

Title: **THE SAFE HANDLING,
TRANSPORTATION AND
DISPOSAL OF CELLS,
BATTERIES AND ELECTROLYTE**

Unique Identifier: **240-89797258**

Alternative Reference Number: **<n/a>**

Area of Applicability: **Engineering**

Documentation Type: **Standard**

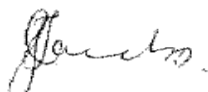
Revision: **2**

Total Pages: **23**

Next Review Date: **October 2022**

Disclosure Classification: **Controlled
Disclosure**

Compiled by

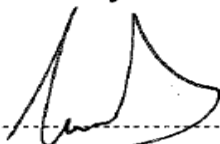


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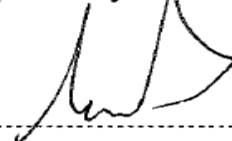


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1. Introduction

Eskom uses batteries at their sites for the provision of standby power for the control and protection of power plant at these sites. Batteries are classified as hazardous substances and therefore must be handled in a safe manner to minimize risk and ensure the safety of staff, the public and the environment.

It is frequently required of the DC field staff to commission the batteries either at the workshop or at site, which involves the transportation of the batteries on public roads. Therefore, it is critical that the business is aware of the regulations for the control of the carriage of dangerous goods by road in South Africa as stipulated in Chapter VIII of the 1996 National Road Traffic Act. These regulations incorporate numerous codes of practice compiled by the South African Bureau of Standards, which became effective on 3 August 2001.

At the end of the batteries' useful life, it is removed from service and disposed of or recycled in an environmentally friendly manner in support of Eskom's commitment towards the preservation of the environment.

The information contained in this document on the relative densities of electrolyte usually used in batteries was compiled from material safety datasheets of battery manufacturers and laboratories.

2. Supporting clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to specify the minimum requirements for the safe handling, transportation and disposal of cells, batteries and the associated electrolyte. This document does not replace material data sheets that are shipped with hazardous substances, but gives an indication of the risks involved and the procedure to follow when handling these hazardous substances.

As far as transportation of dangerous goods is concerned, this document indicates the requirements when loads below the exempt quantities are being transported as the applicable SANS documents detail the requirements where the loads exceed exempt quantities.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] Chapter VIII of the National Road Traffic Regulations of 1999: *Transportation of dangerous goods and substances by road*.
- [2] Hazardous Chemical Substances Regulations, 1995
- [3] National Environmental Management: Waste Act (Act 59 of 2008) and associated regulations
- [4] Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- [5] SANS 10228:2012, Edition 6, The identification and classification of dangerous goods for transport by road and rail modes
- [6] SANS 10229-1: 2010, Edition 2, Transportation of dangerous goods – Packaging and large packaging for road and rail transport – Part 1: Packaging.

- [7] SANS 10229-2: 2010, Edition 1.1, Transportation of dangerous goods – Packaging and large packaging for road and rail transport – Part 2: Large Packaging.
- [8] SANS 10231: 2014, Edition 4, Transportation of dangerous goods – Operational requirements for road vehicles.
- [9] SANS 10232-1: 2007, Edition 3, Transportation of dangerous goods – Emergency information systems – Part 1: Emergency information system for road transportation.
- [10] SANS 10232-3: 2011, Edition 3.01, Transportation of dangerous goods – Emergency information systems – Part 3: Emergency response guides.
- [11] SANS 10232-4: 2012, Edition 1.02, Transportation of dangerous goods – Emergency information systems – Part 4: Transport emergency card.
- [12] 240-44175132, Eskom Personal Protective Equipment (PPE).
- [13] 240-62946386, Vehicle and Driver Safety Management Procedure.
- [14] 32-95, Environmental, Occupational Health and Safety Incident Management Procedure.
- [15] DSP_34-1061: Specification for safety signs used in DC applications.
- [16] 32-123, Emergency Planning.
- [17] 32-245, Eskom Waste Management Standard
- [18] DST_34-332: First Aid Standard.

2.2.2 Informative

- [19] Dangerous Goods Digest – The orange book of Southern Africa.
- [20] National Environmental Management Act, 1998 (Act No. 107 of 1998)
- [21] National Road Traffic Act, 1996 (Act No. 93 of 1996)
- [22] Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- [23] MSDS-IBG-ALCAD-ENG, Alcad Nickel cadmium battery safety data sheet – Secondary battery, April 2003
- [24] MSDS 03, Standby (Planté, Faure & Tubular) material safety data sheet, 15-02-2008

2.3 Definitions

2.3.1 General

Definition	Description
class 8	Substances that, by chemical action, cause damage to living tissue, to commonly used metals, or to other cargo.
danger group II	Substances and goods that present a serious risk.
danger group III	Substances and goods that present a relatively low risk.
electrolyte	A liquid, semi-solid or solid phase containing mobile ions.
hydrometer	An instrument for measuring the specific gravity of fluids.
relative density	The density of the electrolyte relative to the density of pure water, corrected for the reference temperature.
specific gravity	Replaced by relative density.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
MSDS	Material Safety Datasheet
°C	Degrees Celsius
PPE	Personal protective equipment
RD	Relative density
S.I.N.	Substance identification number
SG	Specific gravity

