

**TAMILNADU GENERATION & DISTRIBUTION
CORPORATION LIMITED**

1X800MW NORTH CHENAAI STAGE III (BTG)

**TECHNICAL SPECIFICATION
FOR
*220V DC BATTERY***

SPECIFICATION NO: PE-TS-423-508-E001, R0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301**



TECHNICAL SPECIFICATION FOR 220V DC BATTREY

SPECIFICATION NO. PE-TS-423-508-E001

REVISION 00

DATE: 01.09.17

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TOTAL SHEETS INCLUDING COVER SHEET/CONTENT SHEET = 27



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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS



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1.0 SCOPE

- 1.1 This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing, despatch to site and supervision of E&C of 220V DC batteries as described in the various sections of this specification. The batteries shall generally conform to IS/ IEC/ IEEE. Erection and commissioning is not included in vendor's scope. However Vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.
- 1.2 Technical requirements of 220V DC BATTERY are indicated in Data Sheet-A & Section-II.
- 1.3 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

2.0 BILL OF QUANTITIES

Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

S. No.	Reference clause No. of Section II (if any)	Specific Requirement/ Change
1	NIL	NIL

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

4.1 Documents required along with Technical offer

Signed and Stamped copies of following documents:-

- Battery sizing calculation with respect to load duty cycle as per Annexure-II of Section-II to be provided along with supporting documents (capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue) for considered factors.
- Schedule of BOQ cum Price Schedule (Unpriced)
- Compliance certificate
- Schedule of deviations.

4.2 Documents required after award of LOI

Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:-



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S. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.
1	Quality Plan for battery	PE-V0-423-508-E902
2	Data Sheet for battery	PE-V0-423-508-E101
3	General Arrangement drawing for Battery	PE-V0-423-508-E102
4	Battery sizing calculation (Including battery catalogues, curves etc)	PE-V0-423-508-E103
5	Bill of Material for the battery	PE-V0-423-508-E104
6	Field Quality Plan for battery	PE-V0-423-508-E105
7	List of E&C Spares for battery	PE-V0-423-508-E106
8	List of O&M Spares for battery	PE-V0-423-508-E107
9	List of Mandatory Spares for battery	PE-V0-423-508-E108
10	O & M manual for battery	PE-V0-423-508-E109
11	Fault calculation & Connector sizing calculation	PE-V0-423-508-E110
12	Type test reports for the battery	PE-V0-423-508-E111
13	Cable Termination arrangement for battery terminal	PE-V0-423-508-E112
14	Loose items to be shipped with battery	PE-V0-423-508-E113
15	Packing list (to be submitted after dispatch of battery)	PE-V0-423-508-E114
16	Battery room lay out	PE-V0-423-508-E115

Note:-

1. Document indicated at clause no. 4.2 above, shall be submitted through document management system (DMS).



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DATA SHEET -A LEAD ACID PLANTE BATTERY

1.	Rated voltage (V)	:	220V DC
2.	Type of Battery	:	Lead Acid Plante high discharge
3.	Design Ambient temp.	:	50°C
4.	Min Electrolyte temp.	:	15°C
5.	Cell Container	:	clear view SAN type, suitable robust, heat resistance, leak proof, non-absorbent, acid resistant, non-bulging type
6.	DC System Earthing	:	Unearthed
7.	Conforming to	:	IEEE/ IEC / IS standards
8.	No. of cells & End cell voltage	:	108 Nos.; 1.85V
9.	Nominal Float voltage (V)	:	2.25 V/cell
10.	Boost voltage (Maximum) (V)	:	Bidder to furnish the detail along with offer
11.	AH Capacity of battery at temp 'T' (27°C) for a) MAIN PLANT BATTERY as per Annexure-III	:	Bidder to furnish quoted AH capacity and battery sizing calculation along with offer for battery
12.	Arrangement of batteries on racks	:	Single tier for batteries having cell weight 50kg or more.
13.	Connection from battery to Charger	:	3-1CX400sqmm (Cu)/ pole (Fire survival cable EPR insulated) for MAIN PLANT BATTERY (Annexure-III)- Tentative size
14.	Fault current (DC)		The battery shall be designed to restrict maximum fault level on DCDB limited to 50kA for 1 Sec. As per Annexure-II for MAIN PLANT Battery
15.	Battery to be suitable for duty		
16.	Recommended charging rate for boost charging a) For Main Plant Battery (as per Annexure-III)	:	Bidder to furnish the detail along with offer
17.	Tapping to be provided in battery		NO
18.	Tapping to be provided at which cell		NO

Note 1: Bidder shall furnish following along with offer:

- Battery capability / discharge curve.
- Battery sizing calculation as per IEEE-485.
- Indicate value at sl. No. 10, 11 and 16 above.
- Supporting calculation for temp correction factor as per IEEE 485 shall be furnished for batteries which are not designed at 25°C.
- Bidders stand guarantee that the rating offered at S. No. 11 shall meet 'Load Duty Cycle' taking into factors account for battery sizing as per Annexure-II of specification.



