

2 X 660 MW Udangudi Supercritical Thermal Power Project - Stage – 1

**TAMIL NADU GENERATION & DISTRIBUTION
CORPORATION LTD. (TANGEDCO)**

VOLUME – II

TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery

BHEL DOCUMENT NO. : PE-TS-435-508-E001
REVISION NO. : 1



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301, UTTAR PRADESH, INDIA



**TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery**

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

REVISION 1 DATE : 29.01.2020

SHEET 1 OF 1

CONTENTS

<u>S. NO.</u>	<u>CONTENTS</u>	<u>NO. OF SHEETS</u>
1)	COMPLIANCE CERTIFICATE	01
2)	SECTION – I	
a)	SPECIFIC TECHNICAL REQUIREMENTS	05
b)	DATA SHEET-A	01
c)	DATA SHEET-C	03
d)	ANNEXURE-I (APPLICABLE STANDARDS)	01
e)	ANNEXURE-II (LOAD DUTY CYCLE)	03
f)	ANNEXURE-III (SINGLE LINE DIAGRAM FOR 220V DC SYSTEM)	02
g)	ANNEXURE-IV (ACCESSORIES)	01
h)	ANNEXURE-V (DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER)	01
i)	ANNEXURE-VI (DOCUMENTS REQUIRED AFTER AWARD OF LOI)	01
j)	ANNEXURE-VII (BATTERY ROOM LAYOUT FOR UNIT-1 & 2)	01
3)	SECTION – II	
a)	STANDARD TECHNICAL REQUIREMENTS	07
b)	QUALITY PLAN	04

TOTAL NO. OF SHEETS = 34 (INCLUDING COVER/ SEPARATOR SHEETS)



**TECHNICAL SPECIFICATION
FOR 220V DC Lead Acid Battery**

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

REVISION 1

DATE: 29.01.2020

SHEET 1 of 1

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 enclosed with NIT shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE



**TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery**

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 1 OF 5

**SECTION –I
SPECIFIC TECHNICAL REQUIREMENTS**



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 2 OF 5

1.0 SCOPE OF ENQUIRY

- 1.1 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of 220V DC BATTERY.
- 1.2 Standard technical requirements of the 220V DC BATTERY are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I & Data Sheet-A.
- 1.3 The stipulations of Section-I, followed by those of Data Sheet-A, followed by Section-II shall prevail in case of any conflict between the stipulations of Section-I, Section-II & Datasheet-A.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per BOQ cum Unpriced Price Schedule enclosed with NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS:

3.1 Technical /Quality/ Inspection:

S. No.	Reference clause No. of Section II (if any)	Specific Requirement/ Change
1.0	Section-II, Clause no. 4, D): Power & Control Cables	Shall be read as: "Power & Control Cables excluding Interfacing Cables of BHMS (Refer clause no. 5 of Section-I).
2.0	Section-II, Clause no. 13.0	Refer Annexure-V of Section-I.
3.0	Section-II, Clause no. 9.2 INSPECTIONS & TESTING	Shall be read as: Following type tests reports conducted as per IS1652 / IEC 60896 shall be submitted for the battery: ☐ Verification of constructional requirements. ☐ Dimensional check ☐ Test for capacity ☐ Retention of charge test ☐ Ampere - hour and watt-hour efficiency tests. ☐ Endurance test. ☐ Short circuit current and internal resistance measurement test. ☐ Test for loss of capacity on storage ☐ Test for resistance to overcharge ☐ Test for voltages & specific gravity during discharge. ☐ Internal resistance measurement test. Following Acceptance tests shall be conducted for the battery: ☐ Visual inspection. ☐ Dimensional check ☐ Test for capacity ☐ Test for voltages & specific gravity during discharge. ☐ Internal resistance of cells.



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 3 OF 5

		Following Site tests shall be conducted for the battery (Necessary equipment, including the variable resistor, tools, tackles and instruments shall be arranged by BHEL) and same shall be part of Field Quality Plan: ☐ Check name plate details according to the specification ☐ Check for physical damage ☐ Check tightness of all bolts, clamps, joints and connecting terminals ☐ Check for electrolyte level ☐ Check for correct polarity ☐ Check charging and discharging cycle
4.0	Section-II, Clause no. 9.0): INSPECTIONS & TESTING	Additional clause: 9.3 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. Such Type tests should have been conducted within last 5 years from date of contract (i.e. 15.12.2015), from on similar or higher rating of components/ materials of battery in an independent laboratory only or witnessed by third party".

