



**GUJARAT ENERGY TRANSMISSION
CORPORATION LTD.**

**SARADAR PATEL VIDYUT BHAVAN,
RACE COURSE, BARODA – 390 007.**

TECHNICAL SPECIFICATIONS

**110 V/220 V, Vented Type
Nickel – Cadmium Alkaline Battery Set**

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TECHNICAL SPECIFICATION OF 110V / 220V VENTED TYPE Nickel-Cadmium ALKALINE BATTERY SET

1. SCOPE:

This specification covers Design, Manufacture, Testing at works, Supply of complete 110V / 220V vented type Ni-Cd alkaline Battery set (of rating mentioned here in elsewhere), with FRP Battery stand, Testing and Commissioning at site for use in 400/220/132/66 kV sub-stations anywhere in Gujarat.

2. APPLICABLE STANDARDS:

Unless otherwise specified in this specification, the Ni-Cd Batteries shall comply with the following standards and latest amendments revision thereof.

Sr. No.	Standard	Applicability
1	IS: 10918	Specifications for vented type Nickel Cadmium battery
2	IEC 60993	Cell electrolyte
3	IEEE – 1115	IEEE recommended practice for sizing Nickel-Cadmium batteries for stationary applications
4	IS 8320	General requirement and methods to test lead acid storage batteries (For sampling criteria)

3. RATINGS:

The ratings for 110 V / 220V vented type Nickel-Cadmium battery set are specified as follows:

The scope of supply shall be as mentioned in schedule-A of respective tender.

- a) 110V Battery set – 250 Ah (As per parameter specified in Cl. No. 5)
- b) 220V Battery set –250 Ah or 450 Ah (As per parameter specified in Cl. No. 5).

4. CELL VOLTAGE AND NOS OF CELLS:

The Voltage rating of vented type Nickel-Cadmium battery cell shall be considered as follows.

Sr. No.	Operating condition	Cell Voltage
1	Nominal Voltage	1.2 V per cell
2	Trickle charge Voltage	1.4 to 1.42 V per cell
3	Boost charge Voltage	1.54 to 1.69 V per cell
4	Maximum Boost Charge Voltage	1.6 to 1.7 V per cell
5	End cell voltage	1.14 V per cell

The numbers of cells required in each of above rating battery set shall be as follows.

Sr. No.	Battery Set	Nos of Cell	Spare cells
1	220V	174 Nos	As per price schedule (If specified)
2	110V	87 Nos	As per price schedule (If specified)

5. CAPACITY AT ROOM TEMPERATURE

The rated capacity in ampere-hour when tested in accordance with Cl. No. 10.7 of IS 10918 shall not be less than the capacity specified hereunder at a given discharge rate.

The Battery capacity shall be as under.

- a) For 250Ah Battery set – 250 Ah at 5 Hrs 0.2 C5 Amp discharge to ECV 1.14V (Equivalent to 266Ah at 5 Hrs 0.2 C5 Amp discharge to ECV 1.0 V)
- b) For 450Ah Battery set – 450 Ah at 5 Hrs 0.2 C5 Amp discharge to ECV 1.14 V (Equivalent to 480 Ah at 5 Hrs 0.2 C5 Amp discharge to ECV 1.0 V)

6. BATTERY CELL CONSTRUCTION:

The cell construction shall be absolutely sturdy and vibration free. Cell component shall be of high quality and reliability. The cells shall have prismatic (rectangular), spill-proof and vented type of construction and shall be made of non-porous plastic or Alkali-proof mild steel. The construction of each component shall be as under.

a) Plates:

The positive plate containing nickel hydroxide as active material and negative plates containing cadmium hydroxide shall be made up of double perforated steel strips. It shall encompass the active material.

b) Plate groups:

The plate groups shall have welded construction to impart high mechanical strength to withstand severe vibrations.

c) Terminal arrangement:

Terminal arrangement shall be provided with Nickle plated terminal post to have high electrical conductivity.

d) Splash guard:

Splash guard shall be provided to

- Prevent splashing of electrolyte
- Prevent possible short circuit caused by external objects accidentally falling into cell.

e) Grid separator:

The separator shall be of porous alkali-resistance polypropylene material having insulating capability to avoid shorting or leakage of current between plates of opposite polarity.

Accordingly, Grid separator shall be provided to

- Separate the plates
- Insulate the frames from each other
- To allow free electrolyte flow

f) Vent:

The venting device shall be antisplash type and allow the gases to escape freely and shall effectively prevent electrolyte from coming out. Provision shall be made for drawing out electrolyte samples, checking and topping up electrolyte.

