



## TRANSPORTATION OF DANGEROUS GOODS

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# Shipping and importing devices containing lithium batteries

From: [Transport Canada](#)



In this document, the term lithium batteries is used to refer to both lithium ion and lithium metal batteries.

Lithium batteries are dangerous goods, much like gasoline, propane, and sulphuric acid.

Lithium batteries are used in many electronic devices such as cameras, cell phones, laptop computers, medical equipment and power tools.

To ship or import lithium batteries, including those contained in or packed with devices and equipment, you must:

- declare the batteries to postal carriers, couriers or transport companies as part of the contents
- meet all other shipping requirements in the *Transportation of Dangerous Goods (TDG) Regulations*

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## Risks for shipping lithium batteries:

While most lithium batteries are safe, some have overheated and caught fire. Once ignited, they can cause any nearby batteries to overheat and catch fire. These fires are difficult to put out and produce toxic and irritating fumes.

You should keep in mind certain risks when shipping lithium batteries or items containing them:

- your shipment may end up on an aircraft because it may be unclear which mode of transport will be used when you send goods
- fire suppression system may be unable to extinguish all types of lithium battery fires
  - You must take extra precautions in [packaging batteries for air transport](#) to avoid short circuit and fires
- Counterfeit and no-brand lithium batteries are also of concern, because they may not have been safety tested. These lithium batteries may be poorly designed, have little protection, or contain manufacturing flaws.

## Regulations to follow for shipping and importing

Transport Canada regulates the safe handling, offering for transport, transporting and importing of lithium batteries by specifying classification, documentation, labelling, packaging and training requirements.

All designs and types of lithium batteries must meet the requirements of the UN Manual of Tests and Criteria to be shipped safely.

Shippers and importers must meet the requirements set out in the TDG Regulations for the handling, offering for transport, transporting and importing of lithium batteries in Canada. The requirements vary by mode of transport.

Lithium batteries are subject to rigorous testing according to the UN Manual of Tests and Criteria. If a lithium battery does not meet the conditions, then the manufacturer must correct any failures and have it retested. This ensures a higher level of safety for design deficiencies or flaws.

The UN Manual of Tests and Criteria lists eight tests. Required tests vary depending on the type and design of lithium battery.

You are forbidden from transporting by aircraft any batteries that are:

- ship damaged
- defective
- recalled
- recycled

This ban applies whether or not these lithium batteries are contained in equipment.

### **Shipping by air within Canada**

When shipping lithium batteries within Canada by aircraft, the TDG Regulations let you:

1. Comply with the latest International Civil Aviation Organization (ICAO) Technical Instructions and some additional requirements of the TDG Regulations;

OR

2. Use the alternative requirements listed under sections 12.10, 12.12, 12.13, 12.14 or 12.17 when the ICAO Technical Instructions limit or restrict the quantity or type of dangerous goods that you can transport.

### **Shipping or importing internationally by air**

When shipping or importing lithium batteries internationally by aircraft, Part 12 of the TDG Regulations requires you to comply with the ICAO Technical Instructions and some additional requirements of the TDG Regulations.

Please see [Part 12 of the TDG Regulations](#) to learn more.

### **Shipping by vessel**

Please refer to [Part 11 of the TDG Regulations](#) for requirements related to marine transport.

### **Importing by any mode of transport**

When importing lithium batteries, you must comply with the TDG Regulations. The TDG Regulations specify requirements for classification, documentation, labelling,

packaging and training. You must declare them to postal carriers, couriers or transport companies.

Make sure that the lithium batteries in your shipment are not counterfeit before importing them into Canada. Buy lithium batteries from a reputable manufacturer or distributor that has documented proof that the batteries have been tested and meet the UN Manual of Tests and Criteria.

You are also required to have a proof of classification, which is further explained in [section 2.2.1 of the TDG Regulations](#).

## Accepting packages for transport

Always be aware of what you are accepting.

You should know if there are lithium batteries in the package for shipment, contained in the equipment or packed with the equipment.

Remember that regardless of the mode you are using to ship your lithium batteries, your shipment may end up on an aircraft. You must:

- prepare your shipment accordingly

OR

- specify that the shipment of batteries is **for ground transport only**

## Types of lithium batteries and cells

### Cells versus batteries

A **cell** is a single encased electrochemical unit (one positive and one negative electrode) with a voltage differential across its two terminals.

