

Article Safety Data Sheet - Lithium Metal Batteries

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This Article Safety Data Sheet is provided as a service to our customers.

Based on the definition of the term 'article' in the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200, there is no requirement for a Material Safety Data Sheet (MSDS) for lithium primary coin cells. Notification is not required because these products are 'articles' that do not release a covered toxic chemical under the normal conditions of processing or use.

Disclaimer:

The batteries are exempt articles and are not subject to hazard Communication Standard Requirement. This sheet is provided as technical information only. The information contained in this Product Safety Data Sheet has been established to the best of RENATA SA's knowledge and belief. RENATA SA makes no representation and provides no warranty or guarantee regarding the contents of this Product Safety Data Sheet and excludes its liability, express or implied.

Section 1 - Product identification

1.1 Product identifier

Product Name: **Primary (non-rechargeable) Lithium Battery** Nominal Voltage: 3.0 V

Models: **Coin Type Cells CR Series see Annex I**

Chemical System: **Lithium Manganese Dioxide** ($\text{Li} + \text{MnO}_2 \rightarrow \text{LiMnO}_2$)
Primary **NOT** designated for Recharge

1.2 Recommended use and restrictions on use

Recommended use: battery, no restrictions, see section 7 handling and storage.

1.3 Suppliers details

Renata SA
Kreuzenstrasse 30
CH-4452 ITINGEN / Switzerland
Tel: +41 61 975 75 75
Mail: sales@renata.com
www.renata.com

1.4 Emergency phone number

For US call The National Poison Control Center (1-800-222-1222) day or night – for advice and follow-up.

Swallowed a Button Battery? Battery in the Nose or Ear?: National Capital Poison Center

Call 1-202-625-3333 for guidance.

For other countries please contact the local Tox Centers

(EU: http://ec.europa.eu/growth/sectors/chemicals/poison-centres/index_en.htm).

Section 2 - Hazard Identification

2.1 Classification of the substance or mixture

Classification according to UN-GHS

Batteries are considered as articles and are as such exempted from the UN-GHS classification requirements. The classification based on the hazardous substances contained in the product (electrode materials and liquid electrolyte contained in the batteries) is provided below for information purposes only.



Eye Dam. 1	H318: Causes serious eye damage
Skin Irrit. 2	H315: Causes skin irritation
Acute Tox. 4	H302: Harmful if swallowed
Acute Tox. 4	H332: Harmful if inhaled
STOT RE 2	H373: May cause damage to organs (Brain) through prolonged or repeated exposure (Inhalation)
Repr. 1B	H360 FD: May damage fertility. May damage the unborn child.
Water-react. 1	H260: In contact with water releases flammable gases which may ignite spontaneously

2.2 GHS Label elements, including precautionary statements

The UN GHS labeling information is not provided in this section as batteries are articles and therefore are exempted from the UN GHS labeling requirements. Other labeling requirements apply for batteries according to EU Directive 2006/66/EC.

Nevertheless the following warning must be observed:

Keep out of reach of children.

2.3 Other hazards which do not result in classification

The chemicals mentioned in Section 3 are contained in a sealed can.

Risk of exposure occurs only if the battery is mechanically or electrically abused or if it is ingested (see Safety precautions in Section VII). Swallowing of a battery can lead to chemical burns, perforation of soft tissues and death. Severe burns can occur within 2 hours of ingestion. In case of ingestion, seek medical attention immediately.

Section 3 - Composition / Information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

IMPORTANT NOTE: The battery should not be opened or exposed to heat because exposure of the following ingredients contained within could be harmful under some circumstances.

Hazardous substances contained in the product according to UN-GHS:

Chemical Name	CAS No.	Content % of total weight	Hazard class and category	Hazard statement
Manganese Dioxide (MnO ₂)	1313-13-9	12 - 50	Acute Tox. 4, Acute Tox. 4, STOT RE 2	H302, H332, H373 (Brain) (Inhalation)
Lithium*	7439-93-2	1.1 - 3.3	Water-react. 1 Skin Corr. 1B	H260, H314
Propylene Carbonate (PC)	108-32-7	2 - 9	Eye Irrit. 2	H319
1,2 dimethoxy ethane (DME)**	110-71-4	1 - 3.5	Flam Liq. 2, Acute Tox. 4, Repr. 1B	H225, H332, H360FD
Lithium Perchlorate (LiClO ₄)	7791-03-9	0.2 – 0.8	Ox. Sol. 2, Skin. Irrit. 2, Eye Irrit. 2, STOT SE 3	H272, H315, H319, H335

* Approximate weight content of lithium in each model can be found in Annex I

** DME (CAS 110-71-4) is listed in the European candidate list as a SVHC (Reason for inclusion: Toxic for reproduction - REACH Regulation 1907/2006/EC, Article 57c)

Section 4 - First Aid Measures

None unless internal material exposure.

4.1 Description of necessary first aid measures

Skin contact:

Skin contact with contents of an opened battery causes irritation, flush immediately with copious amounts of water. Remove contaminated clothing. If irritation persists, get medical help.

Eye contact:

Contents of an opened battery causes serious eye damage, flush immediately thoroughly with copious amounts of water for at least 15 minutes. Get medical attention immediately.