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DATA SHEET -C

S. No.	PARAMETER	UNIT	VALUE
1.0	Make and Type		
2.0	AH capacity at 27° C and end voltage		
2.1	At 10 Hr discharge rate	AH	
2.2	At 1 Hr discharge rate	AH	
3.0	Battery Discharge current		
3.1	At one minute rate	Amp	
3.2	At 30 minutes rate	Amp	
3.3	At 30 minutes rate at end voltage	Amp	
3.4	At 60 minutes rate	Amp	
3.5	At 60 minutes rate at end voltage	Amp	
3.6	At 120 minutes rate at end voltage	Amp	
4.0	Types of plates		
4.1	Negative plates		
4.2	Positive plates		
5.0	Method of connection between cells		
6.0	Voltage per cell at the end of charge at the finishing rate	V	
7.0	Recommended Trickle charge current	Amp	
8.0	Type and material of separators		
9.0	Material of container		
10.0	Type of container		
11.0	Internal resistance of cells	Ohms	
12.0	Total resistance of connectors	Ohms	
13.0	Insulator Material for		
13.1	Cells		
13.2	Racks		
14.0	Average life	Years	
15.0	Recommended boost charger rating for		
15.1	Charging in 8 hours	Amp	
15.2	Charging in 10 hours	Amp	



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S. No.	PARAMETER	UNIT	VALUE
16.0	Allowable ripple content acceptable to battery (r.m.s)	%	
17.0	Hydrogen evaluation		
18.0	Cell designation in accordance with IS: 1651/1652		
19.0	Applicable standard		
20.0	Whether battery performance curve and calculation for capacities enclosed		
21.0	Recommended Maximum period of storage of Electrolyte before first charge		
22.0	Amount and specific gravity of electrolyte per cell required for first filling at 27° C		
23.0	Recommended specific gravity of electrolyte at 27° C		
23.1	When fully charged		
23.2	When fully discharged		
24.0	Container dimensions	(L X B X H)mm	
25.0	Distance between centres of cells when erected	Mm	
26.0	Terminal connectors		
26.1	Type		
26.2	Material		
27.0	Battery Racks		
27.1	Type & Material		
27.2	Outline dimensions	(L X B X H) mm	
27.3	Net weight	Kg	
28.0	Weight per cell	Kg	
28.1	Net dry weight	Kg	
28.2	Net weight with electrolyte	Kg	
29.0	Total shipping weight of one battery unit (without electrolyte)	Kg	
30.0	Taps provided at cell no.		
31.0	Connection from battery to charger (busbar/ cable)		
32.0	Recommended size of (busbar/ cable)		
33.0	Whether backup calculation furnished		
34.0	Cable lugs at battery terminals of suitable size		

Note: Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)



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SECTION-II

STANDARD TECHNICAL REQUIREMENTS

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1.0 INTENT OF SPECIFICATION

The intent of specification is not to specify all details of design & construction of material. The material shall, however, conform in all aspects to high standard of design, engineering and workmanship and be capable of performing in continuous operation up to & after bidder's guarantee period in manner acceptable to purchaser who will interpret the drawings & specification and shall have power to reject any work or material which in his judgement is not in full accordance with this specification.

2.0 CODES & STANDARDS

- 2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 2.2 The design, material, construction, manufacture, inspection, testing and performance of 220V DC Battery shall conform to the latest revision of relevant standards and codes of practices as per Annexure-I.
- 2.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 SERVICES AND EQUIPMENT TO BE EXCLUDED

- A) Civil works like foundation and cable cellar, flooring of the battery room etc.
- B) Ventilation of battery and charger room.
- C) DCDB
- D) Power and control cables
- E) Erection of the equipment
- F) Battery charger, battery fuse box and discharge resistor panel

4.0 SYSTEM CONCEPT

- 4.01 **Main Plant:** 220V DC system shall be an ungrounded system comprising of two sets of batteries (2X100%) with 1x100% float cum-boost charger for each set of battery and one sectionalised 1X100% DCDB & 1 no. common standby float cum boost charger. The 220V DC system is designed to cater the control, protection, interlocking, emergency lighting and emergency dc drives for main plant and associated station (excluding CHP & Switchyard). The load duty cycle and typical single line diagram for 220V battery and charger connections for Main Plant is enclosed as Annexure-II & Annexure-III respectively.