2.5 Roles and responsibilities

- a) The line managers in each Operating Unit (OU) where batteries and electrolyte are used and handled are responsible to ensure that the requirements of this standard are implemented and adhered to.
- b) Management shall ensure that the requirements related to hazardous substances as detailed in 32-245, Eskom Waste Management Standard, are adhered to.
- c) The site risk and safety representative shall be responsible in conjunction with management for the establishment of an emergency preparedness plan which is in line with the requirements of 32-123, Emergency Planning. It is advised that each OU establish contracts with regional emergency service providers e.g. NETCARE 911, ER24, HAZMAT operators, for the handling and transportation of dangerous goods related incidents and that the business is duly informed of the available emergency services.
- d) Management shall ensure that the requirements of this standard are adhered to when Eskom vehicles are used for the transportation of dangerous goods.
- e) Management shall ensure that all staff involved with the handling, transportation and disposal of cells/batteries have received training on the requirements outlined in this standard.
- f) In the case of dangerous goods loads in excess of the exempt quantity, the consignor shall ensure that the selected transport company is authorised as a dangerous goods operator and registered as such with the Department of Transport.
- g) The consigner shall ensure that the requirements of the National Environmental Management: Waste Act (Act 59 of 2008) is adhered to – specifically related to the mandate granted to local municipalities in clause 25.(1). It states that local bylaws may require waste transporters to be registered with the waste management department of the municipality to operate within their boundaries. The local SHEQ department shall be consulted for confirmation and guidance on the implementation of the applicable bylaw requirements concerning storage, handling and transportation of batteries as this might differ per municipality.
- h) It is the responsibility of the transport company (consignee) that transports the dangerous goods to ensure that it operates within the requirements of Chapter VIII of the National Road Traffic Regulations of 1999: Transportation of dangerous goods and substances by road.

2.6 Process for monitoring

The Batteries Care Group is accountable to ensure that the contents of this document are updated and relevant.

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2.7 Related/supporting documents

This document replaces the following documents:

- 240-75343769, Transportation of electrolyte and battery cells.
- 240-75365565, The safe handling of batteries and electrolyte.
- 240-80176775, Safe disposal of redundant batteries.
- DPC_34-140, Distribution Standard – Part 16: Safe disposal of redundant batteries.
- DPC_34-1042, Distribution Procedure – Part 16: The safe handling of batteries and electrolyte.
- ETPR 0800, The safe handling of batteries and electrolyte.

3. Requirements

3.1 General

Sulfuric Acid (H₂SO₄) and Potassium Hydroxide (KOH) are hazardous substances that are used as electrolyte in Lead Acid batteries and Nickel Cadmium batteries, respectively. Certain safety measures must be implemented to ensure the safe handling and storage of these substances.

The main hazards associated with cells and batteries are:

- a) Explosions, due to the hydrogen liberated during operation which can be ignited,
- b) The corrosive electrolyte which could by chemical action severely damage living tissue or other materials,
- c) Electrocution as the cell / battery stores electrical energy in a chemical form and can release a significant amount of current and heat when the terminals are short circuited. Therefore, all tools used to work on cells / batteries shall be fully insulated and checked to be in good working order on a regular basis and before use
- d) Environmental pollution when the electrolyte spills
- e) and physical injuries as the cells can weigh anything from a few kilograms to tens of kilograms.

As can be seen from Table 1 and Table 2, these substances are classified as being class 8 substances. Class 8 substances have a more or less destructive effect on materials such as metals and textiles. Many substances in this class become corrosive only after having reacted with water or with moisture in the air. The reaction between water and many class 8 substances is accompanied by the emission of irritating and corrosive gases. Such gases usually become visible as fumes in the air.

Material Safety Datasheets shall be supplied with each consignment of batteries or electrolyte. Where this is not reasonably practicable, sufficient information shall be provided to enable the user to take necessary measures as regards the protection of health and safety.

3.2 Nickel cadmium batteries and alkaline electrolyte

The electrolyte used in Nickel Cadmium batteries consists of a solution of Potassium Hydroxide (KOH), Lithium Hydroxide (LiOH) and deionised water.

Table 1 lists the information with respect to nickel cadmium batteries and the alkaline electrolyte, as stated in SANS 10228:2012, Edition 6, The identification and classification of dangerous goods for transport by road and rail modes, as well as the exemption information as stated in Annex C.1 of SANS 10231: 2014, Edition 4, Transportation of dangerous goods – Operational requirements for road vehicles.

Table 1: Applicable information on nickel cadmium cells, batteries and alkaline electrolyte

UN No./ S.I.N.	Proper shipping name	Packing Group	Exempt Quantity	Mixed Load Factor / F
1813	Potassium Hydroxide, Solid	II	50 kg	20
1814	Potassium Hydroxide Solution	II III	50 l 200 l	20 5
2795	Batteries, Wet, Filled with Alkali, electric storage	---	200 l	5
2797	Battery fluid, Alkali	II	50 l	20

3.2.1 Ingredients and composition

The ingredients and composition by weight of the alkaline electrolyte, compared with the other basic cell components, are as follows:

- Potassium Hydroxide: 5.4% to 5.8%
- Lithium Hydroxide: 0.5%
- Carbon: 2% to 4%
- De-ionised water: 27% to 31%