4.0 **220V DC SYSTEM**

Battery and charger will be connected to DCDB. Under normal conditions, each charger will cater continuous loads and trickle charging current of batteries. If load is high and exceeds the charger capacity, then excess load will be supplied by the battery. All the terminals and inter-cell and inter-bank connectors will be fully insulated. In case of failure of AC, battery will meet the DC load requirement. After restoration of power, the float charger will continue to supply the loads as well as trickle charge the battery.

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

- Battery Health Monitoring System shall include microprocessor based hardware and software to monitor the condition of each battery cell of 220V DC system battery banks on-line on 24x7 basis with Battery Health Monitoring System, it shall be possible to measure & analyse the individual cell and battery parameters so that any damage to battery shall be prevented by pro-active maintenance. Each Battery set shall have its own independent Battery Health Monitoring System.
- Battery Health Monitoring System shall measure and store the following parameters.
 1. Each cell voltage
 2. Battery charging and discharging current

	TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery	SPECIFICATION NO. PE-TS-435-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 1	DATE: 29.01.2020
		SHEET 4 OF 5	

3. Ambient room and Cell temperature

4. Net charge of battery.

- Further, Battery Health Monitoring System module shall have additional provision of accepting at least 6 Nos. of Digital inputs. Battery Health Monitoring System shall also be able to store these inputs status for future reference.
- Each battery shall be supplied with micro-processor based battery health monitoring system (BHMS) for individual cell healthiness monitoring which shall be located in 220V Battery room. The voltage of each cell shall be monitored to ascertain any probable failure in the cell. In case of any failure, particular cell number will be indicated locally and alarm will be generated. Provision shall be kept to transmit the group alarm signal in remote also.
- Battery Health Monitoring System shall communicate with the DDCMIS & provide alarms for abnormal condition of Cell/ Battery as finalized by owner during detailed engineering. Battery Health Monitoring System modules shall have one port suitable for connecting laptop locally & one port suitable for TCP/ IP protocol for communication to DDCMIS system. DC FAIL alarm shall be generated and given in Central Control Room buzzer (Audio Visual Fascia). The cable required for connecting the cells to Battery Health Monitoring System & Battery Health Monitoring System to DDCMIS shall also be in bidder's scope. It shall also be able to communicate with EMS.
- Technical Parameters:
 - a) Input Power Supply 230V AC (UPS) / 220V DC
 - b) Voltage Measurement Accuracy 0.5% or better
 - c) Current Measurement Accuracy 0.5% or better
 - d) Operating Temperature Range 0-50 deg C
 - e) Mounting Panel Mounting
 - f) IP Protection IP-42
- Necessary software for communication between Battery Health Monitoring System & DDCMIS as well as for analysis of stored data shall be provided by the bidder. The software for analysis shall be capable of showing graphical representation of various stored parameters & shall give some corrective suggestion based on the abnormal parameters. The software shall calculate & show battery Ah during charge/discharge cycles. Logging of cell/ battery parameters (voltage, current & temperature) & alarm conditions as well as event log of all activities affecting the battery bank shall be possible with date/ time stamp. Logged data can be exported in MS Excel format.
- Cable Requirement for BHMS:

In addition to all the accessories required for meeting the above requirement of BHMS system, Suitable length & type of Cables required to establish connection between cells to BHMS and BHMS to DDCMIS, should be considered by bidder in their scope of supply. Distance of 100 m is to be considered between Battery room and DDCMIS.

6.0 LIST OF CODES & STANDARDS (Refer Annexure-I enclosed with Section-I).



**TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery**

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 5 OF 5

- 7.0 LOAD DUTY CYCLE (Refer Annexure-II enclosed with Section-I).
- 8.0 SINGE LINE DIAGRAM FOR 220V DC SYSTEM (Refer Annexure-III enclosed with Section-I).
- 9.0 LIST OF ACESSORIES (Refer Annexure-IV enclosed with Section-I).
- 10.0 DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER (Refer Annexure-V enclosed with Section-I).
- 11.0 DOCUMENTS REQUIRED AFTER AWARD OF LOI (Refer Annexure-VI enclosed with Section-I).



