Saudi Electricity Company	الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION	46-SDMS-01 Rev. 00
	DATE: 01-05-2014G

46-SDMS-01

REV. 00

SPECIFICATIONS

FOR

VENTED NICKEL-CADMIUM STATIONARY BATTERY BANK FOR PRIMARY DISTRIBUTIONSUBSTATAIONS

TABLE OF CONTENTS

1.0 SCOPE

This SEC Distribution Material Standard Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacture, inspection, testing, and performance of indoor Vented Nickel-Cadmium Stationary Battery Bank intended to be used in the Primary Distibution Substations for Distribution Sector of the Saudi Electricity Company, Saudi Arabia.

2.0 CROSS REFERENCES

This Material Standard Specification shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (latest revision), titled "General Requirements for All Equipment/Material", which shall be considered as an integral part of this SDMS.

This SDMS shall also be read in conjunction with SEC Purchase Order or Contract Schedules for project, as applicable.

3.0 APPLICABLE CODES AND STANDARDS

The latest revisions/amendments of the following Codes and Standards shall be applicable for the equipment/material covered in this SDMS. In case of conflict, the vendor/manufacturer may propose equipment/material conforming to one group of Industry Codes and Standards quoted hereunder without jeopardizing the requirements of this SDMS.

3.1	IEC 60050-482	International Electrotechnical Vocabulary, Chapter 482, Primary & Secondary Cells and Batteries.
3.2	IEC 60410	Sampling Plans and Procedures for Inspection by Attributes.
3.3	IEC 60417	Graphical Symbols for Use on equipment.
3.4	IEC 60623	Secondary Cells and Batteries Containing Alkaline or other Non-acid Electrolytes - Vented Nickel-Cadmium Prismatic Rechargeable Single Cells
3.5	IEC 61438	Possible Safety and Health Hazards in the Use of Alkaline Secondary Cells and Batteries – Guide to Equipment Manufacturers and Users.

3.6	IEEE 1106	Recommended Practice for Installation Maintenance, Testing, and Replacement of Nickel Cadmium Batteries for Stationary Applications
3.7	IEEE 1115	Recommended Practice for Sizing Nickel-cadmium Batteries for Stationary Applications
3.8	NFPA 10	Standards for Portable Fire Extinguishers.
3.9	NFPA 70	National Electrical Code (NEC)

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 Batteries

The batteries shall be:

4.1.1 Vented type Nickel-Cadmium having an intended minimum design life of at least 25 years.

4.1.2 With pocket type positive and negative plates unless otherwise specified in the Data Schedule.

4.1.3 Provided for nominal d.c auxiliary voltage of 125 V or 48 V or otherwise as specified in the Data Schedule.

4.1.4 Designed for operation on continuous-float basis.

4.1.5 With a stabilized self-discharge rate not exceeding 3 percent per month at +25 °C after the initial period having relatively higher rate of discharge.

4.1.6 Designed to prevent cracking, warping or bulging of containers/covers due to plate growth or differential expansion of plate supports, during normal service life.

4.1.7 Equipped with venting system having explosion resistant integral flash arrestor and dust prevention caps for each unit.

4.1.8 With shock absorbing, heat resistant, plastic material for container and cover. The container shall be transparent and have minimum and maximum level markings for electrolyte.

4.1.9 With gastight and electrolyte tight sealed joints to provide a spill-proof and leak-proof construction including for cell terminal pillars except for vents.

4.1.10 Complete with polarity marking, provision for individual cell lifting strap/slings and chemical-resistant, non-metallic cell numbers for each cell.

4.1.11 Constructed in single cells or mono-blocks suitable for series connections to achieve the required system voltage. The spaces provided by the manufacturer shall facilitate uniform and adequate cooling of each unit.