3.2.2 Physical and chemical characteristics

3.2.2.1 The electrolyte is in liquid form and has an off-white colour with no odour.

3.2.2.2 The relative density of the alkali electrolyte usually ranges from 1,2 g/cm³ to 1,3 g/cm³ (at 20 °C).

3.2.2.3 The ingredients are completely soluble in water.

3.2.3 Potential health effects

3.2.3.1 Eyes - Contact with alkaline electrolyte may cause eye burns and irreversible eye damage.

3.2.3.2 Skin - Contact with alkaline electrolyte causes skin burns and may cause deep, penetrating ulcers of the skin.

3.2.3.3 Ingestion

- 1) Ingestion of alkaline electrolyte causes gastro-intestinal tract burns.
- 2) Ingestion of alkaline electrolyte may produce severe abdominal pain, corrosion of the lips, mouth, tongue, and pharynx, and the vomiting of large pieces of mucosa.
- 3) Large doses of lithium may cause dizziness, prostration, and kidney damage.

3.2.3.4 Inhalation

Inhalation of alkaline electrolyte may cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath, laryngitis, headache, nausea, vomiting and pulmonary edema.

3.2.3.5 Chronic

Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion.

3.2.4 First aid measures

3.2.4.1 Eyes

- 1) Check for and remove contact lenses.
- 2) Flush with plenty of water for as long as possible (use 15 to 30 min as a guide), occasionally lifting the upper and lower lids until the chemical is gone.
- 3) Do NOT allow the victim to rub or keep his/her eyes closed.
- 4) Get medical help immediately.

3.2.4.2 Skin

- 1) Flush the skin with plenty of soap and water for at least 15 min while removing contaminated clothing and shoes.
- 2) Get medical help immediately.

3.2.4.3 Ingestion

- 1) Do NOT induce vomiting.
- 2) If the victim is conscious and alert, give 2 to 4 cups full of milk or water.
- 3) NEVER give anything by mouth to an unconscious person.
- 4) A possible aspiration (breathing) hazard may occur.
- 5) Get medical help immediately.

3.2.4.4 Inhalation

- 1) Immediately remove the victim from the area of exposure into a safe area with fresh air.
- 2) If the victim's breathing is difficult, supply oxygen. DO NOT use mouth-to-mouth respiration.
- 3) If breathing has ceased, apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
- 4) Get medical help immediately.
- 5) Notes to physician - Treat symptomatically and supportively.

3.2.5 Firefighting measures

3.2.5.1 General information

- 1) As in any fire, wear a self-contained breathing apparatus and full fire-fighting protective gear.
- 2) During a fire, thermal decomposition or combustion may generate irritating and highly toxic gases.
- 3) Use water spray to keep fire-exposed containers cool and "knock down" vapour.
- 4) Do not use a water jet.
- 5) Vapours may be heavier than air. They can spread along the ground and collect in low or confined areas.
- 6) Containers may explode when heated.

3.2.5.2 Extinguishing media

- 1) In case of a fire, use a class D dry chemical, carbon dioxide, alcohol-resistant foam or sand.
- 2) Cool containers with flooding quantities of water until long after the fire is out.

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3.2.6 Accidental release measures

3.2.6.1 General information

Use proper personal protective equipment, as indicated in 3.2.8.2. Each workshop and vehicles used for the transportation of batteries shall be equipped with a spill kit as indicated in 4.4. All spillages / incidents shall be dealt with in line with the requirements of 32-95, Environmental, Occupational Health and Safety Incident Management Procedure.

3.2.6.2 Spills and leaks

- 1) Absorb the spill with an inert material (for example, dry sand or earth).
- 2) The spill may also be covered with a solid neutraliser, for example, boric acid or dilute acetic acid.
- 3) Place the absorbed or neutralised material in a lined disposal container (chemical waste container). The containers shall be properly labelled.
- 4) Flush the residue with water.
- 5) Avoid run-off into storm sewers and ditches that lead to waterways.
- 6) Clean up spills immediately, observing precautions as indicated in 3.2.8.2.
- 7) Provide sufficient ventilation.
- 8) The absorbed or neutralised material (waste) shall be disposed of in an environmentally friendly manner as required by the 32-245, Eskom Waste Management Standard, National Environmental Management Waste Act (Act 59 of 2008) and associated regulations, Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the Hazardous Chemical Substances Regulations, 1995

3.2.7 Handling and storage

3.2.7.1 Handling

- 1) Wash thoroughly after handling.
- 2) Remove contaminated clothing and wash before re-use.
- 3) Use only in a well-ventilated area.
- 4) Wear protective clothing to prevent contact with eyes, skin and clothing.
- 5) Keep containers tightly closed.
- 6) Do not ingest or inhale.

3.2.7.2 Storage

- 1) Store the cells in a cool, dry, well-ventilated area which is under roof and away from incompatible substances.
- 2) The storage area shall be demarcated and have impervious surfaces and adequate containment in the event of spills. All applicable emergency equipment shall be available.
- 3) Always store cells filled with electrolyte with the vents upwards.
- 4) The electrolyte will release flammable hydrogen gas when in contact with aluminium, tin, zinc, and the alloys. It can react violently if it comes in contact with trichloroethylene.
- 5) Keep the cells away from fire, sparks and heat.
- 6) Keep the cells out of the way of pathways and general areas where forklifts and other equipment are used that could lead to cell damage and electrolyte spills in the event of an accident.

