



173.185 Lithium batteries and cells

(revised Oct. 1, 2005)

(a) Except as otherwise provided in this subpart, a lithium cell or battery is authorized for transportation only if it conforms to the provisions of this section. For the purposes of this sub-chapter, "lithium content" means the mass of lithium in the anode of a lithium metal or lithium alloy cell, except in the case of a lithium ion cell where the "equivalent lithium content" in grams is calculated to be 0.3 times the rated capacity in ampere-hours. The lithium-equivalent content of a battery equals the sum of the grams of lithium-equivalent content contained in the component cells of the battery.

(b) **Exceptions.** Except for primary (non-rechargeable) lithium batteries and cells transported aboard passenger-carrying aircraft, cells and batteries are not subject to any other requirements of this sub-chapter if they meet the following:

- (1) Each cell with a liquid cathode may contain not more than 0.5g of lithium content. Each cell with solid cathode may contain not more than 1.0g of lithium content. Each lithium-ion cell may contain not more than 1.5g of equivalent-lithium content;
- (2) Each battery with a liquid cathode may contain an aggregate quantity of not more than 2.0g of lithium content. Each lithium-ion battery may contain an aggregate quantity of not more than 8.0g of equivalent-lithium content;
- (3) Each cell or battery containing a liquid cathode must be hermetically sealed;
- (4) Cells and batteries must be packaged in such a way so as to prevent short circuits and must be packed in strong packagings, except when installed in equipment; and
- (5) The outside of each package that contains a primary (non-rechargeable) lithium battery or cell must be marked "PRIMARY LITHIUM BATTERIES – FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" on a background of contrasting colour, in letters:
 - (i) At least 12mm in height on packages having a gross mass of more than 30 kg; or
 - (ii) At least 6mm on packages having a gross mass of 30kg or less; and
- (6) If when fully charged, the aggregate lithium content of the anodes in a liquid cathode battery is more than 0.5g, or the aggregate lithium content of the anodes in a solid cathode battery is more than 1.0g, then the battery may not contain a liquid or gas that is a hazardous material according to this sub-chapter unless the liquid or gas, if free, would be completely absorbed or neutralized by other materials in the battery.

(c) Except for primary lithium (non-rechargeable) batteries and cells transported aboard passenger-carrying aircraft, cells and batteries are not subject to any other requirements of this sub-chapter if they meet the following:

- (1) The lithium content of the anode of each cell, when fully charged, is not more than 5g;
- (2) The aggregate lithium content of the anodes of each battery, when fully charged, is not more than 25g;
- (3) Each cell or battery is of the type proven to be non-dangerous by testing in accordance with Tests in the UN Manual of Tests and Criteria. Such testing must be carried out on each type of cell or battery prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999 is not required to be retested;
- (4) The outside of each package that contains a primary (non-rechargeable) lithium battery or cell must be marked "PRIMARY LITHIUM BATTERIES – FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" on a background of contrasting colour, in letters:
 - (i) At least 12mm in height on packages having a gross mass of more than 30kg; or
 - (ii) At least 6mm on packages having a gross mass of 30kg or less; and
- (5) Cells and batteries are designed or packed in such a way as to prevent short circuits under



conditions normally encountered in transportation.

(d) Except for transportation aboard passenger-carrying aircraft, cells and batteries and equipment containing cells and batteries that were first transported prior to January 1, 1995, and were assigned to Class 9 on the basis of the requirements of this sub-chapter in effect on October 1, 1993, may continue to be transported in accordance with the applicable requirements in effect on October 1, 1993.

(e) Cells and batteries may be transported as items of Class 9 if they meet the requirements in paragraphs (e)(1) through (e)(7) of this section:

- (1) Each cell and battery must be equipped with an effective means of preventing external short circuits.
- (2) Each cell and battery must incorporate a safety venting device or be designed in a manner that will preclude a violent rupture under conditions normally incidental to transportation.
- (3) Batteries containing cells or series of cells connected in parallel must be equipped with effective means as necessary to prevent dangerous reverse current flow.
- (4) Authorized outer packagings: rigid outer packagings that conform to the general packaging requirements of part 173 and the packaging specifications and performance requirements of part 178 of this sub-chapter at the Packaging Group II performance level. Cells and batteries must be packaged in such a manner as to effectively prevent short circuit through the use of inner packagings, dividers, or other suitable means.
- (5) [Reserved]
- (6) Each cell or battery is of the type proven to meet the lithium battery requirements in the UN Manual of Tests and Criteria. A cell or battery and equipment containing a cell or battery of a design type which was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999 is not required to be retested;
- (7) Except as provided in paragraph (h) of this section, cells and batteries with a liquid cathode containing sulfur dioxide, sulfuryl chloride or thionyl chloride may not be offered for transportation or transported if any cell has been discharged to the extent that the open circuit voltage is less than two volts, or is less than two-thirds of the voltage of the fully charged cell, whichever is less.

(f) Equipment containing or packed with cells and batteries meeting the requirements of paragraph (b) or (c) of this section is exempted from all other requirements of this sub-chapter.

(g) Equipment containing or packed with cells and batteries may be transported as items of Class 9 if the batteries and cells meet all requirements of paragraph (e) of this section and are packaged as follows:

- (1) Equipment containing cells and batteries must be packed in a strong outer packaging that is a waterproof or has a waterproof liner, unless the equipment is made waterproof by nature of its construction. The equipment must be secured within the outer packaging and be packed as to effectively prevent moving, short circuits, and accidental operation during transport; and
- (2) Cells and batteries packed with equipment must be packed in inner packagings conforming to (e)(4) of this section in such a manner as to effectively prevent moving and short circuits.

(h) Cells and batteries, for disposal, may be offered for transportation or transported to a permitted storage facility and disposal site by motor vehicle when they meet the following requirements:

- (1) Be equipped with an effective means of preventing external short circuits; and
- (2) Be packed in a strong outer packaging conforming to the requirements of 173.23 and 173.24a. The packaging need not conform to performance requirements of part 178 of this sub-chapter.

(i) Cells and batteries and equipment containing or packed with cells and batteries which do not comply with the provisions of this section may be transported only if they are approved by the Associate Administrator.

(j) For testing purposes, when not contained in equipment, cells and batteries may be offered for transportation or transported by highway as items of Class 9. Packaging must conform with paragraph (e)(4) of this section.



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(k) Batteries employing a strong, impact-resistant outer casing and exceeding a gross mass of 12kg, and assemblies of such batteries, may be packed in strong outer packagings, in protective enclosures (for example, in fully enclosed wooden slatted crates) or on pallets. Batteries must be secured to prevent inadvertant movement, and the terminals may not support the weight of other superimposed elements. Batteries packaged in this manner are not permitted for transportation by passenger aircraft, and may be transported by passenger aircraft, and may be transported by cargo aircraft only if approved by the Associate Administrator prior to transportation.