

# Isle of Man Ship Registry Technical Advisory Notice

## Lithium-ion batteries as cargo

Ref. 010-23

Issued: 05 Oct 2023

### 1. Introduction

As the demand for lithium-ion (Li-ion) batteries surges in our increasingly digital world, so does the requirement to transport and use them safely. Li-ion battery fires can be far more dangerous than a traditional fire on a vessel, as they produce toxic fumes, can require over 10 times more water to extinguish and have the potential to re-ignite hours after being extinguished. Traditional fire suppression methods may not effectively extinguish Li-ion battery fires.

This notice provides guidance to cargo ship owners and operators on the hazards and safe transport of Li-ion batteries as cargo only. Where batteries of different chemical composition are transported as cargo there may be different requirements. Operators should consult the text of the IMDG Code and manufacturers' requirements for further information regarding transportation of such batteries.

### 2. Hazards

Li-ion batteries are susceptible to thermal runaway, which causes the internal temperature of the battery to rise uncontrollably. Overcharging, external heat sources, mechanical damage, manufacturing defects and internal or external short circuits all have the potential to trigger thermal runaway, leading to a chain reaction that releases a significant amount of heat and can result in fierce fires, explosions and the release of toxic gases.

Insufficient packaging or inadequate separation of Li-ion batteries can heighten the risk of physical damage. When a battery is damaged, it no longer adheres to the manufacturer's intended safety standards, introducing unforeseen levels of risk. Damaged batteries are particularly prone to thermal runaway and short circuits, requiring extremely careful handling.

Moreover, environmental factors like extreme temperatures, humidity, vibrations, and pressure variations encountered during maritime transport can affect the performance and stability of Li-ion batteries. These conditions can elevate the risk of incidents involving these batteries.

### 3. Requirements

There are several mandatory requirements within the International Maritime Dangerous Goods (IMDG) Code designed to facilitate the safe transport of Li-ion batteries:

- Battery Classification - Ensure proper classification of Li-ion batteries according to their UN number, packing group, and hazard class. This classification determines the packaging, labelling, and handling requirements according to the battery chemistry



- Packaging and Labelling - Package Li-ion batteries in UN-approved packaging that meets the specifications outlined in the IMDG Code. Ensure packages are clearly labelled with appropriate hazard labels and handling instructions.
- Stowage and Segregation - Stow Li-ion batteries in a manner that ensures proper segregation from other incompatible goods and prevents physical damage. Ensure batteries are kept away from sources of heat such as heated fuel tanks.

#### **4. Best Practices**

The IMDG code provides a solid regulatory foundation; however, operators are strongly encouraged to consider applying the best practices given below as further mitigation measures:

- Designated stowage area for Li-ion batteries - In the event that a battery fire occurs, it is preferential to have it in a location that is easier to tackle and close to firefighting equipment, and well ventilated rather than in the middle of a stack of containers;
- Use of video monitoring to compliment fire detection systems and detect problems relating to Li-ion batteries earlier;
- The provision and training of thermal imaging equipment for earlier detection of Li-ion battery fires;
- Toxic gas detection systems as an early warning system for Li-ion battery systems;
- Increased surveys of containers storing Li-ion batteries by trained crew to ensure batteries are correctly packaged, labelled and will not move during transit.
- Li-ion batteries are most stable when stored 30-70% charge and they should be kept as dry as possible at all times.
- Crew training (in particular those engaged in fire patrols) to be aware of the early warning signs that may precede a thermal runaway event e.g. hissing, whistling, or popping sounds, a possible sweet chemical smell, or smoke or vapour being emitted.

#### **5. Transporting Electric Vehicles**

Operators engaged in the carriage of electric vehicles are strongly encouraged to take account of the guidance set out in [MGN 653\(M\)](#) as amended.

#### **6. Transporting Damaged Batteries**

Where reasonably possible, batteries should be inspected for physical damage before being loaded as cargo. Batteries that are hot, have an odour, are discoloured, deformed, bulging or swollen should be considered damaged and not loaded unless necessary.

For a damaged battery to be loaded as cargo, operators must follow the requirements outlined in SP376 of the IMDG Code, as amended.

It should be noted that transportation of damaged Electric Vehicles should not be considered the same as transportation of damaged Li-ion batteries and different requirements apply. Where damaged EV batteries cannot be removed and packaged as per the IMDG Code refer to section 5 of [MGN 653 \(M\)](#) for further guidance.

#### **7. Fire Suppression**

Operators should strongly consider re-evaluating their fire plans to ensure they adequately account for the risks posed by Li-ion batteries. Li-ion battery fires can be challenging to extinguish, often requiring significantly more water than traditional fires and posing a high



risk of re-ignition. Therefore, continuous monitoring following a Li-ion battery fire is essential, and fire plans should be updated accordingly.

Additionally, operators should contemplate the adoption of extinguishing water lances (EWL) onboard their vessels. EWL is specialized equipment designed to puncture a battery's outer casing and cool down the cells. However, if EWL is used onboard, it's crucial to provide additional training for fire control personnel to ensure proper and effective usage. It's worth noting that the use of EWL systems may cause further battery damage, potentially leading to more ignition incidents. Therefore, careful consideration of their use should be given, weighing the benefits against the risks of penetrating the battery enclosure. Ideally, EWL systems should be reserved for trained firefighting professionals.

## 8. Further Information

- [CINS Network: Lithium-Ion Batteries in containers guidelines](#)
- [EMSA / DNV: Study on Electrical Energy Storage For Ships](#)
- [TT Club / UK P&I Club / Brookes Bell: Lithium batteries whitepaper](#)
- [IMDG Code \(can be purchased here\)](#)
- [lithium batteries and their safe storage transport use and disposal including re use and re cycling.pdf](#)
- [How to care for defective lithium ion batteries.](#)
- [MGN 653 M Amendment 1 Electric Vehicles onboard passenger roll on roll off ro-ro ferries carriage of damaged vehicles](#)

*Please note - The Isle of Man Ship Registry cannot give legal advice. Where this document provides guidance on the law it should not be regarded as definitive. The way the law applies to any particular case can vary according to circumstances - for example, from vessel to vessel. You should consider seeking independent legal advice if you are unsure of your own legal position.*