What we call AA batteries and AAA batteries are actually cells.



**Figure 1: common types of lithium cells**



A **battery** is two or more cells that are electrically connected together and fitted with devices such as a case, terminals, marking and protective devices that it needs to function properly.

**Figure 2: a common type of battery**



Battery packs, modules or battery assemblies manufactured to provide a source of power to another piece of equipment are treated as batteries in TDG regulations.

### **Lithium metal versus lithium ion batteries**

A **lithium metal battery**:

- is usually non-rechargeable

- contains metallic lithium
- features a higher energy density than other non-rechargeable batteries

Lithium metal batteries are often used in calculators, pacemakers, remote car locks and watches, to name a few.

#### A **lithium ion battery**:

- is rechargeable
- doesn't contain metallic lithium
- features high energy density

A lithium polymer battery is considered a type of lithium ion battery. Lithium ion batteries are used in consumer products such as cell phones, electric vehicles, laptop computers, power tools and tablets.

### **Contained in equipment versus packed with equipment**

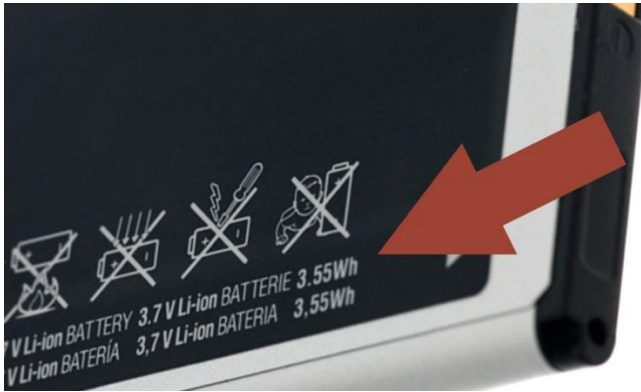
A lithium ion or metal battery contained in equipment means that the battery is fitted or joined to the actual device. Examples include a calculator, laptop computer or watch—with an integrated lithium battery.

A lithium ion or metal battery packed with equipment is not fitted or joined to the device. An example would be a power tool packed alongside a spare battery.

### **Determining the energy rating and lithium content of batteries**

TDG Regulations regulate lithium ion batteries based on their watt-hour (Wh) rating or amount of energy.

When a person uses the lithium ion batteries exemption on a road vehicle, a railway vehicle or a vessel on a domestic voyage in accordance with special provision 34 of the TDG Regulations, the Wh rating must appear on the battery case if it was made on or after January 1, 2009. If the Wh rating is not indicated on the lithium ion battery case, then all requirements set out in the TDG Regulations must be met.



## How do I calculate the Wh rating?

If the Wh rating does not appear on the battery case, you can calculate the Wh rating using one of the formulas below.

1. If you know the nominal voltage (V) and the capacity in ampere-hours (Ah), use:

$$\text{Wh} = (\text{V}) \times (\text{Ah})$$

2. If you know the nominal voltage (V) and the capacity in milliamper-hours (mAh), use:

$$\text{Wh} = (\text{V}) \times (\text{mAh} \div 1000)$$

If you are still not sure what your lithium battery's Wh rating, contact its manufacturer.

## Calculate the lithium content

You can calculate the lithium content, in grams (g), of a lithium metal cell with one of the formulas below.

1. If you know the battery's capacity in ampere-hours (Ah)

$$\text{Grams (g) lithium metal} = (\text{Ah}) \times 0.3$$

2. If you know the capacity in milliamper-hours (mAh)

$$\text{Grams (g) lithium metal} = (\text{mAh} \div 1000) \times 0.3$$

To calculate the lithium content of the battery, simply multiply the grams (g) of lithium metal by the number of cells in the battery.

## Related links

- [Bringing electronic devices and lithium batteries on air flights](#)
- [Lithium Battery Transport Research Program](#)
- [Learn about safe transport of dangerous goods](#)
- [\*Transportation of Dangerous Goods Act\*](#)
- [\*Transportation of Dangerous Goods Regulations\*](#)