3.2.8 Exposure controls and personal protection**3.2.8.1 Engineering controls**

- 1) Workshop facilities storing or utilising this material shall be equipped with an eyewash facility and a safety or emergency shower.
- 2) Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

3.2.8.2 Personal protective equipment

- 1) PPE consisting of a face shield, protective gloves, a protective apron and protective footwear shall be worn to respectively prevent eye, skin, clothing and body contact. The PPE shall comply with the requirements of 240-44175132, Eskom Personal Protective Equipment (PPE).
- 2) An eyewash bottle with clean water or sterile saline solution shall be available.

3.3 Lead acid batteries and acid electrolyte

The electrolyte used in Lead Acid batteries consists of a solution of Sulfuric Acid (H₂SO₄) and de-ionised water. Table 2, lists the information with respect to lead acid batteries and the associated electrolyte, as stated in SANS 10228:2012, Edition 6, The identification and classification of dangerous goods for transport by road and rail modes, as well as the exemption information as stated in Annex C.1 of SANS 10231: 2014, Edition 4, Transportation of dangerous goods – Operational requirements for road vehicles.

Table 2: Applicable information on lead acid cells, batteries and acid electrolyte

UN No./ S.I.N.	Proper shipping name	Packing Group	Exempt Quantity	Mixed Load Factor / F
2794	Batteries, Wet, Filled with Acid, electric storage	---	200 l	5
2796	Sulphuric acid with not more than 51% acid or Battery fluid, Acid	II	50 l	20
2800	Batteries, Wet, Non-spillable, electric storage	---	200 l	5

3.3.1 Composition and ingredients

The main components are Lead (Pb), Sulphuric acid Antimony (Sb), and Styrene Acrylonitrile of which the last two mentioned components are non-hazardous. The sulphuric acid component is usually between 29% to 35% in terms of weight. The Sulphuric acid is harmful by all routes of entry whereas the lead compounds are only harmful when in a dust, vapour or fume form.

3.3.2 Physical and chemical characteristics

3.3.2.1 The electrolyte is in liquid form with an oily feel and a clear colour. It has a sharp pungent odour in vapour form.

3.3.2.2 The relative density of the electrolyte usually ranges from 1,23 g/cm³ to 1,26 g/cm³ (at 20 °C).

3.3.2.3 The ingredients are completely soluble in water.

3.3.3 Potential health effects**3.3.3.1 Eye**

- 1) Contact with acid electrolyte may cause eye burns.
- 2) Contact with acid electrolyte may cause irreversible eye damage.

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- 3) Exposure to acid mist may lead to watering and irritation.

3.3.3.2 Skin

Skin contact may result in severe burns, blistering and pain.

3.3.3.3 Ingestion

- 1) Ingestion of acid electrolyte may cause severe and permanent damage to the digestive tract.
- 2) Ingestion of acid electrolyte causes gastrointestinal tract burns.
- 3) Vomiting and diarrhoea of dark blood may occur.
- 4) Asphyxia may occur due to throat swelling.
- 5) The stomach and oesophagus may become perforated.

3.3.3.4 Inhalation

- 1) Ingestion of acid electrolyte may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed pulmonary (lung) oedema.
- 2) Ingestion of acid electrolyte causes chemical burns to the respiratory tract.

3.3.3.5 Chronic

- 1) Delayed symptoms include tight chest, fluid in the lungs, cyanosis (blue), hypotension, bronchitis emphysema, traceobronchitis, dental erosion or discolouration, pneumonia and gastro-intestinal disturbances.
- 2) Skin irritation or dermatitis, conjunctivitis and lacrimation of the eye can occur.

3.3.4 First aid measures

3.3.4.1 Eyes

- 1) Check for and remove contact lenses.
- 2) Flush with plenty of water for as long as possible (use 15 to 30 min as a guide), occasionally lifting the upper and lower lids until the chemical is gone.
- 3) Do NOT allow the victim to rub or keep his / her eyes closed.
- 4) Get medical help immediately.

3.3.4.2 Skin

- 1) Flush the skin with plenty of soap and water for at least 15 min while removing contaminated clothing and shoes.
- 2) Get medical help immediately.

3.3.4.3 Ingestion

- 1) Do NOT induce vomiting.
- 2) If the victim is conscious and alert, give 30 ml of Milk of Magnesia or large quantities of water to dilute the acid.
- 3) NEVER give anything by mouth to an unconscious person.
- 4) Get medical help immediately.

3.3.4.4 Inhalation

- 1) Immediately remove the victim from the area of exposure into a safe area with fresh air.
- 2) If the victim's breathing is difficult, supply oxygen. DO NOT use mouth-to-mouth respiration.
- 3) If breathing has ceased, apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
- 4) Get medical help immediately.

3.3.4.5 Notes to physician - Treat symptomatically and supportively.

3.3.5 Firefighting measures

3.3.5.1 General information

- 1) As in any fire, wear a self-contained breathing apparatus in pressure-demand and full protective gear.
- 2) During a fire, thermal decomposition or combustion may generate corrosive, irritating and highly toxic gases. Avoid inhalation by keeping upwind.
- 3) Contact with metals may evolve flammable hydrogen gas.
- 4) Use water spray to keep fire-exposed containers cool and "knock down" vapour.
- 5) Do not use a water jet.