Ingestion:

Seek medical attention immediately.

Inhalation:

Do not inhale leaked material. Provide immediately fresh air, if irritation persists, get medical help.

4.2 Most important symptoms / effects, acute and delayed

The chemicals mentioned in Section 3 are contained in a sealed can.

Risk of exposure occurs only if the battery is mechanically or electrically abused or if it is ingested (see Safety precautions in Section VII). Swallowing of a battery can lead to chemical burns, perforation of soft tissues and death. Severe burns can occur within 2 hours of ingestion. In case of ingestion, seek medical attention immediately. See 1.4 Emergency phone number.

In case of exposure to inner component/material of the battery:

Harmful if swallowed (Manganese Dioxide)

Harmful if inhaled (Manganese Dioxide, DME)

May cause damage to organs (Brain) through prolonged or repeated exposure (Inhalation) (Manganese Dioxide)

May damage fertility. May damage the unborn child. (DME)

4.3 Indication of immediate medical attention and special treatment needed

No further information available.

Section 5 - Fire Fighting Measures

5.1 Suitable extinguishing media

In case of fire in an adjacent area, use water. Use CO₂ or dry chemical extinguishers if cells are packed in their original containers since the fuel of the fire is basically paper products. For bulk quantities of unpackaged cells use for example LITH-X (Graphite Base). In this case, do not use water.

In a small room, remember that the supply of oxygen is quickly consumed in feeding a lithium fire.

5.2 Specific hazards arising from the chemicals

When exposed to heat, the battery may rupture and release hazardous substances.

Burning lithium manganese dioxide batteries produce toxic and corrosive lithium hydroxide fumes.

Lithium metal reacts with water and forms flammable hydrogen gas.

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus to avoid inhalation of hazardous decomposition products. Wear protective clothing and equipment.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Steps to be taken in case material is released or spilled:

The preferred response is to leave the area and allow the batteries to cool and the vapours to dissipate. Avoid skin and eye contact or inhalation of vapours.

6.2 Environmental precautions

Do not allow product to reach sewage system or any water course.

In the event of spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

6.3 Methods and material for containment and cleaning up

In the event of spill or accidental release, collect all released material in a plastic lined metal container and remove spilled liquid with absorbent. Doing this, protect your skin and eyes with chemical resistant protective gloves (EN374) and tightly sealed protective goggles (EN166). Avoid direct contact with internal components.

Section 7 - Handling and Storage

When used correctly, lithium batteries provide a safe and dependable source of power. However, if they are misused or abused, leakage, venting, or in extreme cases explosion and/or fire may result.

7.1 Precautions for safe handling

- Do not insert batteries in reverse. Observe the polarity markings on battery and equipment
- Do not short-circuit batteries
- Do not charge batteries
- Do not force discharge batteries
- Do not mix batteries
- Do not overheat batteries by exposure to high temperatures and direct sunlight.
- Do not weld or solder directly to batteries
- Do not dismantle batteries
- Do not deform batteries
- Do not dispose of batteries in fire
- A battery with a damaged container should not be exposed to water
- Do not allow children to replace batteries without adult supervision
- Keep batteries out of the reach of children. In case of ingestion of a cell or battery, the person involved should seek medical assistance promptly.
- Equipment intended for use by children should have battery compartments which are tamper-proof
- Do not encapsulate and/or modify batteries
- Exhausted batteries should be immediately removed from equipment and disposed of (see section 13)
- When discarding batteries with solder tags, insulate the tags by wrapping them with tape, foil, etc.

7.2 Conditions for safe storage, including any incompatibilities

- Store unused batteries in their original packaging and keep them away from metal objects which may short-circuit them. Storing unpackaged cells together could result in cell shorting and heat build-up.
- Store and display batteries in their original packaging in well ventilated, dry and cool conditions.
- Avoid storing or display batteries in direct sun or in places where they get exposed to rain.
- The normal storage of lithium coin cells is made at temperature between +10°C and +25°C, never exceeding +30°C (also according to IEC 60086-4). In this way the maximum shelf-life (i.e. max. retention of cell performances after storage periods) of lithium coin cells is achieved. Storage temperatures above room

temperature will increase the rate of self-discharge, reducing the available capacity of the cell. Humidity above 95% R.H. and below 40% R.H. should also be avoided for sustained periods, as these extremes are detrimental to batteries. Storing the cells at low temperature is also suggested, but attention must be paid when transferring the cells to warmer environments, because of the possibility of having water condensing on to the cells (risk of short-circuits).

- Do not stack battery cartons on top of each other exceeding a specified height. The height is clearly dependent on the strength of the packaging. As for general rule this height should not exceed 1.5 m for cardboard packages or 3 m for wooden cases. The above recommendations are equally valid for storage conditions during prolonged transit. Thus, batteries should be stored away from ship engines and not left for long periods in unventilated metal box cars (containers) during summer.

Section 8 - Exposure Controls / Personal Protection

8.1 Control parameters

Occupational exposure limits are observed as long as the battery remains intact.

8.2 Appropriate engineering controls

Ventilation is not necessary under conditions of normal use.

Avoid contact with water.