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- 4.02 The battery shall be designed to restrict maximum fault level on DCDB limited to 50kA for 1 Sec.
- 4.03 In case of failure of AC, battery will meet the DC load requirement. After restoration of power, the float/float cum boost charger will continue to supply the loads as well as trickle charge the battery.
- 4.04 The 220V batteries shall be sized considering emergency load cycle requirement of 120 minutes and various factors as per Annexure-II.
- 4.05 The voltage at load terminal will not exceed the limits of +10% and -15% of nominal system voltage for 220V DC system.
- 4.06 Batteries shall be connected to DC distribution board through single cores copper cables. Battery terminals shall be made suitable for cable size to be informed during contract stage. Long barrel heavy duty copper lugs for cable termination at battery terminals shall be in the scope of bidder. Size of the cable shall be informed during detailed engineering.
- 4.07 The equipment will be located indoor but in a hot, humid and tropical atmosphere.
- 4.08 Necessary accessories required for maintenance and testing of batteries shall be supplied with each battery bank as per enclosed Annexure-IV.

5.0 OTHER TECHNICAL REQUIREMENTS

5.1 Lead-Acid Batteries

- a) Batteries shall be stationery storage Lead Acid Plante high discharge type conforming to IS-1652/IEC60896-11/ IEEE 485-1995. The batteries shall meet the 'Load Duty Cycle' requirements under all site-operating conditions as specified.
- b) Each set of battery shall consist of number of cells assembled together on mounting racks.
- c) The battery shall be flooded cell with Plante Lead acid. In the event of failure of any cell, there shall be no interruption in power supply to load.
- d) Containers:
Container shall be made of clear view SAN type, suitable robust, heat resistance, leak proof, non-absorbent, acid resistant, non-bulging type and free from flaws, such as wrinkles, cracks, blisters, pin holes etc. Electrolyte level lines shall be marked on container. The marking for the electrolyte level should be for the upper and lower limits. Container shall be closed / sealed lid type. The pole sealing arrangement should be such that no acid particle gets entrapped due to acid creep

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as a result of capillary action and it should be possible to remove and refix the sealing to carry out the maintenance.

e) Vent Plugs:

Vent plugs shall be provided in each cell. They shall be anti splash type, having more than one exit hole shall allow the gases to escape freely but shall prevent alkali from coming out. The design shall be such that the water loss due to evaporation is kept to minimum. In addition the ventilator shall be easily removed for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte samples.

f) Plates:

The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuations of load. The construction of plates shall conform to latest revisions of IS : 1652 as applicable. The separators shall maintain the electrical insulation between the plates and shall allow the electrolyte to flow freely. Separators should be suitable for continuous immersion in the electrolyte without distortion. The positive and negative post shall be clearly marked. The positive plates shall be supported from the ledges of the SAN container. They should not be supported at the bottom of container. Sufficient space shall be allowed to allow the creepage of the plates.

g) Sediment Space:

Sufficient sediment space shall be provided so that cells will not have to be cleaned during normal life and prevent shorts within the cells.

h) Electrolyte:

The electrolyte shall be prepared from battery grade Sulphuric Acid conforming to IS-266 and distilled water conforming to IS-1069. The cells shall be shipped in dry uncharged condition and electrolyte shall be supplied separately in non-returnable containers. 10% extra electrolyte shall be furnished as extra fitting to cover spillage in transit or during erection.

i) Connectors and Fasteners:

Lead coated copper connectors shall be used for connecting up adjacent cells, rows and banks. The cell terminal post shall be provided with connector bolts, nuts, clamps, connectors and washers made of copper/ brass effectively coated with lead to prevent corrosion.