3.3.5.2 Extinguishing media

- 1) In case of a fire, use a class ABC extinguisher, CO2 foam and/or Halon.
- 2) Cool containers with flooding quantities of water until long after the fire is out.

3.3.6 Accidental release measures

3.3.6.1 General information

Use proper personal protective equipment, as indicated in 3.3.8.2. Each workshop and vehicles used for the transportation of batteries shall be equipped with a spill kit as indicated in 3.4.

3.3.6.2 Spills and leaks

- 1) Neutralise the spill with slaked lime, limestone or sodium bicarbonate to a pH of 7.
- 2) Place the neutralised material in a lined disposal container (chemical waste container). The containers shall be properly labelled.
- 3) Flush the residue with water.
- 4) Avoid run-off into storm sewers and ditches that lead to waterways.
- 5) Clean up spills immediately, observing precautions as indicated in section 3.3.8.2.
- 6) Provide sufficient ventilation.
- 7) The absorbed or neutralised material (waste) shall be disposed of in an environmentally friendly manner as required by the 32-245, Eskom Waste Management Standard, National Environmental Management Waste Act (Act 59 of 2008) and associated regulations, Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the Hazardous Chemical Substances Regulations, 1995.

3.3.7 Handling and storage

3.3.7.1 Handling

- 1) Wash thoroughly after handling.
- 2) Remove contaminated clothing and wash before re-use.
- 3) Use only in a well-ventilated area.
- 4) Wear protective clothing to prevent contact with eyes, skin and clothing.
- 5) Keep containers tightly closed.
- 6) Do not ingest or inhale.

3.3.7.2 Storage

- 1) Store the cells in a cool, dry, well-ventilated area with impervious surfaces and adequate containment in the event of spills.
- 2) The storage area shall be demarcated, under roof and away from incompatible substances. All applicable emergency equipment shall be available.
- 3) Do not store in the same physical location as alkaline substances.
- 4) Keep the cells away from fire, sparks and heat.
- 5) Keep the cells out of the way of pathways and general areas where forklifts and other equipment are used that could lead to cell damage and electrolyte spills in the event of an accident.

3.3.8 Exposure controls and personal protection

3.3.8.1 Engineering controls

- 1) Workshop facilities storing or utilising this material shall be equipped with an eyewash facility and a safety or emergency shower.
- 2) Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

3.3.8.2 Personal protective equipment

- 1) PPE consisting of a face shield, protective gloves, protective apron and protective footwear shall be worn to respectively prevent eye, skin, clothing and body contact. The PPE shall comply with the requirements of 240-44175132, Eskom Personal Protective Equipment (PPE).
- 2) An eyewash bottle with clean water or sterile saline solution shall be available.

3.4 Spill kit

A spill kit shall be available in workshops where batteries are handled and vehicles used for the transportation of batteries and electrolyte. All staff members shall be trained in the utilisation of the spill kits.

The spill kit shall consist of the following:

- a) Personal protective equipment
- b) Disposable bags
- c) Plastic shovel, dustpan and broom
- d) Socks / barriers for spillage containment
- e) Hazardous substance encapsulation compound or absorbing material
- f) Handling instructions and inventory

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3.5 Transportation on public roads

3.5.1 General

3.5.1.1 Hazardous substance and goods loads below the exempt quantity, as indicated in Table 1 and Table 2, are not required to comply with the requirements of SANS 10231: 2010, Edition 3.1, Transportation of dangerous goods – Operational requirements for road vehicles and SANS 10232-1: 2007, Edition 3, Transportation of dangerous goods – Emergency information systems – Part 1: Emergency information system for road transportation. This applies to a single engine driven vehicle and trailer where applicable.

3.5.1.2 In cases where the exempt quantities are exceeded it may be necessary to transport the load with more than vehicle or contract the services of an authorised dangerous goods operator. However if the exempt quantities are exceeded, the regulations apply and should be adhered to. Refer to DC & Auxiliary Supplies Website for the maximum number of cells that may be transported in order for the total quantity to be below or equal to the exempt quantity.

3.5.1.3 Battery suppliers with whom Eskom has a contract shall ensure that their transporters comply with the requirements of the regulations as well as local municipal by-laws and that loading and off-loading facilities are available whenever they collect or deliver consignments.

3.5.1.4 The sender of any consignment is advised to always arrange beforehand with the goods receiver when the consignment will arrive at their premises.

3.5.1.5 Table 3 shows the items that are required for transportation of dangerous goods and also the relevant specifications. It further indicates whether the listed items are required for exempt and non-exempt loads.

Table 3: Legal requirements for hazardous substance and goods loads

Applicable SABS documents	Item	Item required [Y/N]	
		Exempt loads	Non-exempt loads
SANS 10232-1,	Vehicle signs (placarding)	N	Y
SANS 10229-1, SANS 10229-2	Packaging	Y	Y
SANS 10229-1, SANS 10229-2	Package labelling	Y	Y
SANS 10231	Vehicle operational requirements	N	Y
SANS 10231, SANS 10232-1	Tremcards or TREC	N	Y
SANS 10231	Hazardous Goods Driver permits	N	Y
SANS 10231	Dangerous goods declaration	N	Y
---	Dangerous Goods Exemption Confirmation	Y ¹⁾	N
SANS 10232-3	Emergency response guides	N	Y
SANS 10231	Material Safety Datasheets	Y ²⁾	N
NOTE:			
1) This is to declare that the load has been checked to be below the exempt quantity.			
2) It is required that the applicable material safety datasheets shall be available in the vehicles transporting dangerous goods at all times.			