8.3 Individual protection measures, such as personal protective equipment (PPE)

In case of exposure to inner component/material (i.e. when handling damaged batteries), protect your skin and eyes with chemical resistant protective gloves (EN374) and tightly sealed protective goggles (EN166).

<u>Respiratory protection (specify type):</u>	Not necessary under conditions of normal use.
<u>Ventilation:</u>	Not necessary under conditions of normal use.
<u>Protective gloves:</u>	Not necessary under conditions of normal use.
<u>Eye protection:</u>	Not necessary under conditions of normal use.
<u>Other protective clothing or equipment:</u>	Not necessary under conditions of normal use.

Section 9 - Physical and Chemical Properties

9.1 Basic physical and chemical properties

Physical state:	Solid
Colour:	according to product specifications
Odour:	Not applicable
Melting point / Freezing point:	Not applicable
Boiling point/Boiling range:	Not applicable
Flammability:	Not determined
Lower and upper explosion limits / Flammability limit:	Not determined
Flash point:	Flash point of electrolyte solvents (°C): DME: -6°C, PC: 123°C, Mixture: 20°C
Auto-ignition temperature:	Not applicable
Decomposition temperature:	No decomposition under normal conditions of use
pH:	Not applicable

A COMPANY OF THE  **SWATCH GROUP**

Renata SA
CH-4452 Itingen/Switzerland
Tel. +41 (0)61 975 75 75
Fax. +41 (0)61 975 75 95
sales@renata.com
www.renata.com

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Kinematic viscosity:	Not applicable
Solubility:	Not applicable
Partition coefficient	
(n-octanol/water) log value:	Not applicable
Vapour pressure:	Not applicable
Density or relative density:	Not applicable
Relative vapour density:	Not applicable
Particle characteristics:	Not applicable

Section 10 - Stability and Reactivity

Lithium batteries are contained in a stable steel container and are sealed to avoid any chemical release under conditions of normal use.

10.1 Reactivity

No reactions if article is used according to specifications.

10.2 Chemical stability

No decomposition if article is used according to specifications.

10.3 Possibility of hazardous reactions

No dangerous reactions if article is used according to specifications.

10.4 Conditions to avoid

See section 7

10.5 Incompatible materials

See section 7

10.6 Hazardous decomposition products

No further information available

Section 11 - Toxicological Information

11.1 Information on toxicological effects

The chemicals mentioned in Section 3 are contained in a sealed can.

Risk of exposure occurs only if the battery is mechanically or electrically abused or if it is ingested (see safety precautions in section 7).

Classification based on the hazardous substances contained in the product (electrode materials and electrolyte solution contained in the batteries):

Acute toxicity

Harmful if swallowed (Manganese Dioxide)

Harmful if inhaled (Manganese Dioxide, DME)

Skin corrosion/irritation

Causes skin irritation (Lithium)

Serious eye damage/irritation

Causes serious eye damage (Lithium)

Respiratory or skin sensitization

Based on classification of ingredients, the classification criteria are not met.

Germ cell mutagenicity

Based on classification of ingredients, the classification criteria are not met.

Carcinogenicity

Based on classification of ingredients, the classification criteria are not met.

Reproductive toxicity

May damage fertility. May damage the unborn child. (DME)

STOT-single exposure

Based on classification of ingredients, the classification criteria are not met.

STOT-repeated exposure

May cause damage to organs (Brain) through prolonged or repeated exposure (Inhalation) (Manganese Dioxide)

Aspiration hazard

Based on classification of ingredients, the classification criteria are not met.

11.2 Information on the likely routes of exposure

The chemicals mentioned in Section 3 are contained in a sealed can.

Risk of exposure occurs only if the battery is mechanically or electrically abused or if it is ingested (exposure via ingestion, skin or eye contact or inhalation). The most likely risk is acute exposure when a cell vents.

11.3 Symptoms related to the physical, chemical and toxicological characteristics

No further information available.

11.4 Delayed and immediate effects and also chronic effects from short and long term exposure

The chemicals mentioned in Section 3 are contained in a sealed can.

Risk of exposure occurs only if the battery is mechanically or electrically abused or if it is ingested (see Safety precautions in Section VII). Swallowing of a battery can lead to chemical burns, perforation of soft tissues and death. Severe burns can occur within 2 hours of ingestion. In case of ingestion, seek medical attention immediately.

11.5 Numerical measures of toxicity

No further information available.

11.6 Interactive effects

No further information available.

Section 12 - Ecological Information

The chemicals mentioned in Section 3 are contained in a sealed battery can.

Under conditions of normal use, the chemicals will not be released.

12.1 Toxicity

Aquatic toxicity: Based on classification of ingredients, the classification criteria are not met.

12.2 Persistence and degradability

Not biodegradable.

12.3 Bioaccumulative potential

No further information available.

12.4 Mobility in soil

No further information available.

12.5 Other adverse effects

No further information available.

Section 13 - Disposal Considerations

13.1 Disposal methods

a) Be sure to comply with your federal, state and local regulation disposal of used batteries.

Dispose in accordance with appropriate national and international regulations, below some references.

