GP Batteries (UK) Limited
Summerfield Avenue, Chelston Business Park,
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Tel: 01823 660044 Fax 01823 665595
http://www.gpbatteries.co.uk

PRODUCT HANDLING

RE:- HEALTH AND SAFETY AT WORK ACT 1974

The above act came fully into force on 1st April 1975. We, as manufacturers and suppliers of batteries, wish to inform you that, in compliance with Section 6 of the Act, safety precautions should be taken with our products. Every care is taken to ensure, so far as is reasonably practicable, that our products are safe and without risks to health or safety when properly used. The appropriate health and safety precautions must nevertheless be taken, as listed below.

COMMON HAZARDS TO ALL BATTERIES

1. ELECTRICAL

Battery terminal voltages in excess of a safe level should be suitably protected. Overloaded current conductors can reach excessive temperatures producing a hazard. Sparks can be created by all types and sizes of batteries, creating a hazard in an explosive atmosphere, unless batteries are specifically designed for use in these conditions. Purchasers are recommended to seek the advice of electrical contractors where there are doubts about the suitability of current conductors.

2. MECHANICAL

Batteries must be constructed and maintained in accordance with the manufacturer instructions. In cases where the purchaser is not the final user, it is the purchaser's responsibility to ensure that the operating instructions are supplied with the battery to the final user.

3. THERMAL

Batteries must be operated and stored within the manufacturer's specified temperature limits. In cases where the purchaser is not the final user, it is the purchaser's responsibility to ensure that the operating instructions are supplied with the battery to the final user.

HEALTH AND SAFETY

4. CHEMICAL

Residual deposits on external surfaces of batteries must be prevented from coming into contact with sensitive areas of the body. Protective clothing should be worn when handling chemicals, which must also be prevented from coming into contact with eyes or skin. Batteries contain toxic compounds, the disposal of which should be delegated to a competent organisation, complying with the Deposit of Poisonous Waste regulation, 1972.

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Lithium cells - if the cell is crushed, the electrodes will be short-circuited, and there will invariably be loss of electrolytes. The latter itself is not caustic and relatively non-toxic, but is flammable. If the crushing is such that there is local intense heat generation, a fire may well be started. Should there be water surrounding the crushed cell, or very high humidity in the atmosphere, the reaction with the exposed Lithium will give off Hydrogen and considerable heat, which may also cause a fire. Exposed Lithium metal must **never** be touched or picked up with bare hands since it is very caustic especially, again, if there is water present.

HAZARDS ASSOCIATED WITH SPECIFIC BATTERY TYPES

1. PRIMARY

Such batteries are designed for discharge purposes only. The charging of such batteries is STRICTLY PROHIBITED owing to the risk of leakage of corrosive compounds and possible explosion.

2. SEALED NICKEL CADMIUM

On continuous charge, the electrical energy, once the battery is fully charged, is converted to heat. To ensure this occurs under controlled conditions, it is essential that charging is from a constant current source of the correct magnitude, and adequate ventilation for cooling is provided.

3. MAINTENANCE FREE LEAD ACID

Maintenance free lead acid batteries are provided with one-way valves to permit gasses formed within the cells to be vented to atmosphere. The gasses evolved are potentially explosive. Adequate ventilation must, therefore, be provided.

GENERAL SAFETY CRITERIA

** ***Do not*** dispose of cells/batteries in fire.
** ***Do not*** short circuit.
** ***Do not*** attempt to recharge primary cells/batteries.
** ***Do not*** crush, puncture, open, dismantle or otherwise mechanically interfere with or abuse, these cells/batteries.
** Do not store at temperatures in excess of +60°C - the optimum storage temperature for maximum life is +10°C to + 35°C.
** ***Always observe*** the polarity of the cells - insert correctly.

UNLESS CELLS/BATTERIES ARE SUITABLY INSULATED, THEY SHOULD NOT BE:-

** Carried in pockets with keys, change or other metal objects.
** Put in drawers, boxes, trays etc. with metal objects like paper clips, steel rulers, scissors, screwdrivers etc.
** Put in metal drawers, filing cabinets etc.

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FIRST AID

Occasionally, small children swallow button cells, in particular. In the event of this happening, consult a doctor, who will normally recommend that the swallowed cell is monitored to ensure it moves through the body.