The thickness of lead coating shall be measured as per appendix-F of IS-6848. All the terminals and inter-cell connectors shall be fully insulated or have insulated shrouds. End take of connections from positive and negative poles of batteries shall be done through single core copper cable having stranded copper conductor and XLPE insulation (Exact cable size to be informed during contract stage). The bidder shall supply lead coated bent copper plate, tubular copper lugs, clamps, bolts, nuts, washers, etc. for termination of these cables on batteries. Suitable numbers of inter rack connectors shall be supplied by the bidder to suit the battery room layout during detailed engineering. Calculation for sizing of connectors and fasteners shall be furnished during detail engineering.



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All connectors and lugs shall be capable of continuously carrying the 2 hour discharge current of respective batteries and through fault short circuit current, which the battery can produce and withstand for the period of one second. The successful bidder shall furnish necessary sizing calculations to prove the compliance for the same at contract stage.

j) **Battery Racks:**

Wooden racks for all the batteries shall be provided. These racks shall be made of good quality first class seasoned teak wood in line with CPWD specification. They shall be free standing type mounted on porcelain/hard rubber/PVC pads insulators/High impact plastic insulators. Batteries having cell weight of 50 Kg or more will be arranged in single tier. The batteries rack and wooden support for cable termination shall be coated with three (3) coats of anti-acid paint of approved shade. Numbering tags, resistant to acid, for each cell shall be attached on to the necessary racks. The bottom tier of the stand shall not be less than 150 mm above the floor. Wherever racks are transported in dismantled condition, suitable match markings shall be provided to facilitate easy assembly.

Following information shall be indelibly marked on outside of each cell:
Manufacturer's name and trademarks Manufacturer type designation

- AH capacity at 10 hour discharge rate
- Serial number

k) Positive and negative terminal posts shall be clearly and indelibly marked for easy identification. Numbering tags for each cell shall also be attached on to the racks.

l) Following minimum information shall be given on the instruction cards:

- Manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate
- Maintenance instructions
- Designation of cell in accordance with relevant standard
- Storing conditions of electrolyte

m) **BATTERY HEALTH MONITORING SYSTEM (BHMS)**

Each set of battery shall be equipped with a battery health monitoring system. In general, the BHMS shall be able to monitor following conditions during a partial discharge against stored characteristics for the type and capacity of battery:

- a. Excessive current during charging or discharging
- b. Short circuit
- c. Over Voltage-Overcharging
- d. Over heating- Exceeding the cell temperature limit
- e. Under Voltage - Exceeding present depth of discharge limit

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Further, DC Health Monitoring System module shall have additional provision of accepting at least 6 Nos. of Digital inputs and 2 Nos. of Analog inputs (4-20mA). DC Health Monitoring System shall also be able to store these inputs status for future reference. The system should be able to test, analyze and predict the battery performance, computing remaining capacity and battery efficiency. The BHMS shall compensate for cell temperature and discharge load current throughout the discharge cycle. The system shall have a programmable event log which shall be secured in the event of total power failure for atleast a period of six months. In addition to local indication and control, the battery monitoring shall also include RS 485 output port to enable battery parameters and alarms to be monitored from plant DDCMIS / EDMS / SAS.

6.0 PERFORMANCE GUARANTEE

- 6.1 Bidders shall guarantee that battery offered shall meet the 'Load Duty Cycle' and information given in Annexure –II as stipulated in this specification and as confirmed by them in technical data sheets. In case the performance of battery at site is not as per the performance guarantee, the bidder will have to replace the battery at site free of cost.

7.0 INSPECTIONS & TESTING

- 7.1 Offered equipment shall be of type test design. The bidder shall confirm compliance to quality plan enclosed with the specification, which is subject to BHEL & End customer approval and the inspection shall be carried out based on this approved Quality Plan (QP No. PE-QP-999-508-E002, Rev. 00).
- 7.2 All acceptance and routine tests as per relevant standards and as per QP (attached) shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.
- 7.3 The type, routine and acceptance test on battery will be conducted on two cells of battery as per relevant standard.

(A) Following type tests shall be conducted for the battery.

- Capacity test for voltage on battery during discharge at 27°C.
- Ampere hour & watt hour efficiency test
- Verification of constructional requirement
- Verification of marking
- Verification of dimension

(B) For following tests only type test reports will be submitted.

- Endurance test.
- Test for retention of charge



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7.4 For all components / materials, for which type test reports have been asked as per relevant standard, such Type tests should have been carried out on identical components / materials. In absence of such type tests reports or in case such reports are not found to be meeting the specification/standards requirements, vendor shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval. (Type test charges as per clause 7.5 shall not be applicable in such cases).

