zeus
Battery Products

LITHIUM BATTERY SHIPPING INFORMATION

Lithium batteries of all kinds are considered hazardous materials and have to be handled in shipping as such. There are different regulations for Ocean, Air and Ground transport. Ground transport regulations are controlled by each country or region. This document will focus on information and references for North American ground shipments (49 CFR) and domestic (US) and International air shipments. (References to Maritime law mentioned) . Further, the individual carriers and airlines can implement addition requirements.

As of April 1 2016 significant changes in the regulations have occurred, these will affect supply chains and costs. These changes have been implemented for the safety of people in the transportation system in response to issues that have occurred.

DEFINITIONS

Lithium metal, Primary are **single use items** | Lithium Ion, Secondary, Lithium Polymer are all **rechargeable**
Cells are single encased unit exhibiting a voltage across its terminals.
Battery is an assembly of 2 or more cells electrically connected together.
(Note a single cell with added circuitry can become a battery)

IATA
International Air Transport Association

ICAO
International Civil Aviation Organization

UN
United Nations

DOT
Department of Transportation

PHMSA
Pipeline and Hazardous Materials Safety Administration (part of US DOT)

IMDG
International Maritime Dangerous Goods

IMO
International Maritime Organization

Anyone offering lithium batteries for shipment must be aware of the myriad of regulations and follow them. Packing restrictions are very tight on lithium batteries, especially primary lithium (non-rechargeable) sent by air. As of April 1 2016 only 8 cells or 2 batteries can be in a box. Only ONE box per shipment, previously many of these packages of 2 or 8 units could be contained in an OVERPACK allowing shipment of larger quantities. Multiple boxes are no longer allowed in overpacks.

Another significant change is for secondary lithium batteries. These can have no greater than 30% State of Charge (SOC) when sent by air.

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These restrictions do not currently apply to ground shipments. Customers of Zeus they need to be aware of this and determine their requirements up front. For example, if you intend to ship replacement batteries by air, that need to be specified up front. To ship lithium ion by air, for example, we would need to discharge the batteries in order to comply with the regulation that no more than 30% State of Charge can be shipped by air.

Also, be aware that these new regulations can incur increased costs as a result of changes in packaging, handling, and documentation requirements throughout the supply chain process. Many customers will experience the same increased costs when shipping to their end customers and need to be aware.

Batteries over 100Wh must always be shipped as fully regulated Class 9 hazardous material. Choosing to design below this limit or using a modular approach with each module below this limit can be worthwhile.

Regulations differ when shipping replacement cells/batteries, as opposed to shipping cells/batteries in or with product.

Due to the extent of the regulations and complexity of shipping documentation, many carriers such as UPS and FedEx require customers who ship lithium batteries to be under contract. To be under contract, training must be obtained in the shipping rules and regulations for lithium batteries. For international shipments, this training must take place every 2 years, whereas training for domestic shipments is required every 3 years. Specially focused training is available for participants to focus only on what is needed to ship their particular products.

Beyond the regulations themselves, individual airlines/carriers can create their own regulations to further restrict transport of hazardous material. Always check with the carrier to confirm that they will ship the product type to the desired destination. Airlines can refuse shipments.

Prototypes and samples must be shipped in special metal containers specifically approved for this type of product. Exceptions to this rule can be obtained, but they require a 3-6 month approval process for each shipment.

All lithium batteries being shipped must meet the UN 38.3 testing requirements. Such testing requires significant time and budgetary investment and should be considered well in advance of the product design process when choosing lithium batteries. UN 38.3 testing includes many criteria from shock and vibration, to shorts and overcharging.

Return shipments are more difficult with lithium batteries. Damaged lithium batteries cannot be shipped without special approval. Return logistics from customers can also be restricted as the customer may not have the ability or knowledge to safely ship lithium batteries.

REFERENCES:

http://www.iata.org/whatwedo/cargo/dgr/Documents/lithium-battery-guidance-document-2016-en.pdf

This document provides very good guidance on determining your battery shipment packing and marking requirements for air shipment. Image below is outline for decision chart. Current documents should always be obtained from IATA at time of shipment to ensure latest regulations are followed. These regulations can change often.

The tables provided in the IATA guidance document (outlined below) show the selection process.

http://www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx IATAs summary page for Lithium batteries, updates and instructions are referenced here.

http://www.iata.org/whatwedo/cargo/dgr/Documents/lithium-battery-update.pdf This is the link to Update III wich has ocurred outside of the normal schedule of updates and has gone into effect as of April 1 2016. This represents significant changes in shipping requirements.

https://www.unece.org/fileadmin/DAM/trans/danger/publi/manual/Rev5/English/03en_part3.pdf This is the link for testing requirements. Lithium batteries, all types need to be tested to UN 38.3 Manual of Tests and Criteria. The specific section can be found here: http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/UN_Test_Manual_Lithium_Battery_Requirements.pdf

http://www.imo.org/en/Publications/IMDGCode/Pages/Default.aspx Link to the IMDG code information

http://www.imo.org/en/Pages/Default.aspx Link to the IMO web site

http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title49/49tab_02.tpl Link to the US code of regulations for ground shipments (49 CFR)

http://www.phmsa.dot.gov/ Link to PHMSA web site.

https://www.transportation.gov/ Link to the US DOT web site

ADVANCED DOCUMENTS:

http://www.iata.org/publications/Documents/lithium%20battery-risk-mitigation-guidance-for-operators-1st-ed.pdf