The cell casing and sealing device are composed of materials such as stainless, mild or nickel-plated steel, polypropylene or polyamide. The action of decomposition by the acid-containing juices is not too rapid, but it cannot be safely stated as to how long the cell may remain within the body without causing damage, since this depends on the electro-chemical system, i.e cell voltage, degree of discharge, and the components of the cell casing.

The amount of toxicity of the cell contents (Mercury, Silver, Manganese Dioxide, Nickel Cadmium, Lithium, Zinc etc.) will depend on the amount of this material and the length of time it is left in the body.

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If you require any further information, please do not hesitate to call us.

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Would you please complete and return the acknowledgement slip below: -

COMPANY:- .....

I acknowledge receipt of the PRODUCT HANDLING DETAIL SHEET

SIGNED:- ..... POSITION:-.....

DATE:- .....

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BATTERY SAFETY GUIDELINES

LITHIUM BATTERIES

COSH REGULATIONS

GPB design and manufacture batteries, so far as is reasonably practicable, to be safe and without risk to health when properly used.

Supplied as sealed units they represent no chemical hazard in the sense of the Control of Substances to Health (COSH) regulations.

Chemical hazard can however arrive if batteries are misused or abused when leakage or, in extreme cases, fire or explosion, may occur.

In order to avoid potential problems normal Battery Safety Guidelines should be observed on storage, use and disposal.

Handling

Most primary electrochemical couples in production today contain Zinc as the anode material and Potassium Hydroxide as the electrolyte. Battery systems that have improved life characteristics and energy density use lithium in place of Zinc as the anode material.

Lithium is the lightest metal in the periodic table in terms of weight; it has only half the specific weight of water.

GPB Lithium batteries use organic non-aggressive, non-creeping electrolyte and solid cathode material Manganese Dioxide.

To extract the cell's full capacity and to achieve maximum life the following rules should be followed:-

1) Avoid short circuiting batteries. Although this is not dangerous, the battery's available capacity will be reduced.

2) Observe the correct polarity of the battery to ensure the battery does not receive charge (See 4)

3) Do not incinerate. Incineration may cause the battery case to rupture.

4) GPB lithium MnO2 batteries are primary batteries and not rechargeable.

The amount of accumulated current flowing into the battery must not exceed 1% of its nominal capacity during the lifetime. Higher charge input may result in increase of internal pressure and decomposition of material.

As in all primary systems there is the danger of cells rupturing in such cases.

FIRST AID:- Should a cell rupture, isolate it from moisture and seek professional advice.

Lithium and Manganese Dioxide are both toxic if ingested IMMEDIATE MEDICAL ATTENTION SHOULD BE SOUGHT.

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BATTERY SAFETY GUIDELINES

COSHH REGULATIONS 1994

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Supplied as sealed units they represent no chemical hazard in the sense of the Control of Substances to Health (COSHH) regulations.

Chemical hazard can however arrive if batteries are misused or abused when leakage or, in extreme cases, fire or explosion, may occur.

In order to avoid potential problems the Battery Safety Guidelines (copy attached) should be observed on storage, use and disposal.

1. Zinc Carbon Batteries (Table 1)

   The main chemical hazard arises if the battery leaks or vents. The electrolyte is a concentrated solution of Zinc Chloride and Ammonium Chloride in water. The material is acidic, corrosive, and will cause burns to the skin. The electrolyte is also harmful if it enters the eyes.

   FIRST AID: If the user comes into contact with the electrolyte, the part affected should be washed immediately with water. If the material enters the eyes - seek immediate medical attention without delay.

   The cathode mix is corrosive and contains Manganese Dioxide which is toxic if ingested. Immediate medical attention should be sought.

2. Zinc Chloride Batteries (Table 2)

   The main chemical hazard arises if the battery leaks or vents. The electrolyte is a concentrated solution of Zinc Chloride in water. This material is acidic, corrosive and will cause burns to the skin. The electrolyte is also harmful if it enters the eyes.

   FIRST AID: If the user comes into contact with the electrolyte, the part affected should be washed immediately with water. If the material enters the eyes - seek immediate medical attention without delay.

   The cathode mix is corrosive and contains Manganese Dioxide which is toxic if ingested. Immediate medical attention should be sought.