3.5.2 Packaging and containers

3.5.2.1 The packaging and containers used during the transportation of cells/batteries and electrolyte, respectively, shall comply with the requirements of SANS 10229-1: 2010, Edition 2, Transportation of dangerous goods – Packaging and large packaging for road and rail transport.

3.5.2.2 Therefore, it is advisable that electrolyte and cells/batteries shall always be stored and transported in the original containers as received from the supplier.

3.5.2.3 An inert cushioning material shall be used between the batteries when they are packed in order to provide protection during transportation.

3.5.2.4 Wet batteries shall be packed in such a way to prevent accidental short circuiting of the battery / cell and spillage of the electrolyte during transportation.

3.5.2.5 The packaging or container shall be suitably sealed to prevent any spilled or leaked electrolyte from getting in contact with the load body of the vehicle.

3.5.2.6 Where practical, the electrolyte of leaking cells shall be emptied in clearly labelled polycans.

3.5.2.7 In the case of recovering nickel cadmium batteries for disposal and where the cabinet is also replaced, it is advisable that all the cells are left in the battery trolley with the trolley secured to the load body of the vehicle.

3.5.2.8 All groups of cells shall be firmly strapped together with corrosive resistant straps, ropes or sufficient cling wrap to prevent cells from falling over during transportation.

3.5.2.9 Where possible all cells in transit must be fitted with rubber / plastic vent sealing caps.

3.5.2.10 The cells/batteries and electrolyte containers are normally packed in wooden crates or secured with industrial grade cling wrapping to wooden pallets of which the base is accessible by forklifts or pallet trucks.

3.5.2.11 Apply the cling wrap as follows (indicated in Figure 1):

- 1) In cases where the cell lids have detached from the cell casings, it is advisable that the electrolyte be decanted into polycans until it is at the MIN level mark. Ensure that all vent caps are firmly in place.
- 2) Place the cells tightly against each other on the pallet ensuring that each cell stands firmly and level.
- 3) Place a layer of polystyrene or cardboard, large enough to cover all exposed cell terminals, over the cells. This is to prevent anything, falling on top of the cells, from causing a short-circuit.
- 4) During wrapping process, the cling wrap shall not be cut i.e. it shall be a continuous process from start to end. Wrap at least two layers of industrial grade cling wrap around the group of cell casings starting from corner A, following arrow 1 around the cells. When you reach corner A for the third time, wrap the cling wrap twice around the corner of the pallet before moving on to arrow 4. Follow the arrows indicated in Figure 1, remembering to wrap the corners of the pallet twice.
- 5) Apply the appropriate labelling and marking.

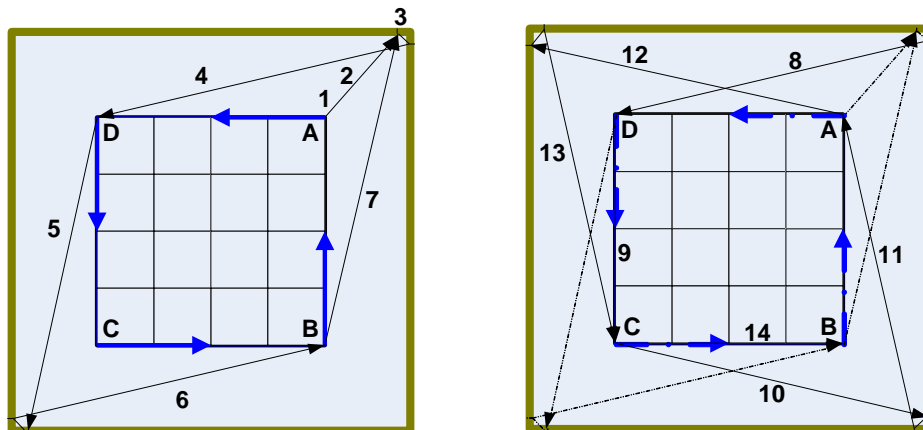


Figure 1: Wrapping steps

3.5.2.12 Cells may be packaged in the filled and charged state, as long as the cells are packaged in such a way that no spillage is possible.

3.5.2.13 Ensure that the load is secure and will not move around during transportation.

3.5.2.14 In cases where the electrolyte is emptied from the cells, it shall be emptied into 25 litre, clearly labelled, polycans, which shall also be securely strapped onto pallets during transport.

3.5.2.15 Operating Units with a waste tank (for onsite containment of acid & alkali) which is emptied and neutralised on a regular basis by an approved waste disposal company may dispose of the electrolyte in such a manner.

3.5.3 Package labelling and marking

3.5.3.1 The marking and labelling of all packaging shall comply with the requirements of SANS 10229-1: 2010, Edition 2, Transportation of dangerous goods – Packaging and large packaging for road and rail transport.