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

DATA SHEET-A

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1 DATE: 29.01.2020

SHEET 1 OF 1

1.	Rated voltage (V)	:	220V DC
2.	Type of Battery	:	High Discharge Lead-Acid Plante F-Type, HDP
3.	Conforming to	:	IEEE/ IS standards
4.	DC system Fault level & duration	:	25KA for 1 Sec
5.	Material of Battery Rack	:	Mild Steel rack coated with three coats of anti-acid paint of approved shade
6.	Design Ambient Temperature	:	50 Deg. C
7.	Minimum Electrolyte Temperature to be considered for Battery Sizing	:	17 Deg. C
8.	No. of cells	:	108
9.	End cell voltage	:	1.85V/cell
10.	Nominal Float voltage (V)	:	2.25 V/cell
11.	Boost voltage (Maximum) (V)	:	Bidder to furnish the detail along with offer
12.	AH Capacity of Battery	:	Bidder to furnish quoted AH capacity and battery sizing as per LOAD DUTY CYCLE (Annexure-II)
13.	Arrangement of batteries on racks	:	Single tier for batteries having cell weight 50kg or more
14.	Cable size to be terminated at Battery end	:	1) Main plant: 2 RUNS 1C x 400 sq.mm (Cu) FS CABLE/ pole. 2) Offsite areas (WT/ RO & SEA WATER INTAKE): 2C x 50 sq.mm (Cu) FS CABLE.
15.	Tapping to be provided in battery	:	No
16.	Tapping to be provided at which cell (if Tapping is applicable)	:	NA
17.	Type of lug	:	Copper tubular lugs.
18.	Recommended boost charging rate	:	Bidder to furnish the detail along with offer
19.	Recommended trickle charging rate	:	Bidder to furnish the detail along with offer

Notes:

- Suitable number of copper lugs for cable termination at battery terminals shall be provided by bidder as per cable size informed by BHEL above.
- Bidders stand guarantee that the rating offered at S. No. 12 shall meet 'Load Duty Cycle' as per Annexure-II of specification.
- Refer Annexure-III (Single Line Diagram of 220V DC system) for connection arrangement of Battery, charger and DCDB.
- Suitable number of inert-cell, inter-row and inter-bank connectors to be provided by bidder.



**TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery**

DATA SHEET-C

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1 | DATE: 29.01.2020

SHEET 1 OF 3

DATASHEET-C



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

DATA SHEET-C

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 2 OF 3

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	
16.0	Allowable ripple content acceptable to battery (r.m.s)	%	



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

DATA SHEET-C

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1 DATE: 29.01.2020

SHEET 3 OF 3

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)



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 1 OF 1

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.



**TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery**

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

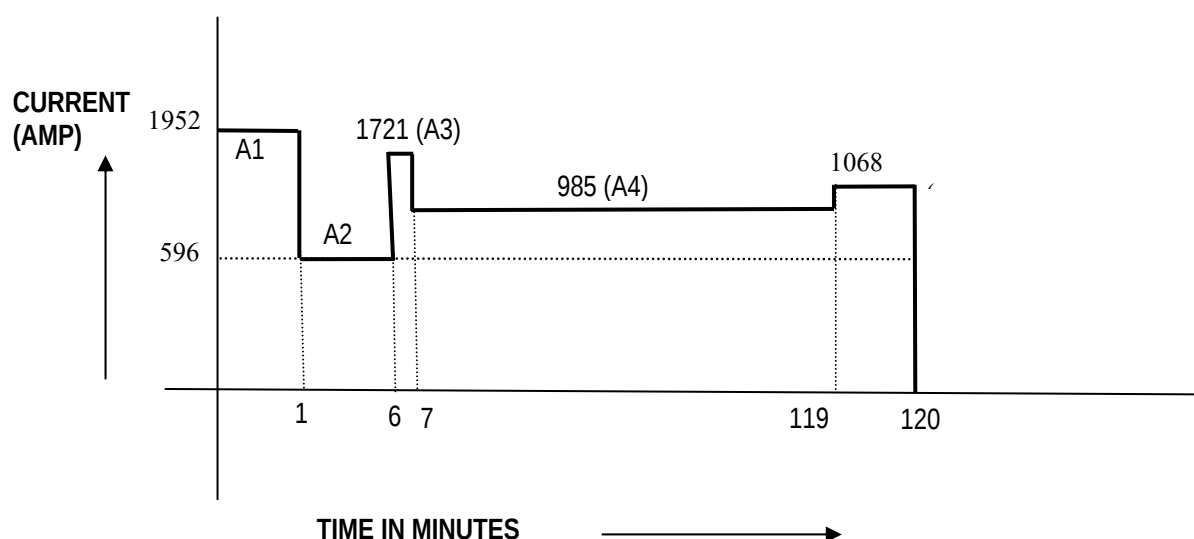
REVISION 1

DATE: 29.01.2020

SHEET 1 OF 3

ANNEXURE-II

**LOAD DUTY CYCLE
LOAD DUTY CYCLE OF AREA 1 (MAIN PLANT & ASSOCIATED STATION
LOADS)**



Duration	0-1 min	1-06 min	06-07 min	07-119 min	119-120 min
Current	1952	596	1721	985	1068

FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1.0 for Lead-Acid
2. MIN.ELECTROLYTIC TEMP. : 17 °C
3. END CELL VOLTAGE : 1.85V/cell
4. DESIGN MARGIN : 1.1
5. TEMPERATURE CORRECTION FACTOR : IEEE 485 for Lead Acid shall be the principle for sizing the battery including temperature correction factor.

Note:

1. Supporting Calculation for temp correction factor as per IEEE-485 shall be furnished for batteries which are not designed at 25 °C.
2. Due to maximum AH capacity limitation, bidder can offer battery with parallel battery string of 108 cells. However, because of layout constraint, bidder can offer maximum of 2 parallel battery string.



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 2 OF 3

LOAD DUTY CYCLE OF AREA 2 (FOR WATER TREATMENT & RO PLANT LOADS)



Duration	0-1 min	1-119 min	119-120 min
Current	45	9	28

FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1.0 for Lead-Acid
2. MIN.ELECTROLYTIC TEMP. : 17 °C
3. END CELL VOLTAGE : 1.85V/cell
4. DESIGN MARGIN : 1.1
5. TEMPERATURE CORRECTION FACTOR : IEEE 485 for Lead Acid shall be the principle for sizing the battery including temperature correction factor.

Note:

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 Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 29.01.2020

SHEET 3 OF 3

LOAD DUTY CYCLE OF AREA 3 (FOR SEA WATER INTAKE LOADS)



Duration	0-1 min	1-119 min	119-120 min
Current	34	8	21

FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1.0 for Lead-Acid
2. MIN.ELECTROLYTIC TEMP. : 17 °C
3. END CELL VOLTAGE : 1.85V/cell
4. DESIGN MARGIN : 1.1
5. TEMPERATURE CORRECTION FACTOR : IEEE 485 for Lead Acid shall be the principle for sizing the battery including temperature correction factor.

Note:

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 Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