3. Alkaline Manganese Batteries (Table 3)

The main hazard arises if the battery leaks or vents. The electrolyte is strongly alkaline (34 - 38% solution) Potassium Hydroxide which is highly corrosive. It will cause burns to skin externally (or internally). Potassium Hydroxide is *exceedingly* harmful although tissue damage will not become apparent for several hours after exposure.

FIRST AID: Anyone coming into contact with Potassium Hydroxide should wash the affected area *thoroughly* with water. If the material enters the eyes - seek emergency medical attention without delay.

Alkaline Manganese cells contain Zinc powder and Manganese Dioxide, both of which are toxic if ingested. Immediate medical attention should be sought.

4. Button Cells (Table 4)

Any type of button cell is hazardous if swallowed. If this arises immediate medical attention should be sought. *Surgical removal of the battery should only be considered if the battery does not continue its movement through the body, and on considered medical advice.*

The chemical hazard depends on the system type. If button cells are ingested, even the nickel-plated case material will dissolve in the stomach acid giving rise to toxic nickel salts. Most button cells contain 34 - 40% Potassium Hydroxide solution, which is highly corrosive but present in small volume.

Mercuric Oxide-Zinc button cells are the most hazardous if ingested because they contain approximately 30% by cell weight of highly toxic Mercuric Oxide powder in the cathode.

5. Nickel-Cadmium and Nickel Metal Hydride Batteries (Tables 5 & 6)

These batteries contain 30% Potassium Hydroxide solution which is highly corrosive. Normally this material would only be expelled under conditions of abuse. NiCd batteries also contain Cadmium, Cadmium Hydroxide and Nickel Hydroxide, all of which are toxic.

FIRST AID: Anyone coming into contact with Potassium Hydroxide should wash the affected area *thoroughly* with water. If the material enters the eyes - seek emergency medical attention without delay.

TABLE 1
ZINC CARBON LECLANCHE BATTERIES (ROUND AND LAYER CELLS)
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Can (anode)	Low	Low health risk. Could be reactive fire hazard
Cadmium (in can)	Low	High toxicity, but trace levels <100 ppm
Lead	Low	High toxicity, but trace levels <100 ppm
Manganese Dioxide	High	Toxic material present in large quantity. Irritant oxidising agent assists fire. Avoid ingestion
Ammonium Chloride	High	Corrosive, harmful of ingested. Avoid eye/skin contact
Zinc Chloride	High	Corrosive, harmful of ingested. Avoid eye/skin contact
Cellulose coated paper separator	Low	Low hazard but would contain corrosive electrolyte, component trace of Manganese Dioxide.
Carbon Rods (RC) Carbon coat on Zinc	Low	Low hazard but would be wet with corrosive electrolyte and is in contact with Manganese Dioxide.
Carbon Black, also graphite layer paper	Low	Low oral toxicity, but is mixed with harmful Manganese Dioxide and corrosive electrolyte components.
Bitumen sealant (RC) Wax (LC)	Low	Low hazard but in contact with other hazardous materials
Shrink sleeve	Low	Low ingestion hazard. Danger on incineration.
Outer labels/metal jackets	Low	Inks may be harmful if ingested.
Plated metal components	Low	Nickel or Copper surfaces when corroded lead to formation of toxic salts. Avoid ingestion.
Chlorine (not primary constituent)	Low	Toxic gas but only formed if batteries charged or reverse position
Nitrogen Trichloride (not primary constituent)	Low	Explosive compound which can be formed in rare instances during battery reversal or charging.

TABLE 2
ZINC CHLORIDE BATTERIES
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Zinc Can (anode)	Low	Low health risk. Could be reactive fire hazard
Cadmium (in can)	Low	High toxicity, but trace levels <100 ppm
Lead	Low	High toxicity, but trace levels <100 ppm
Manganese Dioxide	High	Toxic material present in large quantity. Irritant oxidising agent assists fire. Avoid ingestion
Zinc Chloride (Electrolyte)	High	Corrosive, harmful if ingested. Avoid eye/skin contact
Separator, starch PVA organic corrosion inhibitor	Low	Low hazard but would contain corrosive electrolyte component trace Manganese Dioxide
Carbon Rods (RC) Carbon coat on Zinc (LC)	Low	Low hazard but would be wet with corrosive electrolyte and is in contact with Manganese Dioxide.
Carbon Black	Low	Low oral toxicity, but is mixed with harmful Manganese Dioxide and corrosive electrolyte components.
Bitumen sealant	Low	Low hazard but in contact with other hazardous materials
Shrink sleeve	Low	Low ingestion hazard. Danger on incineration.
Outer labels/metal jackets	Low	Inks may be harmful if ingested.
Plated metal components	Low	Nickel or Copper surfaces when corroded lead to formation of toxic salts. Avoid ingestion.
Chlorine (not primary constituent)	Low	Toxic gas but only formed if batteries charged or reverse position