4.1.12 With suitable dust tight access for specific gravity measurement.

4.1.13 With ungrounded DC system unless otherwise specified in the Data Schedule.

4.1.14 Of ampere hour rating based on 10 hours discharge rate unless otherwise specified in Data Schedule.

4.1.15 Equipped with oxygen-hydrogen recombinators when specified in Data Schedule.

4.1.16 With capacity loss not exceeding 1.5% per year.

4.2 Accessories

The following accessories and personnel safety equipment shall be provided as minimum for the complete battery bank:

4.2.1 Modular steel tray/rack for mounting/housing the batteries as per Para 4.3 below. Alternatively, self-racking arrangement shall be provided to form the complete bank.

4.2.2 Bolted type banking accessories such as inter-cell, inter-block (for mono-block batteries) inter-row and inter-tier connectors made of insulated tinned solid copper bar, and adequately sized to carry, without excessive heating or voltage drop, the required current (maximum charge/discharge) at the ambient temperature. Similarly, grounding jumper connectors shall also be provided, if self-racking arrangement of battery bank is offered.

4.2.3 Nickel-plated hardware for inter-cell and inter-step connections. The inter-connectors shall be either insulated or provided with 'snap-on' type insulated covers.

4.2.4 Adequately insulated tools including torque wrenches

4.2.5 A portable test voltmeter reading 2-0-2 volts with contact spears and leads for checking the cell voltage

4.2.6 Portable hydrometer syringe with temperature correction scale

4.2.7 Digital type thermometer of latest vesion (suitable for wall mounting) marked 0°C to 60°C with one degree graduation and having ± 1% accuracy or better.

4.2.8 Distilled water can along with suitable filling jug and funnel.

4.2.9 Corrosion protective coating/grease for un-insulated connectors & terminals.

4.2.10 A hand operated siphon tube with suction bulb for emptying any cell into a container conveniently placed adjacent to it.

4.2.11 Instruction chart secured with plastic cover and caution labels.

4.2.12 Mechanical lifting devices of adequate capacity when specified in the Data Schedule.

4.2.13 The following minimum safety equipment, for safe handling of the battery and protection of maintenance personnel, shall be supplied.

This requirement may differ for the existing substations. The change, if any, shall be specified at the last page of the Data Schedule accordingly.

a. Pair of chemical resistant rubber gloves

b. Protective apron and overshoes

c. Face shield

d. Portable eye/skin wash equipment with minimum 20-liter capacity, if specified in Data Schedule

e. Neutralizing agent recommended by the manufacturer for a alkaline electrolyte spillage

f. Fire extinguisher of suitable type as recommended by the battery manufacturer complying with requirement of NFPA 10 and SEC standards

4.2.14 A lockable steel cabinet for storing the maintenance equipment when specified in Data Schedule.

4.2.15 A wall-mountable medical kit containing all items necessary to attend the battery-related accidents when specified in Data Schedule.

4.2.16 Any other accessories recommended by the battery manufacturer, to make the installation complete in all respects.

4.3 Modular Steel Tray and Rack

4.3.1 The batteries shall be installed on self-stacking, modular steel trays which shall be housed in modular steel rack.

Alternatively, the whole bank arrangement shall be offered in self-stacking enclosures. However, adequate space and ventilation shall be provided when the battery is housed in the enclosures.

4.3.2 The steel rack shall be:

a. Of welded construction with provision for anchoring to the floor.

b. Chemical resistant, epoxy painted or plastic coated.

c. Provided with grounding pad or lug for bare copper grounding conductor of minimum size equivalent to the size of inter-cell connector.

d. Designed to stack battery generally in single tier single/double-step or in special cases in two tiers as indicated in Data Schedule with the following limiting dimensions:

i. Minimum head room of 250 mm between tiers for access and maintenance.

ii. Minimum height to the bottom tier bottom surface not less than 150mm from floor level. The top of the cells in the

highest tier/row shall not be over 1.5 metre above the floor level.