European Community: according to Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), Annex VII, batteries have to be removed from any separately collected

WEEE. The removed batteries have to be treated according to the Battery directive 2006/66/EC

European Waste Catalogue: 16 06 05 other batteries and accumulators

US: Lithium batteries are neither specifically listed nor exempted from the Federal Environmental Protection Agency (US EPA) hazardous waste regulations. The only material of possible concern due to its reactivity is lithium metal. However, button cells contain so little lithium that they can be disposed of in the normal municipal waste stream.

Use a professional disposal firm for disposal of mass quantities of undischarged lithium batteries.

b) Open cells should be treated as hazardous waste

DO NOT INCINERATE or subject battery cells to temperatures in excess of 212°F (100°C). Such treatment can cause cell rupture.

Section 14 - Transport Information

Lithium Metal Batteries are classified as Dangerous goods under Class 9 per the United Nations. Our cells and batteries are in compliance of the United Nation Transport Recommendations and meets all the requirements of UN Manual of Test and Criteria (IATA DGR 3.9.2.6).

For transporting our cell or batteries, depending of the shipping method used, the dangerous goods regulations and/or rules are fulfilled and must be followed in case of further transportation.

Our button cells or batteries are packed and shipped under compliance of IEC 60086-1. Our original packaging are adequate to avoid mechanical damages during the transport, handling and stacking. The materials used prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of moisture, shock and vibration are kept to a minimum. For the transport, handling and storage the boxes must be handled with care – cartons should not be thrown off trucks, slammed into position or piled so high as to overload battery containers below. Protection from inclement weather should be provided – See Section 7, Annex I.

Provisions for the international transportation (pursuant to ICAO-TI/IATA-DGR, IMDG Code, ADR, RID, DOT):

UN-No. UN 3090
Proper Shipping Name: Lithium metal batteries

Lithium metal cells and batteries are subject to the following dangerous goods regulations / rules:

Shipping Method	Dangerous Goods Regulations	Packing Instructions and Special Provisions
Air Cargo aircraft only (Forbidden for transport aboard passenger aircraft)	ICAO TI 2020-2021 related to: IATA Dangerous Goods Regulations 2021 (62 nd Edition)	Packing Instruction 968, Section II Only applies for shipments, where the total net weight of the batteries does not exceed 2.5 kg and the shipment does not exceed more than one package (handling unit). Shipper's Declaration (DGD) is not required. Packing Instruction 968, Section IB Applies for shipments with more than one package, total net weight do not have to exceed 2.5 kg pro package (handling unit). Shipper's Declaration (DGD) is required.
Road and Rail Europe	ADR / RID 2021	Special Provision 188
Marine	IMDG Code 2020/2021 (amdt. 40-20)	Special Provision 188
USA	DOT 49 CFR	49 CFR Sections 171.12, 171.24, 171.25, 173.185

Summary of Transport Packing Instructions and Special Provisions of above mentioned Technical Guidelines:

1. For all lithium metal (button) cells, listed in Annex I the lithium content is not more than 0.3 g and for lithium metal batteries the lithium content is not more than 0.3 g.
2. For all the lithium metal (button) cells, listed in Annex I, that the cells are fully and successfully tested to meet the requirements of each test in the UN Manual of *Tests and Criteria*, Part III, subsection 38.3 - (IATA DGR 3.9.2.6).
3. Our cells are safe for transport when build-in equipment¹ (IATA - PI 970) or packed with equipment² (IATA - PI 696) shipped under UN3091. Proper shipper name vary, see below:

UN No.	IATA DGR - Proper Shipper Name	IATA DGR - Packaging Instruction
¹ UN3091	Lithium metal battery contained in equipment	970
² UN3091	Lithium metal battery packed with equipment	696

Important: assembly of the cells and batteries is the responsibility of the customer and may makes new safety tests related to devices necessary.

For download the UN38.3 Test summary, press the link of the requested model, mentioned in the [Annex I](#)

4. Packing, marking, labelling and weight limitations must be observed as per the latest edition of the technical guidelines of the respective transport mode.

Note I: Example of Lithium Metal Battery Mark see Annex II
 Example of Cargo Aircraft Only Label, see Annex III
 Example of Dangerous Goods Class 9 Label, see Annex IV
 For information 49 CFR 171.12 / 171.24 / 171.25 / 173.185 see Annex V

Section15 - Regulatory Information

Environment-related law of batteries: EU nations have applicable law in accordance with Directive 2006/66/EC and other some countries, China, Korea, Brazil, some provinces of USA and Canada or so have similar law.

REACH regulation (1907/2006/EC)

Duty to communicate information on substances in articles (REACH, Article 33):

The product contains the following substance of very high concern (SVHC) in concentrations above 0.1 % w/w :
 DME (CAS 110-71-4): reason for inclusion in the European candidate list -Toxic for reproduction (REACH, Article 57c).

Section 16 - Other Information

RENATA's lithium batteries are registered by UNDERWRITERS LABORATORIES INC., NORTHBROOK, IL, U.S.A., under file number MH14002.

Further information is given in RENATA Designer's Guide.

For lithium cells and batteries in general, Safety Standard IEC 60086-4 applies, which also contains detailed recommendations for manufacturers of equipment and users.

