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COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS AND ON THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS

Sub-Committee of Experts on the
Transport of Dangerous Goods

Thirtieth session
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PROPOSALS OF AMENDMENTS TO THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Model Regulations on the Transport of Dangerous Goods

Special provision 188 concerning lithium batteries

Transmitted by the expert from the United States of America

Background

Special Provision 188 provides an exception from the provisions of the UN Model Regulations for lithium cells and batteries provided certain conditions are met. Currently, except when installed in equipment, packages containing more than 24 lithium cells or 12 lithium batteries must also meet the following additional requirements:

(i) Each package shall be marked indicating that it contains lithium batteries and that special procedures should be followed in the event that the package is damaged;

(ii) Each shipment shall be accompanied with a document indicating that packages contain lithium batteries and that special procedures should be followed in the event a package is damaged;

(iii) Each package is capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents; and

(iv) Except in the case of lithium batteries packed with equipment, packages may not exceed 30 kg gross mass.

During the twenty-ninth session, the Sub-Committee was presented information on the electrical hazards posed by lithium batteries (ST/SG/AC.10/C.3/2005/43 and UN/SCETDG/29/INF.42). The potential electrical hazard of a lithium battery meeting the provisions of SP 188 is no less than that of a fully regulated lithium battery. The annex to this document contains a summary of lithium battery incidents the United States is aware of over the last 10 years. Based on this information, the expert from the United States proposes amendments to the provisions of SP 188 to address the risk of these cells and batteries due to their potential to short circuit.

Packaging

Special provision 188 contains provisions intended to ensure the cell or battery's integrity throughout the handling and transport system, and that fire or disassembly does not occur due to internal or external short circuiting. For example, SP 188 (c) requires design type testing according to the Manual of Tests and Criteria, Part III, sub-section 38.3; SP 188 (d) requires cells and batteries, except when installed in equipment, to be separated so as to prevent short circuits and packed in strong outer packagings; and SP 188 (e) (iii) requires a package containing more than 24 cells or 12 batteries to pass a 1.2 m drop test without damage, shifting that allows contact, or release of contents. While these are valid requirements, the fact remains that incidents are occurring with damage that could be attributable to mishandling. Therefore, the expert from the United States proposes to enhance the packaging requirements in SP 188 to improve safety. Adding a requirement to individually package lithium cells or batteries transported under this exception will add additional protection to prevent short circuits.

Batteries installed in equipment

The quantity limits and testing requirements prescribed in SP 188 apply to cells and batteries when installed in equipment and when the cells or batteries are packaged separately. However, the special provision does not contain requirements for the proper preparation of lithium batteries when installed in equipment. Excepted lithium batteries installed in equipment pose an electrical safety hazard due to their potential to short circuit equivalent to that of batteries installed in equipment transported in accordance with Packing Instruction P903. In this paper we are proposing to amend SP 188 to require protection against short circuit and accidental activation of the equipment equivalent to the level of protection required in P903.

Cell or battery quantity

Special provision 188 (e) provides requirements for marking, documentation, a drop test, and gross mass limit applicable only for packages containing more than 24 cells or 12 batteries. The heat and/or fire hazard resulting from an internal or external short circuit of just one cell or battery is sufficient to cause a dangerous condition in transport. Taking into account the

electrical hazard potential, there seems to be no reason to apply the safety requirements in SP 188(e) to only packages containing more than 24 lithium cells or 24 lithium batteries. As such the expert from the United States proposes to apply the requirements in (e)(i)-(e)(iv) regardless of the quantity of cells or batteries in a package.

Marking

Special provision 188(e)(i) contains a marking requirement to indicate the package contains a lithium cell or battery and that special procedures should be followed in the event that the package is damaged. This requirement should be more specific to ensure the necessary handling information is communicated to transport personnel to reduce rough handling that could contribute to the possibility of a transport incident involving lithium batteries. Therefore, it is suggested that the Sub-Committee expand the current marking requirement in SP 188. This amendment is based on a voluntary industry standard found in IEC 62281, *Safety of primary and secondary lithium cells and batteries during transport.* The IEC 62281 provides proper handling instructions, warning statements and safety symbols. The application of the IEC marking provisions is voluntary; therefore they are not applied consistently. This proposal seeks to standardize the marking requirements for transport. These same amendments are proposed for the documentation requirements in SP 188(e)(ii).