TABLE 3
ALKALINE MANGANESE BATTERIES
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Zinc Powder (anode)	Low	Fire hazard when wet with electrolyte and exposed to air
Carbapol Gelant	Low	Low oral toxicity but is in contact with anode and corrosive electrolyte.
Potassium Hydroxide solution (electrolyte)	High	Highly corrosive. Avoid skin contact. Dangerous if enters eyes.
Manganese Dioxide	High	Toxic material present in large quantity. Irritant oxidising agent assists fire. Avoid ingestion
Graphite	Low	Low toxicity but is mixed with harmful Manganese Dioxide
Separator (Nylon)	Low	Low toxicity but wet with Potassium Hydroxide
Nickel-plated steel container/top cap	Low	Corroded surfaces would lead to toxic nickel salts. Avoid ingestion
Brass current connector nail (round cells)	Low	Low inherent hazard

TABLE 4
ZINC-SILVER OXIDE BUTTON CELLS
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE
(OR THROUGH INGESTION)

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Zinc Powder (anode)	Low	Harmful by ingestion. Slight fire risk.
Silver Oxide (Cathode)	High	Silver salts are toxic if absorbed. Present in large quantities therefore high hazard rating..
Potassium Hydroxide solution (electrolyte)	High	Highly corrosive. Avoid skin contact. Dangerous if enters eyes.
Separator permion/cellophane layer	Low	Low hazard but contains corrosive electrolyte
Nickel-plated steel container	High	Because of small size, button cells are easily swallowed by infants. Container will dissolve in stomach acid releasing toxic components. Avoid ingestion

TABLE 5
ZINC-MERCURIC OXIDE BUTTON CELLS
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE
(OR THROUGH INGESTION)

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Amalgamated Zinc Powder (anode)	High	Harmful Mercury vapour released. Harmful by ingestion. Slight fire risk.
Mercuric Oxide (Cathode)	High	Highly toxic material. Avoid ingestion
Potassium Hydroxide solution (electrolyte)	High	Highly corrosive. Avoid skin contact. Dangerous if enters eyes.
Graphite	Low	Low toxicity but is mixed with harmful Manganese Dioxide
Separator permion/cellophane layer	Low	Low hazard but contains corrosive electrolyte
Nickel-plated steel container	High	Because of small size, button cells are easily swallowed by infants. Container will dissolve in stomach acid releasing toxic components. Avoid ingestion

TABLE 6
NICKEL CADMIUM BATTERIES
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Negative Electrode Cadmium metal, cadmium Hydroxide, Nickel foam	High	Cadmium metal and Hydroxide present in large quantities. Highly toxic. Fire risk if exposed to air when charged. Cadmium vapour then additional risk
Positive Electrode Nickel Hydroxide, Cobalt Hydride, Nickel foam	High	Nickel and Cobalt Hydroxide toxic if ingested.
Potassium Hydroxide (Electrolyte)	High	Highly corrosive. Avoid skin/eye contact.
Separator - Polyamide	Low	Low inherent hazard but wet with electrolyte in contact with electrodes.

TABLE 7
NICKEL HYDRIDE BATTERIES
COMPONENTS WHICH COULD BE EXPOSED IF CELLS LEAK OR DISRUPT ON ABUSE

SUBSTANCE	HAZARD LEVEL	TYPE OF HAZARD
Negative Electrode Nickel foam, Alloys of Titanium, Cobalt, Chromium, Iron and trace of rare earth	High	Hydroxide present in large quantities. Hydrogen release possible and high temperatures. Nickel toxic if ingested
Positive Electrode Nickel Hydroxide, Cobalt Hydride, Nickel foam	High	Nickel and Cobalt Hydroxide toxic if ingested.
Potassium Hydroxide (Electrolyte)	High	Highly corrosive. Avoid skin/eye contact.
Separator - Polyamide	Low	Low inherent hazard but wet with electrolyte in contact with electrodes.