For further information on RENATA's lithium cells and batteries visit our website: www.renata.com.

Abbreviations

Acute Tox. 4: Acute toxicity, Hazard Category 4
 Eye Dam. 1: Serious eye damage/eye irritation, Hazard Category 1
 Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2
 Flam Liq. 2: Flammable liquids, Hazard Category 2
 Ox. Sol. 2: Oxidising Solids, Hazard Category 2
 Repr. 1B: Reproductive toxicity, Hazard Category 1B
 Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2
 STOT RE 2 Specific target organ toxicity — Repeated exposure, Hazard Category 2

STOT SE 3 Specific target organ toxicity — Single exposure, Hazard Category 3

Water-react. 1: Water-reactive, Hazard Category 1

H225: Highly flammable liquid and vapour

H260: In contact with water releases flammable gases which may ignite spontaneously

H272: May intensify fire; oxidiser

H302: Harmful if swallowed

H314: Causes severe skin burns and eye damage

H315: Causes skin irritation

H318: Causes serious eye damage

H319: Causes serious eye irritation

H332: Harmful if inhaled

H335: May cause respiratory irritation

H373 May cause damage to organs (...) through prolonged or repeated exposure (...)

H360 FD May damage fertility. May damage the unborn child.

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

CAS: Chemical Abstracts Service (division of the American Chemical Society)

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

IATA: International Air Transport Association

IMDG: International Maritime Code for Dangerous Goods

SVHC: substance of very high concern

ANNEX I

APPROXIMATE WEIGHT CONTENT OF LITHIUM IN RENATA LITHIUM BATTERIES AND UN38.3 TEST REPORTS

Model no.	% Lithium Max	Weight of battery (in g)	Qty Li (Max in mg)	UN38.3 Test Summary (link to our homepage)
CR1025	1.50%	0.6	9	Test Summary
CR1216 MFR	1.20%	0.7	8	Test Summary
CR1220 MFR	1.20%	0.9	10	Test Summary
CR1225	1.70%	0.9	15	Test Summary
CR1616	1.30%	1.1	15	Test Summary
CR1620	1.80%	1.2	21	Test Summary
CR1632	2.20%	1.8	39	Test Summary
CR2016 MFR	1.50%	1.7	26	Test Summary
CR2016.MFR	1.30%	1.8	23	Test Summary
CR2025 MFR	2.00%	2.5	50	Test Summary
CR2025.MFR	1.90%	2.5	48	Test Summary
CR2032 MFR	2.00%	2.8	56	Test Summary
CR2032.MFR	2.20%	2.9	65	Test Summary
CR2320	1.60%	2.7	43	Test Summary
CR2325	1.80%	3	55	Test Summary
CR2430	2.00%	4.1	80	Test Summary
CR2450HT	2.20%	6.7	149	Test Summary
CR2450N	2.70%	5.9	160	Test Summary
CR2450N-MFR	2.60%	6	156	Test Summary
CR2477N	3.30%	8.3	270	Test Summary
Power Modules / used cell Modell	% Lithium Max	Weight of battery (in g)	Qty Li (Max in mg)	UN38.3 Test Summary (link to our homepage)
338A / CR1225	1.70%	1.7	15	Test Summary

1000-0 / CR2477N	3.30%	15	270	Test Summary
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Power Modules (Non self-running device)

The encapsulated battery is hermetically sealed and therefore suitable for applications in harsh environmental conditions.

For download the UN38.3 Test Summary, please press on the link of each model above.

ANNEX II

Lithium Battery Mark

For further Information consult the IATA DGR, 62nd Edition (Section 7.1.5.5 / Figure 7.1.C Lithium Battery Mark)



In case that the cell or battery is packed with or build-in equipment the UN Nr. Must be amended to UN3090

ANNEX III

Cargo Aircraft Only Label

For further Information consult the IATA DGR, 62nd Edition (Section 7.4.2 Cargo Aircraft Only, Figure 7.4.B)



ANNEX IV

Class 9 – Miscellaneous Dangerous Goods - Lithium Batteries

For further Information consult the IATA DGR, 62nd Edition (Section 7.3.18.2 – Figure 7.3.X)



ANNEX V

For Information:

e-CFR Data is current as of January 4, 2012

Title 49: Transportation**§ 171.12 North American Shipments.**

(a) *Requirements for the use of the Transport Canada TDG Regulations.* (1) A hazardous material transported from Canada to the United States, from the United States to Canada, or transiting the United States to Canada or a foreign destination may be offered for transportation or transported by motor carrier and rail in accordance with the Transport Canada TDG Regulations (IBR, see §171.7) as authorized in §171.22, provided the requirements in §§171.22 and 171.23, as applicable, and this section are met. In addition, a cargo tank motor vehicle, portable tank or rail tank car authorized by the Transport Canada TDG Regulations may be used for transportation to, from, or within the United States provided the cargo tank motor vehicle, portable tank or rail tank car conforms to the applicable requirements of this section. Except as otherwise provided in this subpart and subpart C of this part, the requirements in parts 172, 173, and 178 of this subchapter do not apply for a material transported in accordance with the Transport Canada TDG Regulations.