7.5 The bidder shall indicate cost of carrying out all the Type tests as specified in clause 7.3 of the specification. The charges for each of the Type tests shall be given separately in price schedule as indicated in BOQ cum Price schedule at Sr. No. 6.0.

7.6 All material used for the construction of the equipment / items shall be new and shall be in accordance with the requirements of this specification. Materials utilised shall be those, which have established themselves for use in such applications.

8.0 Instruction Manuals

Instruction manuals for the installation, operation and maintenance of battery to be supplied shall be furnished at least two months before the date of despatch of equipment.

The installation and maintenance manual of battery shall contain the following:

- A) General description giving type and rating of various batteries.
- B) Technical data.
- C) Salient constructional details.
- D) Instruction to be followed on receipt at site.
- E) Instructions for foundations, if any.
- F) Erection procedures and checks (handling at site, erection, pre-commissioning).
- G) Procedure for filling of electrolyte.
- H) Commissioning procedures and site tests.
- I) Routine, periodic and preventive inspection and maintenance procedures.
- J) Safety rules.
- K) Possible faults, their causes and remedies.
- L) Copies of the type, acceptance and routine test certificates in bound volume.
- M) Catalogues, literature and drawings.
- N) Outline dimension drawings showing constructional features, relevant cross sectional views and earthing details, operator oriented description of equipment and accessories.

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- O) Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

8.1 Bidder shall furnish field quality plan detailing out the specific quality control procedure covering receipt of material/equipment and handling at site, storage, erection, commissioning, post commissioning etc.

9.0 **TOOLS AND TACKLE**

Tools & tackle which are essential to facilitate assembly, adjustments, maintenance & dismantling of equipment shall be provided as part of equipment supplied. The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection.

10.0 **BASIC DESIGN DOCUMENTS**

'Basic Design Documents' cover: Battery sizing calculations, battery data sheet, connector sizing calculation, Quality Plan, OGA for 220V battery, BOM, List of approved makes, type test reports & type test procedure (if applicable) for battery.

Successful bidder shall also prepare battery room lay out during detailed engineering based on BHEL input drawing. Same shall be subject to BHEL/end customer review and approval. There shall be no commercial implication towards the same.

11.0 **AS-BUILT DRAWINGS**

Though only supply of equipment is under bidder's scope, bidder may note that all as-built correction (as given by purchaser to vendor) shall have to be incorporated in the originals by the vendor and copies of the as-built corrected drawings / documents as per requirement shall be submitted by the vendor.

12.0 Statutory and regulatory requirements as per IE rule 1956 with amendment - 3 rule 1986, rules Nos. 35, 42, 50 & 51 shall be adhered to.

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ANNEXURE-I

LIST OF APPLICABLE STANDARDS

- | | | |
|-----|---|-------------|
| 1. | STATIONERY LEAD ACID PLANTE BATTERY | IS 1652 |
| 2. | RECOMMENDED PRACTICE FOR SIZING LEAD ACID BATTERIES | IEEE 485 |
| 3. | SPECIFICATION FOR WATER FOR STORAGE BATTERIES | IS 1069 |
| 4. | SPECIFICATION FOR SULPHURIC ACID FOR LEAD ACID BATTERIES | IS 266 |
| 5. | RUBBER & PLASTIC CONTAINERS FOR LEAD ACID BATTERIES | IS 1146 |
| 6. | SYNTHETIC SEPARATORS FOR LEAD ACID BATTERIES | IS 6071 |
| 7. | SEALING COMPOUND FOR LEAD ACID BATTERIES | IS 3116 |
| 8. | METHODS OF TESTS FOR LEAD ACID BATTERIES | IS 8320 |
| 9. | SPECIFICATION FOR HIGH PERFORMANCE PLANTE'S CELLS | BS-6290 |
| 10. | ELECTRICAL VOCABULAR, PRIMARY CELLS AND BATTERIES. | IS: 1885 |
| 11. | LEAD-ACID BATTERIES FOR TRAIN LIGHTING & AIRCONDITIONING SERVICES | IS: 6848 |
| 12. | STATIONARY LEAD-ACID BATTERIES – VENTED TYPES – GENERAL REQUIREMENTS & METHODS OF TESTS | IEC60896-11 |
| 13. | INDIAN ELECTRICITY RULES & INDIAN ELECTRICITY ACTS | |

Note:

Vendor to note that wherever IS is mentioned equivalent IEC is also acceptable. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.