3.5.3.2 The label on the package is designed to:

- 1) Alert the carrier to the type of product and the need for careful handling.
- 2) Act as a guide as to which substances and goods may or may not be loaded together.
- 3) Act as a guide to the placards that must be placed on the vehicle – where applicable.

3.5.3.3 The following information must be clearly indicated on each package:

- 1) UN identity number – see
- 2) Table 1 and Table 2.
- 3) Proper shipping description of the commodity – see Table 1 and Table 2.
- 4) The applicable class warning diamond.
- 5) The appropriate subsidiary risk warning diamond/s, if any.
- 6) Name, address of the packer, agent or consignor.

3.5.3.4 The marking or labelling must be positioned so that it is visible when the packaging is stacked with other packaging of the same kind. The labels shall be positioned close to the proper shipping name, if package dimensions permit.

3.5.3.5 All pallets carrying redundant cells and / or polycans with electrolyte shall be clearly marked with the word "SCRAP" indicating that the material is earmarked for disposal.

3.5.3.6 The material type and estimated gross weight shall also be clearly indicated on the pallets.

3.5.3.7 Apply the Class 8, primary hazard-class warning diamond.

3.5.4 Road vehicles

3.5.4.1 The requirements of 240-62946386, Vehicle and Driver Safety Management Procedure, shall be adhered to.

3.5.4.2 The load body of the recovery vehicle shall be outlined with an acid and alkali resistant hardwearing rubberised substance.

3.5.4.3 The inside of the load body shall be fitted with sufficient strappable hooks to ensure that cells being transported can be secured in such a manner that shall prevent the cells from sliding around in the load body.

3.5.4.4 If cells are transported in a kombi / panel van type vehicle, a solid safety barrier shall be provided between the driver and the load area.

3.5.5 Load Constraints

SANS 10231: 2010, Edition 3.1, Transportation of dangerous goods – Operational requirements for road vehicles, requires that the following shall be complied with:

3.5.5.1 Where loads with the same UN number are being transported, the exempt quantity is specified in Table 1 and Table 2.

3.5.5.2 In cases where mixed loads, e.g. a lead acid battery and nickel cadmium battery, are being transported on the same vehicle and where no single item of the dangerous goods in the load exceeds the exempt quantity (Table 1 and Table 2), Equation 1 shall be used to calculate A for each item of dangerous goods in the load. If the sum of A for all the calculations does not exceed 1000, then the load is exempt.

$$A = Q \times F \quad \text{Equation 1}$$

Where:

A – the result

Q – the quantity of dangerous goods being transported (kg or l, as applicable)

F – the factor as indicated in Table 1 and Table 2

3.5.5.3 In terms of load compatibility, it shall be ensured that when mixed loads are being transported, acids (e.g. lead acid battery) and bases (e.g. nickel cadmium battery) shall be kept at least 1 m apart.

3.5.6 Documentation

3.5.6.1 The applicable MSDS of the dangerous goods being transported shall be available in the vehicle.

3.5.6.2 A Dangerous Goods Exemption Confirmation Form shall be completed and kept in the vehicle to enable the emergency services to identify the dangerous goods in the load and to confirm that the load has been checked to be below the exempt quantity. See Annex A for the form.

3.5.7 Post incident tasks

After an incident certain activities need to be done in order to prevent adverse health and environmental effects. It is advised that each region establish contracts with regional emergency service providers e.g. NETCARE 911, HAZMAT operators, for the handling of dangerous goods related incidents and that the business is duly informed of the available emergency services and the required process as outlined in the 32- 95 Environmental, Occupational, Health and Safety incidents procedure that should be followed in such an event.

3.5.7.1 Decontamination involves the removal of dangerous goods from personnel and equipment to the extent necessary to prevent potential adverse health effects. If contact between the substance and a person did occur, follow the instructions as indicated in 3.2.4 and 3.3.4.

3.5.7.2 Contaminated protective clothing and equipment should be removed after use and stored in a controlled area until clean up procedures can be initiated by the driver and / or appointed HAZMAT service provider. Where protective clothing cannot be decontaminated, it must be disposed of in a proper manner.

3.5.7.3 The recovery of the vehicle is the responsibility of the carrier or operator. This activity can pose more danger and should be performed by suitable emergency response specialists and breakdown operators.

3.5.7.4 Rehabilitation of an area, after a pollution incident, often involves the removal of considerable quantities of soil for treatment at a waste disposal site and replacement of good quality soil. Therefore, rapid action is necessary in the event of a spill in order to limit the risk of polluting the environment. This involves rapid despatch of absorbent or neutralising agent to any spillage location to assist the local fire brigade in diminishing the extent of damage and easing the task of rehabilitation.

3.5.7.5 The owner (operator) of the load shall be responsible for the rehabilitation of a site after a fire or spillage, unless otherwise specified in the transportation contract. It is essential that the operator must ensure that suitable contingency plans and adequate resources are in place in order to handle such eventualities.

3.5.8 Reputation management

3.5.8.1 Employees are not allowed to make any statements to the media, either on the scene or after the fact.

3.5.8.2 Refer to 32-95, Environmental, Occupational Health and Safety Incident Management Procedure regarding the steps to be taken after an incident.