(2) *General packaging requirements.* When the provisions of this subchapter require a DOT specification or UN standard packaging to be used for transporting a hazardous material, a packaging authorized by the Transport Canada TDG Regulations may be used, subject to the limitations of this part, and only if it is equivalent to the corresponding DOT specification or UN packaging (see §173.24(d)(2) of this subchapter) authorized by this subchapter.

(3) *Bulk packagings.* A portable tank, cargo tank motor vehicle or rail tank car equivalent to a corresponding DOT specification and conforming to and authorized by the Transport Canada TDG Regulations may be used provided

(i) An equivalent type of packaging is authorized for the hazardous material according to the §172.101 table of this subchapter;

(ii) The portable tank, cargo tank motor vehicle or rail tank car conforms to the requirements of the applicable part 173 bulk packaging section specified in the §172.101 table for the material to be transported;

(iii) The portable tank, cargo tank motor vehicle or rail tank car conforms to the requirements of all assigned bulk packaging special provisions (B codes, and T and TP codes) in §172.102 of this subchapter; and

(iv) The bulk packaging conforms to all applicable requirements of §§173.31, 173.32, 173.33 and 173.35 of this subchapter, and parts 177 and 180 of this subchapter. The periodic retests and inspections required by §§173.31, 173.32 and 173.33 of this subchapter may be performed in accordance with part 180 of this subchapter or in accordance with the requirements of the TDG Regulations provided that the intervals prescribed in part 180 of this subchapter are met.

(v) Rail tank cars must conform to the requirements of Canadian General Standards Board standard 43.147 (IBR, see §171.7).

A COMPANY OF THE  **SWATCH GROUP**

Renata SA
CH-4452 Itingen/Switzerland
Tel. +41 (0)61 975 75 75
Fax. +41 (0)61 975 75 95
sales@renata.com
www.renata.com

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(4) *Cylinders*. When the provisions of this subchapter require that a DOT specification or a UN pressure receptacle must be used for a hazardous material, a packaging authorized by the Transport Canada TDG Regulations may be used only if it corresponds to the DOT specification or UN standard authorized by this subchapter. Unless otherwise excepted in this subchapter, a cylinder (including a UN pressure receptacle) may not be transported unless

(i) The packaging is a UN pressure receptacle marked with the letters "CAN" for Canada as a country of manufacture or a country of approval or is a cylinder that was manufactured, inspected and tested in accordance with a DOT specification or a UN standard prescribed in part 178 of this subchapter, except that cylinders not conforming to these requirements must meet the requirements in §171.23. Each cylinder must conform to the applicable requirements in part 173 of this subchapter for the hazardous material involved.

(ii) The packaging is a Canadian Transport Commission (CTC) specification cylinder manufactured, originally marked and approved in accordance with the CTC regulations and in full conformance with the Transport Canada TDG Regulations.

(A) The CTC specification corresponds with a DOT specification and the cylinder markings are the same as those specified in this subchapter except that they were originally marked with the letters "CTC" in place of "DOT";

(B) The cylinder has been requalified under a program authorized by the Transport Canada TDG Regulations or requalified in accordance with the requirements in §180.205 within the prescribed requalification period provided for the corresponding DOT specification;

(C) When the regulations authorize a cylinder for a specific hazardous material with a specification marking prefix of "DOT", a cylinder marked "CTC" which otherwise bears the same markings that would be required of the specified "DOT" cylinder may be used; and

(D) Transport of the cylinder and the material it contains is in all other respects in conformance with the requirements of this subchapter (e.g. valve protection, filling requirements, operational requirements, etc.).

(5) *Class 1 (explosive) materials*. When transporting Class 1 (explosive) material, rail and motor carriers must comply with 49 CFR 1572.9 and 1572.11 to the extent the requirements apply.

(6) Primary lithium batteries and cells. Packages containing primary lithium batteries and cells that meet the exception in §172.102, Special Provision 188 or 189 of this subchapter must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." The provisions of this paragraph do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries cells that are contained in or packed with equipment.

(b) *Shipments to or from Mexico*. Unless otherwise excepted, hazardous materials shipments from Mexico to the United States or from the United States to Mexico must conform to all applicable requirements of this subchapter. When a hazardous material that is a material poisonous by inhalation (see §171.8) is transported by highway or rail from Mexico to the United States, or from the United States to Mexico, the following requirements apply:

(1) The shipping description must include the words "Toxic Inhalation Hazard" or "Poison-Inhalation Hazard" or "Inhalation Hazard", as required in §172.203(m) of this subchapter.

(2) The material must be packaged in accordance with requirements of this subchapter.

(3) The package must be marked in accordance with §172.313 of this subchapter.

(4) Except as provided in paragraph (e)(5) of this section, the package must be labeled or placarded POISON GAS or POISON INHALATION HAZARD, as appropriate, in accordance with subparts E and F of this subchapter.

(5) A label or placard that conforms to the UN Recommendations (IBR, see §171.7) specifications for a "Division 2.3" or "Division 6.1" label or placard may be substituted for the POISON GAS or POISON INHALATION HAZARD label or placard required by §172.400(a) and 172.504(e) of this subchapter on a package transported in a closed transport vehicle or freight container. The transport vehicle or freight container must be marked with identification numbers for the material, regardless of the total quantity contained in the transport vehicle or freight container, in the manner specified in §172.313(c) of this subchapter and placarded as required by subpart F of this subchapter.