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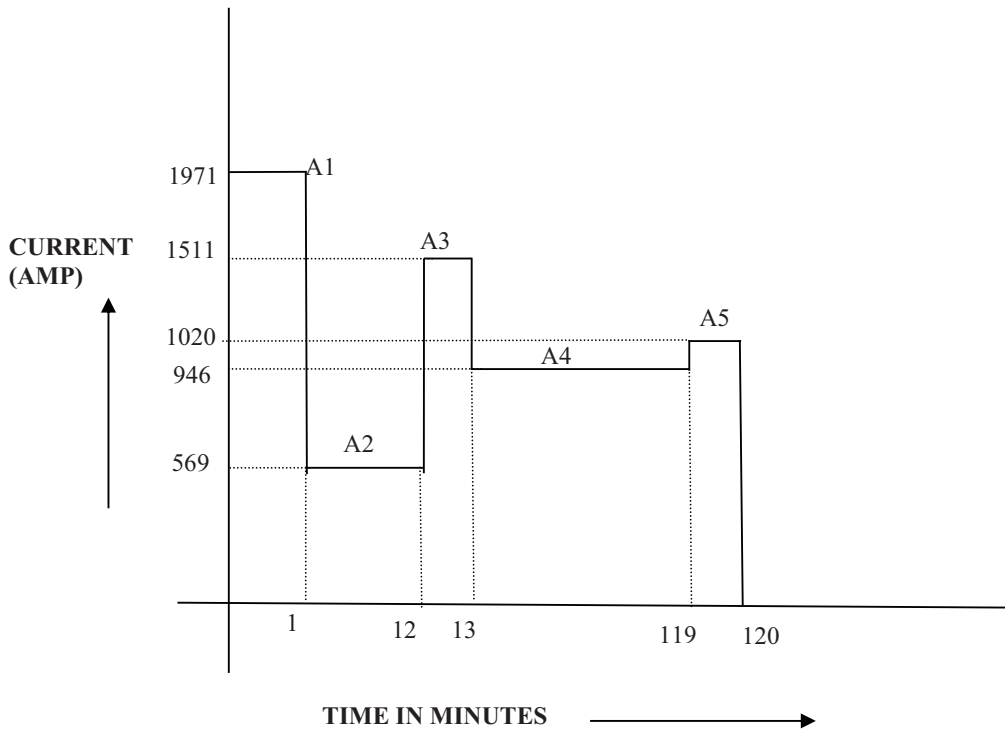
REVISION 00

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ANNEXURE-II

LOAD DUTY CYCLE



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

- | | |
|----------------------------------|--------------------|
| 1. AGEING FACTOR | : 1 |
| 2. MIN.ELECTROLYTIC TEMP. | : 15 °C |
| 3. END CELL VOLTAGE | : 1.85V PER CELL |
| 4. DESIGN MARGIN | : 20% |
| 5. TEMPERATURE CORRECTION FACTOR | : As per IEEE 485* |
| 6. NO. OF CELLS | : 108 |

* Supporting calculation for temp correction factor as per IEEE 485 shall be furnished for batteries which are not designed at 25°C.