Vent shall be flame arresting "Flip – Open" type to prevent explosion and electrolyte contamination.

g) Battery set container and Lid:

The Battery container and Lid shall be of high strength Alkali- resistance material and shall have smooth size except for receptacles, hold down bars, vent tubes, name plates, latches and polarity marking.

h) Cell Container:

The container shall be of high strength alkali-resistance material suitably Translucent polypropylene type for electrolyte visual inspection. It shall be fusion welded to lids to make cell mechanically sturdy.

i) Electrolyte:

The electrolyte shall be a solution of potassium hydroxide (KOH) in distilled water having specific gravity of 1.2 + 0.01% at 27⁰ C.

J) Dimension:

Cell dimension shall be as specified in IS: 10918

7. TERMINALS:

Separate terminals shall be provided for connecting charger to the battery terminals. All inter cell, inter block as well as equalizer terminals connectors shall be of suitable rating nickel-plated copper. Suitable nickel-plated copper lugs shall be provided to connect the load. A typical arrangement of terminals shall be shown in the drawing.

8. TEMPERATURE RANGE:

The battery shall be suitable for continuous satisfactory operation at full rated capacity within ambient temperature range -20⁰ C to +50⁰ C.

9. CHARGE RATE:

Initially uncharged batteries shall be charged maximum up to 0.2 C5 Amp rate for 8 to 10 hrs. The voltage shall reach to maximum boost charge voltage of 1.6 to 1.7 Volt/Cell. The trickle charge rate shall be 1 to 2 mA per Ah.

10. CELL DESIGNATION:

The practice indicated in IS: 10918 - 1984 or latest version thereof shall be followed as under.

Vented Nickel Cadmium rechargeable cell shall be designated by the letter "K" followed by the second letter referring to the positive plates. The positive plates shall be Pocket plate type and accordingly, second letter shall be designated as "P" followed by third letter. Third letter shall be based on rate of discharge. The battery cell shall be of medium rate of discharge suitable for substation applications. Accordingly, third letter shall be designated as "M". The group of three letters shall be followed by cell ampere-hour capacity and followed by "P" in case of material is plastic. Thus cell designation is KPM xxxP.

11. MARKING

11.1 MARKING

The cell shall be marked with following information.

- a) Manufacturer's Name / Type
- b) Month and Year of Manufacturing
- c) Nominal Voltage

- d) Nominal specific gravity
- e) Rated ampere-hour capacity
- f) Country of origin
- g) Cell designation type as per type test report

11.2 POLARITY MARKING:

The polarity of the terminals shall be marked for identification. The positive terminals shall be identified by 'P' or (+) sign and red colour mark and the negative terminal shall be identified by 'N' or (-) sign and blue colour mark. Marking shall be permanent and non-deteriorating.

11.3 WARNING MARKING:

The battery shall be furnished with a warning plate located at conspicuous place specifying the use of "ALKALINE ELECTROLYTE ONLY" (in block letters) and specifying the proper filling level of the electrolyte. Marking shall be permanent and non-deteriorating.

11.4 CELL NUMBERING:

Numbering to each cell shall be provided as per battery set lay out arrangement with self-adhesive alkali resistant PVC stickers. Marking shall be permanent non-deteriorating type and shall be clearly visible.

12. MANUAL OF INSTRUCTIONS:

The instruction of manual containing details of initial treatment of the battery set and maintenance during service shall be provided with each Battery set. The instruction manual shall contain complete details of Battery set Installation, Testing, Commissioning, Maintenance during service life, Do's & Do Not's, Troubleshooting chart, Disposal procedure etc.

13. PACKING:

Battery shall be supplied in dry and uncharged condition suitably packed securely in non-returnable strong wooden crates. Packing shall be suitable for handling during transit by Rail / Road and secured to avoid any loss or damage during transit. Before putting battery cells in wooden crates they shall be wrapped with thin polythene sheet to preserve from dirt, grit, damage during transportation & handling and also to prevent ingress of water during storage/transport.