§ 171.24 Additional requirements for the use of the ICAO Technical Instructions.

(a) A hazardous material that is offered for transportation or transported within the United States by aircraft, and by motor vehicle or rail either before or after being transported by aircraft in accordance with the ICAO Technical Instructions (IBR, see §171.7), as authorized in paragraph (a) of §171.22, must conform to the requirements in §171.22, as applicable, and this section.

(b) Any person who offers for transportation or transports a hazardous material in accordance with the ICAO Technical Instructions must comply with the following additional conditions and requirements:

(1) All applicable requirements in parts 171 and 175 of this subchapter (also see 14 CFR 121.135, 121.401, 121.433a, 135.323, 135.327 and 135.333);

(2) The quantity limits prescribed in the ICAO Technical Instructions for transportation by passenger-carrying or cargo aircraft, as applicable;

(3) The conditions or requirements of a United States variation, when specified in the ICAO Technical Instructions.

(c) *Highway transportation*. For transportation by highway prior to or after transportation by aircraft, a shipment must conform to the applicable requirements of part 177 of this subchapter, and the motor vehicle must be placarded in accordance with subpart F of part 172.

(d) *Conditions and requirements specific to certain materials*. Hazardous materials offered for transportation or transported in accordance with the ICAO Technical Instructions must conform to the following specific conditions and requirements, as applicable:

(1) *Batteries* (i) *Nonspillable wet electric storage batteries*. Nonspillable wet electric storage batteries are not subject to the requirements of this subchapter provided

(A) The battery meets the conditions specified in Special Provision 67 of the ICAO Technical Instructions;

(B) The battery, its outer packaging, and any overpack are plainly and durably marked "NONSPILLABLE" or "NONSPILLABLE BATTERY"; and

(C) The batteries or battery assemblies are offered for transportation or transported in a manner that prevents short circuiting or forced discharge, including, but not limited to, protection of exposed terminals.

(ii) Primary lithium batteries and cells. Primary lithium batteries and cells are forbidden for transportation aboard passenger-carrying aircraft. Equipment containing or packed with primary lithium batteries or cells are forbidden for transport aboard passenger-carrying aircraft except as provided in §172.102, Special Provision A101 of this subchapter. When transported aboard cargo-only aircraft, packages containing primary lithium batteries and cells transported in accordance with Packing Instructions 968-970 (Section II) of the ICAO Technical Instructions must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment.

(iii) *Prototype lithium batteries and cells.* Prototype lithium batteries and cells are forbidden for transport aboard passenger aircraft and must be approved by the Associate Administrator prior to transportation aboard cargo aircraft, in accordance with the requirements of Special Provision A55 in §172.102 of this subchapter.

(2) A package containing Oxygen, compressed, or any of the following oxidizing gases must be packaged as required by Parts 173 and 178 of this subchapter: carbon dioxide and oxygen mixtures, compressed; compressed gas, oxidizing, n.o.s.; liquefied gas, oxidizing, n.o.s.; nitrogen trifluoride; and nitrous oxide.

§ 171.25 Additional requirements for the use of the IMDG Code.

(a) A hazardous material may be offered for transportation or transported to, from or within the United States by vessel, and by motor carrier and rail in accordance with the IMDG Code (IBR, see §171.7), as authorized in §171.22, provided all or part of the movement is by vessel. Such shipments must conform to the requirements in §171.22, as applicable, and this section.

(b) Any person who offers for transportation or transports a hazardous material in accordance with the IMDG Code must conform to the following additional conditions and requirements:

(1) Unless specified otherwise in this subchapter, a shipment must conform to the requirements in part 176 of this subchapter. For transportation by rail or highway prior to or subsequent to transportation by vessel, a shipment must conform to the applicable requirements of parts 174 and 177 respectively, of this subchapter, and the motor vehicle or rail car must be placarded in accordance with subpart F of part 172 of this subchapter. When a hazardous material regulated by this subchapter for transportation by highway is transported by motor vehicle on a public highway or by rail under the provisions of subpart C of part 171, the segregation requirements of Part 7, Chapter 7.2 of the IMDG Code are authorized.

(2) For transportation by vessel, the stowage and segregation requirements in Part 7 of the IMDG Code may be substituted for the stowage and segregation requirements in part 176 of this subchapter.

(3) Packages containing primary lithium batteries and cells that are transported in accordance with Special Provision 188 of the IMDG Code must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries and cells that are contained in or packed with equipment.

(4) Material consigned under UN3166 and UN3171 (e.g., Engines, internal combustion, etc., Vehicles, etc. and Battery-powered equipment) may be prepared in accordance with the IMDG Code or this subchapter.