4.4 Nameplate

4.4.1 Each battery and modular steel tray/rack shall be permanently and legibly marked in English and Arabic with the following information:

a. Manufacturer's name/country

b. Date of manufacture (month and year)

c. Date of commissioning at site

d. Manufacturer's type or model number

e. Cell designation as per IEC

f. Ampere-hour capacity and the number of hours on which the rating is based corresponding to 25 °C and minimum end-of-discharge cell voltage of 1.1 V

g. Number of cells

h. Individual cell voltage (Nominal)

i. Specific gravity at 25 °C

j. Recommended float voltage and boost/equalizing voltage per cell at 25 °C.

k. SEC Purchase Order No./Contract No./Job Order No.

l. 46-SDMS-01, Rev. 0

m. SEC ITEM NO.

4.4.2 The nameplate material shall be stainless steel and shall be fastened to the tray/rack by stainless steel screws or rivets.

4.4.3 Each cell or monobloc shall carry durable markings giving the following minimum information:

a. As mentioned against 4.4.1 ‘a’ , ‘d’ and ‘f’

b. Terminal marking as per IEC 60417

c. Cell serial number

5.0 TESTS

All test results shall be provided for review and acceptance by SEC.

5.1 Design (Type) Tests

5.1.1 All design (type) tests prescribed in the relevant IEC or equivalent ANSI/IEEE standard shall be performed on the representative units of every new design or rating to be supplied to SEC.

5.1.2 In capacity test, the discharge shall be continued till an average battery end-of-cell voltage of 1.1 is reached. The required discharge duration on which the Ampere-Hour capacity rating bases is as stated in Data Schedule.

5.1.3 In lieu of the actual design (type) tests, certified test reports of type tests performed on identical units may be submitted to SEC for review and approval during bidding stage.

5.2 Acceptance Test

The acceptance test for battery capacity shall be performed as a site test per IEEE 1106. Manufacturer's representative(s) or representative(s) of an agency certified by the manufacturer shall be present at the job site to observe the battery installation and commissioning tests.

5.3 Sample Tests - Cells & Racks

Inspections and tests, for batch acceptance, shall be carried out using inspection levels and AQL (Acceptance Quality Level) as recommended in IEC 60623. The sampling procedure shall be established in accordance with IEC 60410.

Similar test shall be carried out on a typical/sample rack.

6.0 PACKING AND SHIPPING

6.1 Packing and shipping shall generally conform to 01-SDMS-01(latest revision) in addition to manufacturer's recommendations.

6.2 The batteries shall be transported "empty and discharged" or "filled and charged" in accordance with the manufacturer recommendations.

7.0 DATA/DOCUMENTS REQUIREMENT

The following documents shall be submitted:

7.1 Along with the Quotation

7.1.1 Dimensional drawings showing the recommended layout and mounting arrangement of the battery with consideration to adequate heat dissipation.

7.1.2 Characteristic curve indicating adjustment of float and boost/equalizing charge voltage levels versus temperature.

7.1.3 Any specific data/particulars, which the battery manufacturer expects the charger manufacturer should take into account while designing the chargers.

7.2 Subsequent to Award of the Contract/Purchase Order

7.2.1 Typical Charge and Discharge characteristic curves showing cell Voltage and Current versus Time.

7.2.2 Curves (or relevant figures) showing the available capacity (expressed as a percentage of nominal capacity) as dependent on different discharge rates to specified final discharge voltage per cell.

7.2.3 Rating Curve for cell type offered indicating "K_T" (Capacity Rating Factor) based on a 10 hour battery capacity "C10" per IEEE 1115 or equivalent IEC Standard.

7.2.4 Curves (or relevant figures) indicating the drawable capacity as a function of ambient temperature.

7.2.5 Cyclic (or relevant figures) behavior curve for the offered batteries (No. of cycles versus depth of discharge).

7.2.6 Documents asked for against item 7.1 during technical evaluation.

7.2.7 Battery sizing calculation

7.2.8 A laminated card summarizing the maintenance requirements, procedures and safety precautions, suitable for mounting adjacent to the battery.