14. ACCESSORIES:

The following accessories shall be supplied with each battery sets:

- i) Cell testing volt meter, 3-0-3 Volt scale conforming to IS:1248 (Part-I) - 1982
- ii) Pair of Rubber gloves (Alkali resistant)

- iii) Insulated socket spanner with handle for opening terminals nuts
- iv) Plastic / glass syringe
- v) Inter cell, Inter tier and Inter rack connectors as per clause No. 7.
- vi) Stand insulators and cell insulators (if required)
- vii) Cell stickers
- viii) FRP Battery stand as per clause No.15.
- ix) Digital Multimeter (0-500V DC)
- x) Goggles
- xi) Funnel
- xii) Jug (2 Ltr capacity)
- xiii) Rubber boots (up to knee height)
- xiv) Apron
- xv) Cell lifting puller
- xvi) Petroleum jelly (minimum 1 Kg)
- xvii) Electrolyte (3% extra) of total quantity

Extra items with accessories like Vent caps, Bolts, Washers shall be supplied in sufficient quantity. Other items not specified but required for efficient working of batteries shall be supplied.

15. BATTERY STAND:

The stand shall be rigid, free standing, floor mounting type and free from wrap and twist. The stand should be made up of Fiber Reinforced Polymer (FRP) material. The FRP stand shall be alkali resistant. The stand shall be designed considering all the aspects of loading and safety to withstand the loading of battery set throughout its life. The battery stand design shall be supported by load bearing calculation.

Dimensions of the stand shall be derived from battery cell layout and considering minimum clearance between each cell. Battery stand shall be of two step-two tier rack arrangement to optimize the battery set footprints. The lower tier of the stand shall be at the height of 300 mm above floor level. Necessary support shall be provided for each rack to safeguard each battery cell from falling or declining. There shall be sufficient space between two tiers of stand to have easy accessibility during handling and maintenance of battery cells of lower tier. Necessary supports for power cable connections to end takeoff terminals shall also be provided on the stand. Any changes required during design review / detail engineering approval shall be carried out.

16. QUALITY ASSURANCE PLAN:

The bidder shall submit Quality Assurance Plan adopted for manufacturing of battery cell specifying detailed manufacturing process covering incoming material inspection to final product testing, packing and dispatch.

Quality Assurance Plan shall cover following aspects.

1. Incoming material / Brought out items verification:

The details containing list of important incoming materials, list of standard according to which the incoming materials shall be tested, list of tests to be performed on incoming materials along with respective OEM test certificates etc.

Precaution taken for ensuring usage of quality raw materials and sub-components shall be a part quality assurance plan.

2. In process inspection steps:

Details of manufacturing facilities available, manufacturing process steps, verification points, list of standards to be followed to ensure correctness of process to have desired product as per specification etc.

3. Routine tests:

Details of verification check points for all routine tests as per specification to be performed on finished product along with list of relevant applicable standards.

4. Acceptance tests:

Details of verification check points for all acceptance tests as per specification to be performed on finished product along with list of relevant applicable standards.

5. Type tests

Details of all type the tests as per specification along with list of relevant applicable standards.

6. Packing and Dispatch

Process of packing along with its verification check points to ensure safe transport, transit, unloading, unpacking and completeness of consignment.

17. DRAWINGS AND DATA:

The bidder shall submit following drawings for approval.

A At the bid stage:

- a) General Arrangement drawing of battery set showing complete battery set arrangement,
- b) Cell dimensional drawing,
- c) Battery stand drawing showing dimensions of overall stand as well as cell arrangements.

B At detailed engineering stage:

- a) General Arrangement drawing of battery set showing complete battery set arrangement, All type of connector detail, Terminal strip detail,
- b) Cell construction details showing Front view, Side view, Top view with dimensions, Marking arrangement, Vent assembly etc.
- c) Terminal assembly arrangement for connection with battery charger/load
- d) Dimensional drawing of connectors
- e) Detailed cross sectional view showing all internal details of battery cell
- f) Bill of materials
- g) Short time discharge data along with capacity factor chart necessary for battery sizing calculations
- h) Battery stand drawing showing dimensions of overall stand as well as individual members, Cell arrangements and all necessary clearances
- i) Load bearing calculation in support of strength of FRP Battery stand
- j) **All the drawings submitted in soft form shall be in pdf format. However, requirement in AutoCAD for shall be at the discretion of GETCO.**

18. TESTS:

The following tests from NABL accredited laboratory shall be carried out in accordance with IS:10918-1984 or the latest **/ amended / up to date IS/IEC.** The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be **older than seven years. Type test reports shall be valid as on the last date of submission of bid.**

18.1 Type Tests on offered Battery cell

- a) Physical examination
- b) Dimensions weight and lay out
- c) Marking
- d) Polarity and absence of short circuit
- e) Air pressure test on offered type container
- f) Ampere-hour capacity
- g) Retention of charge
- h) Discharge performance at 55°C
- i) Life cycle test (for atleast 350 cycles)
- j) Insulation resistance
- k) Dielectric test.