(c) *Conditions and requirements for bulk packagings.* Except for IBCs and UN portable tanks used for the transportation of liquids or solids, bulk packagings must conform to the requirements of this subchapter. Additionally, the following requirements apply:

(1) UN portable tanks must conform to the requirements in Special Provisions TP37, TP38, TP44 and TP45 when applicable, and any applicable bulk special provisions assigned to the hazardous material in the Hazardous Materials Table in §172.101 of this subchapter;

(2) IMO Type 5 portable tanks must conform to DOT Specification 51 or UN portable tank requirements, unless specifically authorized in this subchapter or approved by the Associate Administrator;

(3) Except as specified in this subpart, for a material poisonous (toxic) by inhalation, the T Codes specified in Column 13 of the Dangerous Goods List in the IMDG Code may be applied to the transportation of those materials in IM, IMO and DOT Specification 51 portable tanks, when these portable tanks are authorized in accordance with the requirements of this subchapter; and

(4) No person may offer an IM or UN portable tank containing liquid hazardous materials of Class 3, PG I or II, or PG III with a flash point less than 100 °F (38 °C); Division 5.1, PG I or II; or Division 6.1, PG I or II, for unloading while it remains on a transport vehicle with the motive power unit attached, unless it conforms to the requirements in §177.834(o) of this subchapter.

(d) *Use of IMDG Code in port areas.* (1) Except for Division 1.1, 1.2, and Class 7 materials, a hazardous material being imported into or exported from the United States or passing through the United States in the course of being shipped between locations outside the United States may be offered and accepted for transportation and transported by motor vehicle within a single port area, including contiguous harbors, when packaged, marked, classed, labelled, stowed and segregated in accordance with the IMDG Code, offered and accepted in accordance with the requirements of subparts C and F of part 172 of this subchapter pertaining to shipping papers and placarding, and otherwise conforms to the applicable requirements of part 176 of this subchapter.

(2) The requirement in §172.201(d) of this subchapter for an emergency telephone number does not apply to shipments made in accordance with the IMDG Code if the hazardous material is not offloaded from the vessel, or is offloaded between ocean vessels at a U.S. port facility without being transported by public highway.

§ 173.185 Lithium cells and batteries.

(a) Cells and batteries. A lithium cell or battery, including a lithium polymer cell or battery and a lithium-ion cell or battery, must conform to all of the following requirements:

(1) Be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see § 171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that 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, need not be retested.

(2) Incorporate a safety venting device or otherwise be designed in a manner that will preclude a violent rupture under conditions normally incident to transportation.

(3) Be equipped with an effective means to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.) if a battery contains cells or series of cells that are connected in parallel.

(4) Be packaged in combination packagings conforming to the requirements of part 178, subparts L and M, of this subchapter at the Packing Group II performance level. The lithium battery or cell must be packed in inner packagings in such a manner as to prevent short circuits, including movement which could lead to short circuits. The inner packaging must be packed within one of the following outer packagings: metal boxes (4A or 4B); wooden boxes (4C1, 4C2, 4D, or 4F); fiberboard boxes (4G); solid plastic boxes (4H2); fiber drums (1G); metal drums (1A2 or 1B2); plywood drums (1D); plastic jerricans (3H2); or metal jerricans (3A2 or 3B2).

(5) Be equipped with an effective means of preventing external short circuits.

(6) Except as provided in paragraph (d) of this section, cells and batteries with a liquid cathode containing sulphur 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 2/3 of the voltage of the fully charged cell, whichever is less.

(b) Lithium cells or batteries packed with equipment. Lithium cells or batteries packed with equipment may be transported as Class 9 materials if the batteries and cells meet all the requirements of paragraph (a) of this section. The equipment and the packages of cells or batteries must be further packed in a strong outer packaging. The cells or batteries must be packed in such a manner as to prevent short circuits, including movement that could lead to short circuits.

(c) Lithium cells or batteries contained in equipment. Lithium cells or batteries contained in equipment may be transported as Class 9 materials if the cells and batteries meet all the requirements of paragraph (a) of this section, except paragraph (a)(4) of this section, and the equipment is packed in a strong outer packaging that is waterproof or is made waterproof through the use of a liner unless the equipment is made waterproof by nature of its construction. The equipment and cells or batteries must be secured within the outer packaging and be packed so as to prevent movement, short circuits, and accidental operation during transport.

(d) Cells and batteries, for disposal or recycling. A lithium cell or battery offered for transportation or transported by motor vehicle to a permitted storage facility, disposal site or for purposes of recycling is excepted from the specification packaging requirements of paragraph (a)(4) of this section and the requirements of paragraphs (a)(1) and (a)(6) of this section when protected against short circuits and packed in a strong outer packaging conforming to the requirements of §§ 173.24 and 173.24a.

(e) Shipments for testing (prototypes). A lithium cell or battery is excepted from the requirements of (a)(1) of this section when transported by motor vehicle for purposes of testing. The cell or battery must be individually packed in an inner packaging, surrounded by cushioning material that is non-combustible and nonconductive. The cell or battery must be transported as a Class 9 material.

(f) A lithium cell or battery that does not comply with the provisions of this subchapter may be transported only under conditions approved by the Associate Administrator.

(g) Batteries employing a strong, impact-resistant outer casing and exceeding a gross weight of 12 kg (26.5 lbs.), 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 inadvertent 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 cargo aircraft only if approved by the Associate Administrator prior to transportation.