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

SPECIFICATION NO. PE-TS-423-508-E001

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SECTION II

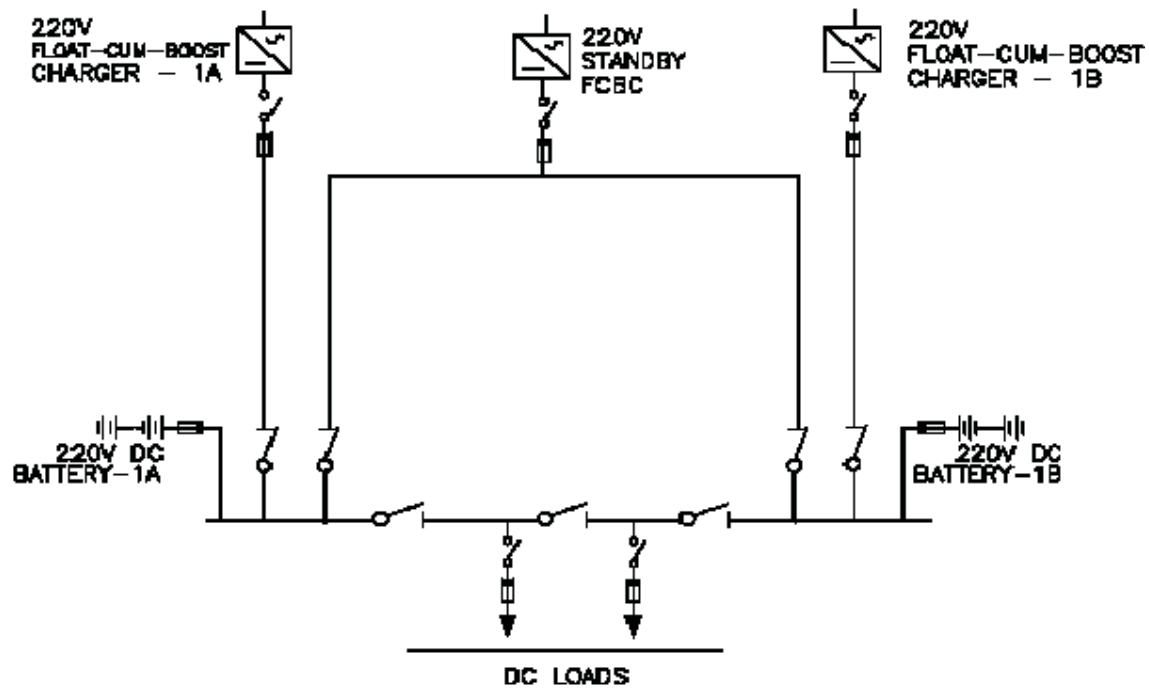
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ANNEXURE-III

ONE LINE DIAGRAM FOR 220 V DC SYSTEM



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ANNEXURE-IV

ACCESSORIES

Following accessories shall be provided for each battery bank (Already part of BOQ cum price schedule)

1.1 Each battery is furnished with following items

Sl. No.	Fittings
1	Electrolyte (sulphuric acid for first filling plus 10% extra in non-returnable container)
2	Seasoned teak wood battery racks for battery properly treated for anti-sulphuric acid resistance coated with 3 coats of anti-acid paint for 220V battery bank
3	porcelain/hard rubber/PVC pads insulators/High impact plastic insulators, rubber pad etc. for rack plus 5% extra
4	Inter cell, Inter row, Inter bank connectors with connection hardware as required for complete instillation plus 5% extra and end take-off with one no. extra take off
5	Lead coated connection hardware plus 5% extra
6	Cell numbering tags with fixing arrangement (1 set)
7	Cable clamps with fixing hardware (1 set)

1.2 Additionally, following set of accessories shall be provided with each battery:

S no	Name of accessory	Unit	QTY
1	Hydrometer (in steps of 0.005)	Nos	1
2	Set of hydrometer syringes (suitable for the vent holes in different cells for specific gravity reading)	SET	1
3	Pocket Thermometer for measuring electrolyte temperature (Digital type)	Nos	3
4	Specific gravity correction chart	Nos	2
5	Wall mounting type	Nos	2



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	holder for hydrometer and thermometer		
6	Cell testing digital voltmeter (3-0-3V) with testing leads	Nos	2
7	Rubber apron	Nos	2
8	Pair of rubber hand gloves	PAIR	2
9	Set of insulated spanners	SET	2
10	No smoking notice	Nos	2
11	Goggles (industrial)	Nos	2
12	Instruction card	Nos	2
13	Electrolyte resistant plastic funnels	Nos	2
14	Electrolyte resistant plastic jugs	Nos	2
15	Plastic filling bottles for filling up	Nos	2
16	Battery Log Book	Nos	1
17	Cell lifting straps	SET	2
18	Siphons	SET	1
19	Earth Leakage tester	Nos	1