Proposal

Amend Special Provision 188 as follows:

188 Lithium cells and batteries offered for transport are not subject to other provisions of these Regulations if they meet the following:

(a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium ion cell, the Watt-hour rating is not more than 20 Wh;

(b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g, and for a lithium ion battery, the Watt-hour rating is not more than 100 Wh. Lithium ion batteries subject to this provision shall be marked with the Watt-hour rating on the outside case;

(c) Each cell or battery is of the type proved to meet the requirements of each test in the Manual of Tests and Criteria, Part III, sub section 38.3;

(d) Cells and batteries, except when installed in equipment, shall be packed in inner packagings that completely enclose the cell or battery. Cells and batteries shall be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit. The inner packagings or trays shall be packed in strong outer packagings which are constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use.

(e) Cells and batteries when installed in equipment shall be protected from damage and short circuit, and shall be equipped with an effective means of preventing accidental activation. When lithium batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.

(f) Each package shall be marked to indicate that:
(i) the package contains lithium cells or batteries;
(ii) the package shall be handled with care and that a flammability hazard exists if the package is damaged;
(iii) special procedures should be followed in the event the package is damaged, to include inspection and repacking if necessary; and
(iv) a telephone number for additional information.

(g) Each shipment shall be accompanied with a document indicating that:
(i) the packages contains lithium cells or batteries;
(ii) the packages shall be handled with care and that a flammability hazard exists if the package is damaged;
(iii) special procedures should be followed in the event the package is damaged, to include inspection and repacking if necessary; and
(iv) a telephone number for additional information.

(h) Except when lithium batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents; and

(i) Except when lithium batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass.

As used above and elsewhere in these Regulations, "lithium content" means the mass of lithium in the anode of a lithium metal or lithium alloy cell.

Annex (ENGLISH ONLY)

Lithium battery and battery-powered devices

Summary of incidents

DATE	TYPE OF BATTERY	**DEVICE** (if applicable)	**INCIDENT SUMMARY**
17-Jul-2006	EaglePicher-Kokam Lithium ion/polymer (used for remote control models), 122 batteries of various sizes		The unlabeled/marked package was discovered to have caught fire while being held in bond for customs clearance in Korea. Package had traveled to Korea in FedEx system from Vienna via Paris and Subic Bay.
15-May-2006	Lithium-ion (VGP-BPL2/VGP-BPS2 or equivalent)	Laptop with spare battery	Shortly before flight departure, a burning smell was detected in the first-class cabin of a Lufthansa ORD-MUC flight. Maintenance personnel were called to check and found it was coming from hand luggage inside an overhead luggage bin above seat 2A. The flight attendants evacuated the passengers in first class and first 2 rows of coach class. Crew used extinguishers to prevent setting off what was seen as the beginning of a slow fire. Maintenance immediately brought the bag outside the aircraft onto the ramp where it started to catch fire. Fire dept was called to assist. Fire was eventually put out after reigniting once. Fire apparently started from the extra battery pack for a laptop (not known if loose or attached to laptop). Flight departed 1 hour 18 minutes late.
03-MAR-2006	Lithium ion button cells, mfr. by Lixing		US-bound package was noticed to be smoking at outbound FedEx station in Shenzen, China. Upon inspection, the package of lithium ion batteries was discovered to be on fire.
29-JUN-2005	Lithium Ion	Battery-pack	At UPS in Ontario, Calif., during unloading of a ULD from Shanghai, it was discovered that a fire had taken place inside the ULD. A package containing a lithium-ion battery pack was identified as the source of the fire. Upon discovery, the burnt package and its contents were cool to the touch and there was no smoldering evident.