8.0 TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)
(Page 1 of 6)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Proposed Values
3.0	**APPLICABLE CODES AND STANDARDS**			
	Applicable Industry Standards		x	
4.0	**DESIGN AND CONSTRUCTION REQUIREMENTS**			
	Battery Application			
	Installation within Air Conditioned area/ Non air-conditioned area			
	SYSTEM DESCRIPTION			
	Grounded/Ungrounded D.C. system			
	No. of Wires	two		
	Battery Bank Nominal Voltage or D. C System Rated Voltage	125/48		
	Minimum Permitted System Voltage (V dc)	100/42		
	Maximum Permitted System Voltage(during equalizing)	137.5/56		
	Cell Nominal Voltage (V dc)		x	
	Recommended float charging voltage at 25 ◦C(V dc/cell)		x	
	Equalizing Voltage (V dc/cell)			
	End of Discharge voltage (V dc/cell)	1.1		
	No. of cells forming the battery bank	92/39		
	Open circuit voltage in charged condition(V dc/cell)		x	

TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)
(Page 2 of 6)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
	BATTERY LOADING a. Continuous loading b. Short duration load c. Momentary load d. Any other load			------Amp. for -----hours -----Amp. for ----- hours ----- Amp. for -----hours ----Amp. for -----hours -----Amp. for ------hours
	Battery Amp. hours Capacity as computed based on 10 hours discharge rate(including all correction factors) (AH)			
	Minimum Battery bank voltage based on end of discharged cell voltage (V dc)			
	Battery type or Model No.		x	
	Manufactured and tested as per standards		x	
	COMPOSITION a. Plates composition Positive plate Negative plate b. Separators c. Retainers d. Container and cover e. Connectors **PLATE CONFIGURATION** Positive plate Negative plate Oxygen index of container and cover		x	

TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Proposed Values
	Internal resistance of battery bank including inter cell and inter tier connection in fully charged condition(mΩ)		x	
	Internal resistance of individual cell in fully charged condition(mΩ)		x	
	Cross section of inter- cell connector (mm^2)		x	
	Battery terminal short circuit current (A)		x	
	Time for total discharge during short circuit (sec)		x	
	Maximum permitted ripple voltage content for float and equalizing charges		x	
	Maximum discharge rate Discharge duration (minutes /seconds) Discharge current (A)		x	
	Recommended maximum recharge current following discharge (A)		x	
	Float Charging Current at the recommended float voltage setting (mA/AH)		x	
	Maximum self discharge rate per month at 25 ◦C		x	
	Guaranteed service life (minimum) under operating conditions (years)		25	
	Cycle life at 80% DOD (cycles)		x	
	Maximum capacity loss (% per year)		x	
	Maximum allowable deep discharge/ percentage of		x	
	Specific gravity at 25 ◦C		x	

TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)
(Page 4 of 6)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Proposed Values
	Specific Gravity range at 25 ◦C		x	
	Operating temperature range (◦C)		x	
	Temperature correction factor for electrolyte density at maximum level (kg/m3)		x	
	Temperature correction factor for electrolyte density at minimum level (kg/m3)		x	
	Electrolyte volume /cell (liters)		x	
	Maximum gassing rate at recommended equalizing voltage (ml/AH//Cell/Month)		x	
	Oxygen-Hydrogen recombinator required ? yes/no		x	
	Portable Eye/skin equipment required? Yes/No		x	
	Material of Battery rack		x	
	Racking of battery(single tier/two tier)		x	
	Total weight of cell		x	
	Overall cell dimensions Height (mm) Width (mm) Depth (mm)		x	
	Medical Kit Yes/No			
	Lockable steel cabinet Yes /No			
	Additional safety equipment, if any			

TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
5.0	TESTS Optional or special test requirements			

x values to be proposed by vendors

12.0 TECHNICAL DATA SCHEDULE

(VENTED NICKEL CADMIUM STATIONARY BATTERY BANK)

(Page 6 of 6)

SEC Enquiry No: _____ Item No: _____

A) Additional technical information or features specified by SEC.

B) Additional supplementary data or features proposed by Vendor/Supplier.

C) Other particulars to be filled up by Vendor/Supplier.
(Use separate sheet if needed).

Address	Manufacturer	Vendor/Supplier
Name of the Company		
Location & Office Address		
Authorized Name & Signature		
Date		
Official Seal / Stamp		