NOTE:

1. The life cycle test report of other than offered Ah capacity of same design will be accepted with justification for its applicability to offered rating battery cell.

- 2. In case of non-submission /partial submission or type test reports of which validity is over, bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.**

18.2 ROUTINE TESTS:

- a) Physical examination
- b) Dimension, weight and lay out
- c) Marking
- d) Polarity and absence of short circuit

18.3 ACCEPTANCE TESTS:

The following shall constitute acceptance test and shall have to be carried out at Manufacturer's works prior to dispatch of the batteries.

A: For Battery cell:

- a) Physical examination.
- b) Dimension, weight and lay out
- c) Marking
- d) Polarity and absence of short circuit
- e) Ampere-hour capacity
- f) Insulation resistance
- g) Air pressure test
- h) Bill of material and accessories verification

B: For Battery stand

- a) Physical examination
- b) Dimension verification
- c) Verification of sections and components
- d) Load test

19. INSPECTION:

Inspection of the material shall be offered only after successful completion of routine testing at the works. The inspection may be carried out by the purchaser at any stage of manufacturing. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. The purchaser reserves the right to insist for witnessing the acceptance / routine testing of bought out items. No material shall be dispatched without inspection and / or dispatch clearance from GETCO.

20. COMMISSIONING:

The first charging & commissioning of each battery set at site in all respect shall be in the scope of the bidder. The successful bidder/s shall have to carry out first testing & commissioning of each battery set at site. The successful bidder shall have to arrange for all the necessary items, equipments, tools, tackles during testing & commissioning.

First charging & commissioning shall include following:

1. Installation of battery stand and battery cells as per approved layout
2. Connection of all cells of battery set as per approved layout
3. Preparation of electrolyte
4. Filling of electrolyte
5. Charging of complete battery set and putting it in parallel operation with charger
6. Measurement of Battery impedance

Battery Impedance Measurement Test shall be performed after first charging / commissioning and Signature Value (Battery Impedance) of all the cells shall invariably be submitted along with commissioning test reports.

Schedule of Guaranteed Technical Particulars of 110 / 220V vented type Nickel-Cadmium alkaline Battery Set

The bidder must fill up all the point of GTP for offered item/s. Instead of indicating "refer drawing, or as per IS/IEC", the exact value/s must be filled in.

Sr. No.	Parameter	Particulars to be filled by bidder	Remarks
1	Manufacturer		
2	Type & Designation if any		
A	Standard Rating		
1	Cell rating		
B	Cell Voltage		
1	Nominal rating		
2	Trickle charge Voltage		
3	Boost charge Voltage		
4	Maximum Boost Charge Voltage		
5	End cell voltage with Ah rating		
C	Cell Capacity	@ECV 1.14 V- ECV 1.0 V	
1	250Ah Battery set		
2	450Ah Battery set		
D	Cell Construction		
1	Plates		
2	Plate group		
3	Terminal arrangement		
4	Splash guard		
5	Grid separator		
6	Vent		
7	Battery container and Lid		
8	Cell Container		
9	Electrolyte		
10	Quantity per cell		
11	Terminal Connector		
12	Cell Dimension		
13	Cell weight		
14	Nos of Positive plate		

15	Nos of Negative plate		
16	Positive Plate dimension		
17	Negative Plate dimension		
E	Temperature range		
F	Charge Rate		
1	Max. charge rate		
2	Duration		
3	Maximum charging voltage		
4	Trickle charge rate		
G	Cell designation		
H	Marking		
1	Cell marking		
2	Polarity marking		
3	Positive terminal		
4	Negative terminal		
5	Warning		
I	Packing details		
J	Accessories		
1	Cell testing volt meter		
2	Pair of Rubber gloves		
3	Spanner		
4	Plastic / glass syringe		
5	Connectors		
6	Insulators		
7	Cell marking		
8	Battery stand		
9	Digital Multimeter		
10	Goggles		
11	Funnel		
12	Jug (2 Ltr capacity)		
13	Rubber boots (up to knee height)		
14	Apron		
15	Cell lifting puller		

16	Petroleum jelly		
17	Electrolyte		
18	Extra items like		
K	Battery Stand		
1	Material		
2	Dimension		
3	Rack arrangement		
4	Minimum clearance from ground		
5	Supports		
6	Clearance between tiers		
7	Support for power cable		