DATE	TYPE OF BATTERY	**DEVICE** (if applicable)	**INCIDENT SUMMARY**
11-FEB-2005	Lithium battery, solid cathode, manufactured by Eagle Picher of Surrey, BC, Canada.	None	An undeclared package containing 18 lithium batteries caught fire while being unloaded from a conveyor belt at the FedEx facility in White Bear Lake, MN. FedEx cargo handlers report hearing a "pop" sound and then seeing the box "lifted" off the conveyor belt by the force. The shipment had flown from Los Angeles to Minneapolis and was to be trucked to Clear Lake, WI. Only one battery caught fire
29-Oct-2004	Ultralife 9-volt lithium (traditional 9-volt form: rectangular with two terminals on top)	Small electronic device (details to come)	Shortly after departure, the battery exploded in the hand of a cameraman traveling on the VP campaign plane of Sen. Edwards (the cameraman reportedly was in the process of changing batteries). It spewed shrapnel and ignited a fire in the seat which was extinguished by flight attendants and others. The flight crew declared an emergency and returned to Raleigh-Durham airport without further incident.
07-Aug-2004	Lithium-ion	Lithium-ion batteries assembled together in a plastic case	Prototype lithium batteries shipped under a competent authority approval from California to Europe apparently started a fire in a ULD during the loading process at the FedEx Memphis hub. The ULD had just been loaded for a transatlantic flight (Memphis-Paris). The ULD and many other packages in it were damaged/destroyed by fire. Shipment apparently was in violation of the DOT approval allowing the prototype battery to be shipped.
01-Apr-2004	CR123 lithium batteries	Flashlight	A flight attendant lent a passenger a flashlight which was recently purchased in Beijing. The passenger dropped the flashlight while it was on. Later the passenger put the flashlight in a seatback pocket. A few minutes later, the flashlight began to emit smoke and noxious fumes. The flashlight became so hot it could only be handled with oven mitts.

DATE	TYPE OF BATTERY	**DEVICE** (if applicable)	**INCIDENT SUMMARY**
02-Nov-2003	Ni-Cad, Ni-Methyl Hydride, and/or Lithium (according to label on computer)	Notebook computer – Toshiba Satellite model # 815-S129	At security screening, a passenger's bag contained a computer bearing a warning label on the bottom near the battery compartment: "Warning: Hot base may cause burn. Avoid prolonged contact with bare skin." Battery compartment was hot. Screener had passenger turn off computer.
12-Aug-2002	Lithium battery (excepted)	Samsung mini computer (palm pilot)	Burning odor detected by handlers at the Los Angeles FedEx inbound package sort center. Battery apparently short-circuited causing the bubble wrap in the package to burn and melt onto the unit.
12-Apr-2002	Lithium batteries	None	Lithium batteries shipped under exception by Abbott Labs did not have terminals protected from short circuit. Started fire inside package at FedEx Indy sort facility.
03-Nov-2000	Hawker lithium sulphur dioxide batteries	None	While in route by road to the FedEx Cargo facility in Portland, OR, a lithium battery shorted and ruptured, burning its packaging. The shorted battery had long flexible protruding positive and negative terminals. Two FedEx drivers were treated at a hospital after inhaling fumes from the incident.
28-Apr-1999	Primary Lithium batteries (excepted)	None	After shipment (two pallets/120,000 batteries) transferred from passenger flight to cargo facility at LAX, a fire occurred. Cargo employee possibly mishandled one of the two pallets. One pallet caught on fire, was moved, the second pallet then caught fire. Initial attempts to extinguish the blaze using water/chemical fire extinguishers failed.
26-Sep-1996	Lithium batteries	None	Eight lithium batteries were connected in a series and packed with bubble wrap inside a plastic express envelope. There were exposed connections on one end and loose wires on the other end. The batteries were not secured from movement within the package and a short-circuit resulted causing the packaging to burn. Burnt package discovered at Airborne sort center after first flight and prior to trans-Pacific cargo flight.

DATE	TYPE OF BATTERY	**DEVICE** (if applicable)	**INCIDENT SUMMARY**
08-May-1994	Duracell lithium batteries (excepted from ICAO regulation by SP A45)	None	Consignment of lithium batteries found emitting smoke in ULD during truck transport to LHR. Fire damage. Batteries were smaller in diameter than a dime and about 5 mm high. They had been tossed loosely into a box. Positive and negative terminals had "tails" which were prone to short circuiting. The shipper was prosecuted by the UK CAA for failure to comply with Special Provision A45 of the ICAO Technical Instructions and fined £1200 with £300 costs.