3.6 Disposal

3.6.1.1 Contractually all the battery suppliers that have an active contract with Eskom are obligated to accept and dispose of (or recycle) redundant cells/batteries returned to them.

3.6.1.2 The applicable transfer of assets form (refer to Annex B) shall be completed and signed by all parties; an Eskom representative (SENDER), the driver collecting the cells (TRANSPORT COMPANY) and the company (RECEIVER) responsible for the safe disposal of the redundant batteries. The asset transfer forms are available from the DC & Auxiliary Supplies Study Committee SharePoint site.

3.6.1.3 The following documents shall be filed in the DC TSS Risk Audit System file as well as the Environmental Management Systems file:

- 1) The signed asset transfer forms,
- 2) A copy of the local municipal authorisation certificate, where applicable to operate as a transporter of hazardous waste
- 3) A copy of the local municipal authorisation certificate, which authorises the services provider to operate as waste transfer station or depot.

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- 4) A copy of the waybill,
- 5) a copy of the delivery note, and
- 6) A copy of the safe disposal certificate.

3.6.1.4 Once the redundant cells have been taken over by the receiver, the receiver commits themselves to dispose of these scrapped materials in such a manner that is acceptable to Eskom and the environmental laws and regulations of South Africa.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Deon van Rooi	Metering, DC & Security Technologies Manager – PTM&C CoE (Acting)
Prudence Madiba	Senior Manager – Electrical and C&I Engineering
Romi Bhimsan	Middle Manager – Environmental Management
Lungile Malaza	Middle Manager – Electrical Plant CoE
Jonathan Magano	Chief Technologist – Electrical Plant CoE

5. Revisions

Date	Rev	Compiler	Remarks
Oct 2017	2	T Jacobs	Included reference to National Environmental Management: Waste Act
			Included reference to the Eskom Waste Management Act
			Updated roles and responsibilities
			Updated Storage and Disposal requirements
			Annex – Exempt quantities for cells removed. Up to date information to be obtained from the DC & Auxiliary Supplies Website
May 2015	1	T Jacobs	The separate documents on transportation, handling and disposal were incorporated into a single document.
			All references to SANS and Eskom documents were updated.
			The Dangerous Goods Declaration Form was replaced with a Dangerous Goods Exemption Confirmation Form.
			The tables indicating the number of cells that can be transported without exceeding the exempt quantity were updated.

6. Development team

The following people were involved in the development of this document:

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- Thomas Jacobs

7. Acknowledgements

The compiler wants to thank all people who provided constructive inputs to the document; Jonathan Magano and Micah Dominick.

Annex A – Dangerous Goods Exemption Confirmation Form

DANGEROUS GOODS EXEMPTION CONFIRMATION FORM



Task No.:		Operator:	
Consignor:		Consignee:	
Product Manufacturer:		Additional Info on handling/storage/transport:	
Product Owner:			
Mixed Load [Y/N]?			

Legend:

Qty - Number of cells

Q - Total electrolyte volume [l]

F - Mixed Load Factor

Q/cell - Electrolyte volume per cell [l]

EQ - Exempt Quantity

A - Result of Q x F

	Shipping Name	UN No.	Cell Model	Qty	Q / cell	Q	≤ EQ	F	A
1									
2									
3									
4									

 ΣQ ΣA **Notes:** $\Sigma Q \leq 200$ litres for loads with the same UN no. (either nickel cadmium or lead acid cells)The mixed load is exempt where $\leq EQ$ is "Y" for all loads and $\Sigma A \leq 1000$

I hereby declare that the content of this consignment is fully and accurately described above by the proper shipping name, and is classified, packaged, marked and labelled and in all respects in proper condition for transport in accordance with the relevant national legislation.


Checked by

Designation

Date

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Annex B – Transfer of Asset Disposal Form

 Eskom		Transfer of Asset for Disposal Form			
1.	Reference No.:				
Eskom Site Details - SENDER					
2.	Site Name:				
3.	Physical address:				
4.	Contact person:				
5.	Tel. No.:				
6.	Fax No.:				
7.	e-mail address:				
Consignment Details – PACKAGE/S					
	Package marking	Cell Type	No. of cells	No. of pallets	Weight [kg]
9.					
10.					
11.					
12.					
13.	Totals				
DECLARATION: I hereby declare that the content of this consignment is fully and accurately described above by the proper shipping name, and is classified, packaged, marked and labelled and is in all respects in proper condition for transport in accordance with the relevant national legislation.					
8.	Signature:		Date:		
Transport Company Details					
14.	Company Name:				
15.	Driver Name:				
16.	Signature:		Date:		
17.	Way Bill Attached?				Yes No
DECLARATION: The consignment above has been received into my vehicle. My vehicle is correctly labelled and I am in possession of all necessary transport documentation pertaining to the transport of dangerous goods, including the procedure to be followed in the case of an emergency"					
RECEIVER Details					
18.	Company Name:				
19.	Physical address:				
20.	Contact person:				
21.	Tel. No.:				
22.	Fax No.:				
23.	e-mail address:				
DECLARATION: I hereby declare that I am permitted by law to receive this waste and can deliver the services to dispose of the waste in an environmentally sound manner.					
24.	Delivery Note Attached?				Yes No
25.	Recycling Certificate Attached?				Yes No
26.	Signature:		Date:		

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