This was developed in cooperation with RECHARGE, CTIF Hazmat Commission, Ing Jetty Middelkoop Hazmat Officer.The Netherlands.

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