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STANDARD QUALITY PLAN

		CUSTOMER :		PROJECT:		SPECIFICATION NO.					
		QUALITY PLAN		TITLE		TITLE					
BIDDER/ VENDOR		STANDARD QUALITY PLAN NO. - PE-QP-999-508-E002, REV.0		SPECIFICATION :		TITLE					
SHEET 1 OF 3		SYSTEM		ITEM : LEAD ACID BATTERY		DOC. NO.					
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	P	W	V
1.0	RAW MATERIALS & BOUGHT OUT ITEMS								10		
1.1	(Pure Lead for Pos. plate, Lead Alloy for Neg. plate & Sulphuric acid)	Chemical	MA	Chemical Analysis	Random Sample	IS:1652, IS:266, IS:1069 & MFR's Std.	IS:1652, IS:266, IS:1069 & MFR's Std.	Test Cert.	3/2	-	1
1.2	SEPARATOR	Visual	MA	Visual	Random Sample	IS:1652 & MFR's Std.	IS:1652 & MFR's Std.	Test Cert.	3/2	-	1
a)	Visual	Visual			-do-	-do-	-do-	-do-	3/2	-	1
b)	Physical	Physical			-do-	-do-	-do-	-do-	3/2	-	1
c)	Chemical	Chemical			-do-	-do-	-do-	-do-	3/2	-	1
d)	Electrical Resistance Test	Electrical			-do-	-do-	-do-	-do-	3/2	-	1
e)	Acceptance test Dimension, Volume Porosity, Wettability of separator	Test		As per Standard	-do-	-do-	-do-	-do-	3/2	-	1
1.3	TERMINAL POST	Visual	MA	Visual	Random Sample	IS:1652, IS:8320 & MFR's Std.	IS:1652, IS:8320 & MFR's Std.	Test Cert.	3/2	-	1
a)	Dimensional Conformance	Visual							3/2	-	1
b)	Material Conformance	Chemical	CR	Chemical	-do-	-do-	-do-	-do-	3/2	-	1
c)	Thread size depth & chamfer	Physical	MA	Measurement	-do-	-do-	-do-	-do-	3/2	-	1
d)	Surface finish & defects	Visual	MA	-do-	100%	-do-	-do-	-do-	3/2	-	1
e)	Plating Quality	Thickness	CR	-do-	Random Sample	-do-	-do-	-do-	3/2	-	1
BHEL		PARTICULARS		BIDDER/ VENDOR							
NAME		NAME		NAME							
SIGNATURE		SIGNATURE		SIGNATURE							
DATE		DATE		DATE							
2 - VENDOR		3 - SUB- VENDOR		P - PERFORM		W - WITNESS		V - VERIFICATION			
1 - BHEL/ CUSTOMER		3 - SUB- VENDOR		P - PERFORM		W - WITNESS		V - VERIFICATION			

भारतीय बिजली निगम		QUALITY PLAN		CUSTOMER :		PROJECT: TITLE		SPECIFICATION NO.				
				BIDDER/ VENDOR		STANDARD QUALITY PLAN NO.- PE-QP-999-508-E002, REV.0		SPECIFICATION : TITLE				
		SHEET 3 OF 3		SYSTEM		ITEM : LEAD ACID BATTERY		DOC. NO.				
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10	11		
e)	AH & WH efficiency Test	-do-	CR	As per IS:1652	Sample Plan as per IS:8320	IS:1652	IS:1652	Inspection Report	3/2	1	-	
f)	Retention of Charge	-do-	CR	-do-	-do-	-do-	-do-	-do-	3/2	1	-	
g)	Endurance Test	-do-	CR	-do-	-do-	-do-	-do-	-do-	3/2	1	-	
3.2	Acceptance Test											
a)	Verification of Markings	Visual	MA	Visual	Sample Plan as per IS: 8320	IS:1652	IS:1652	Inspection Report	3/2	1	-	
b)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	3/2	1	-	
c)	Test for Capacity	Capacity	CR	As per IS: 1652	-do-	-do-	-do-	-do-	3/2	1	-	
d)	Test for Voltage during discharge	Voltage during discharge	CR	-do-	-do-	-do-	-do-	-do-	3/2	1	-	
4.0	ACCESSORIES	Visual & Dimension	MA	Visual	100%	Appd. Drg./Doc.	Appd. Drg./Doc.	-do-	2	1	-	
5.0	CABLE LUGS	Visual	MA	Visual	100%	Appd. DataSheet	Appd. DataSheet	-do-	2	1	-	

NOTE:- Wherever IS is mentioned equivalent IEC is also acceptable. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.

ANNEXURE-A

QUALITY PLAN

STANDARD QP NO. : PE-QP-999-508-E002, REV. 0

LIST OF TYPE TEST FOR LEAD ACID BATTERY

S No	Test	Type test description	Referred standard	Test to be specifically conducted (Yes/No)	BHEL/Customer's approval Req. on test certificate (Yes/No)
1	Type Test	• Test for Capacity & Voltage during discharge/ Discharge performance test at 27 degree C.	IS:1652	Yes	Yes
		• AH & WH efficiency Test	IS:1652	Yes	Yes
		• Retention of Charge	IS:1652	No	Yes
		• Endurance Test	IS:1652	No	Yes