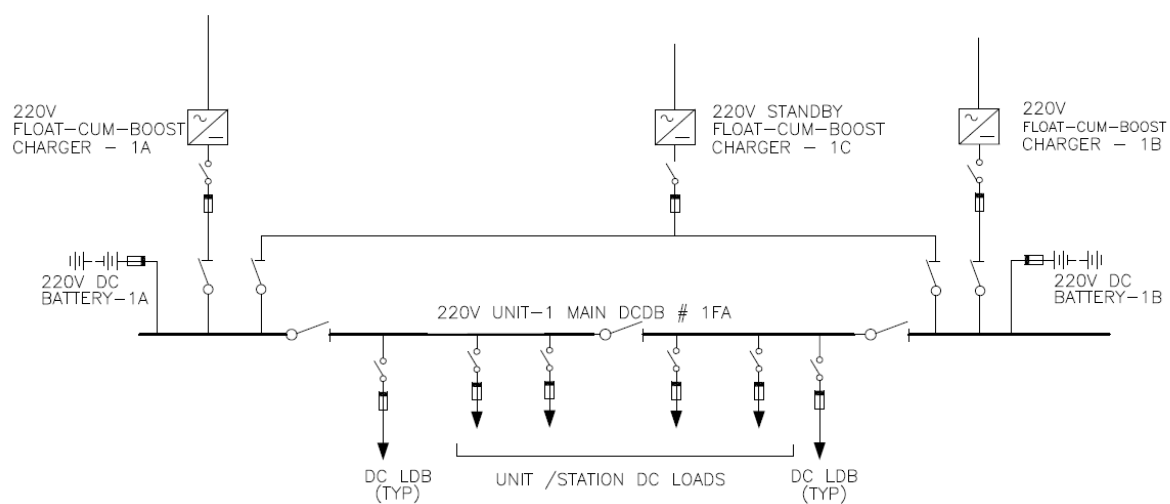
REVISION 1

DATE: 10.01.2020

SHEET 1 OF 2

ANNEXURE-III

SINGE LINE DIAGRAM FOR 220 V DC SYSTEM OF AREA-1 (FOR MAIN PLANT & ASSOCIATED STATION LOADS)





TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

SPECIFICATION NO. PE-TS-435-508-E001

VOLUME II

SECTION I

REVISION 1

DATE: 10.01.2020

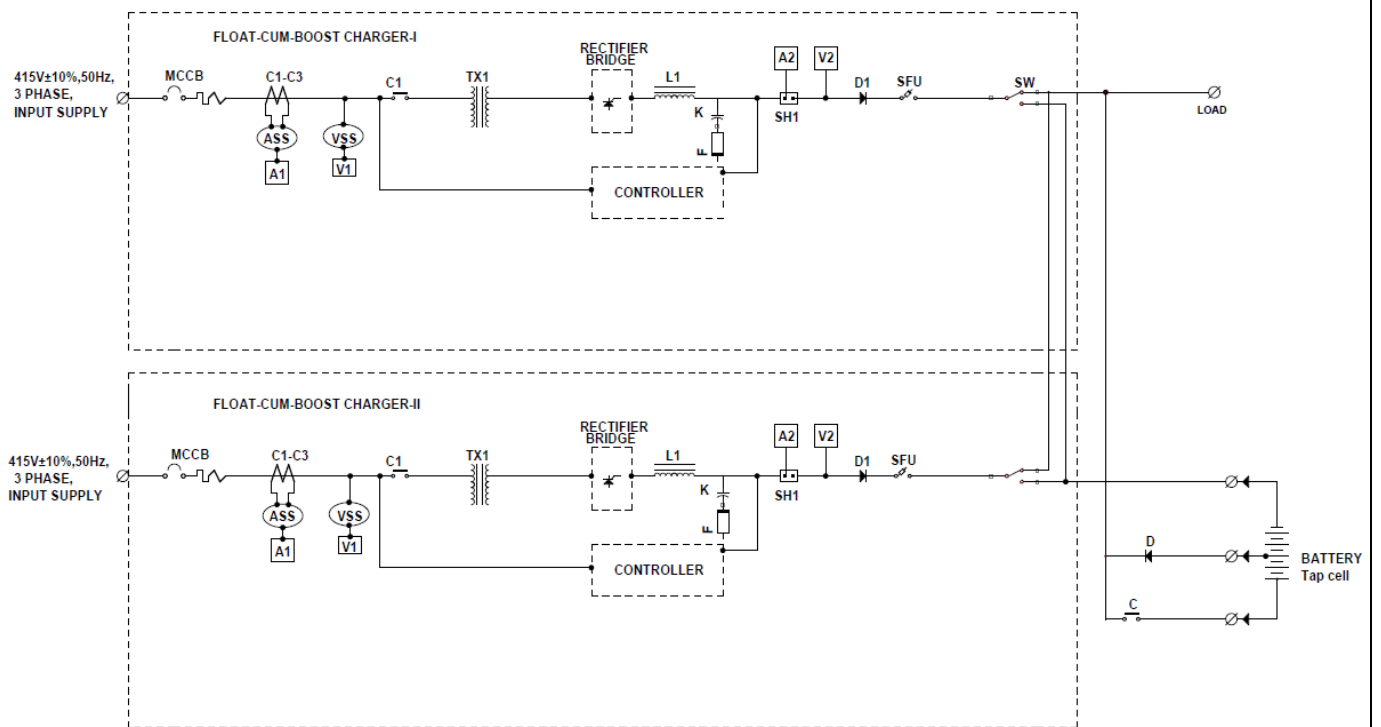
SHEET 2 OF 2

SINGLE LINE DIAGRAM FOR 220 V DC SYSTEM OF:

AREA 2 (FOR WATER TREATMENT & RO PLANT LOADS)

&

AREA 3 (FOR SEA WATER INTAKE SYSTEM LOADS)



LEGENDS

	SELECTOR SWITCH FOR METER
	SELECTOR SWITCH
	POTENTIOMETER
	DC CAPACITOR
	CHOKE
	THYRISTOR (SCR)
	FUSE
	THERMO-MEGNATIC MCCB
	DC CURRENT SENSING SHUNT
	BATTERY
	INTERCONNECTION CABLE
	CABLE TERMINAL
	FUSE SWITCH
	CONTACTOR
	CHARGER FAIL RELAY (BOOST)

	TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery	SPECIFICATION NO. PE-TS-435-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 1	DATE: 29.01.2020
		SHEET 1 OF 1	

ANNEXURE-IV

ACCESSORIES

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

1.1 Each battery bank of 108 cells is furnished with following items.

Sl. No.	Fittings
1	First charge of electrolyte plus 10% extra
2	Mild Steel racks with 3 coats of anti-acid paint
3	Cell inter-connectors with 5% extra and one extra end take-off Interbank, Inter-row connectors with 5% extra (Insulated), Insulators (If applicable).
4	Cell numbering tags with fixing arrangement
5	Anti-splash type vent plug

1.2 Following accessories shall be provided for each AREA 220V DC System

Sl. No.	Accessories	QTY
1	Inter-connector bolt wrench	1 No.
2	Electronic Syringe type Hydrometer with temperature measurement and with built in memory.	1 No.
3	Specific gravity correction chart	1 No.
4	Acid resistant Jug	1 No.
5	Thermometer with plug & cap, specific gravity correction scale	1 No.
6	Cell testing voltmeter (digital) with leads (3-0-3V) with built in memory	1 No.
7	Pocket thermometer	1 No.
8	Electrolyte resisting funnels	2 Nos.
9	Electrolyte resisting jug of adequate capacity	1 No.
10	Rubber apron	1 No.
11	Pair of Rubber hand gloves	1 Set
12	Cell lifting straps	1 Set
13	Insulated Spanner for cells	1 No.
14	First aid box	1 No.
15	Goggles (Industrial)	2 Nos.
16	No smoking Notice	2 Nos.
17	Wall mounting holders for hydrometer and thermometer	2 Nos.
18	Wall mounted teak wood/Acid resistant rubber insulated Steel rack for items at Sl. no. 4, 6, 8, 10, 11 & 13.	1 No.

	TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery	SPECIFICATION NO. PE-TS-435-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 1	DATE: 10.01.2020
		SHEET 1 OF 1	

ANNEXURE-V

DOCUMENTS REQUIRED ALONG WITH THE TECHNICAL OFFER

- i. Battery sizing calculation with respect to load duty cycle (Annexure-II) enclosed with Section-I to be provided along with supporting documents (capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue) for considered factors.
- ii. Unpriced Price Schedule as enclosed with NIT with "Quoted" word against items with bidder's signature and company stamp.
- iii. A copy of the sheet "Compliance certificate" with bidder's signature and company stamp.
- iv. A copy of sheet "Data Sheet-A" with required information and bidder's signature and company stamp.

	TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery	SPECIFICATION NO. PE-TS-435-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 1	DATE: 29.01.2020
		SHEET 1 OF 2	

ANNEXURE-VI

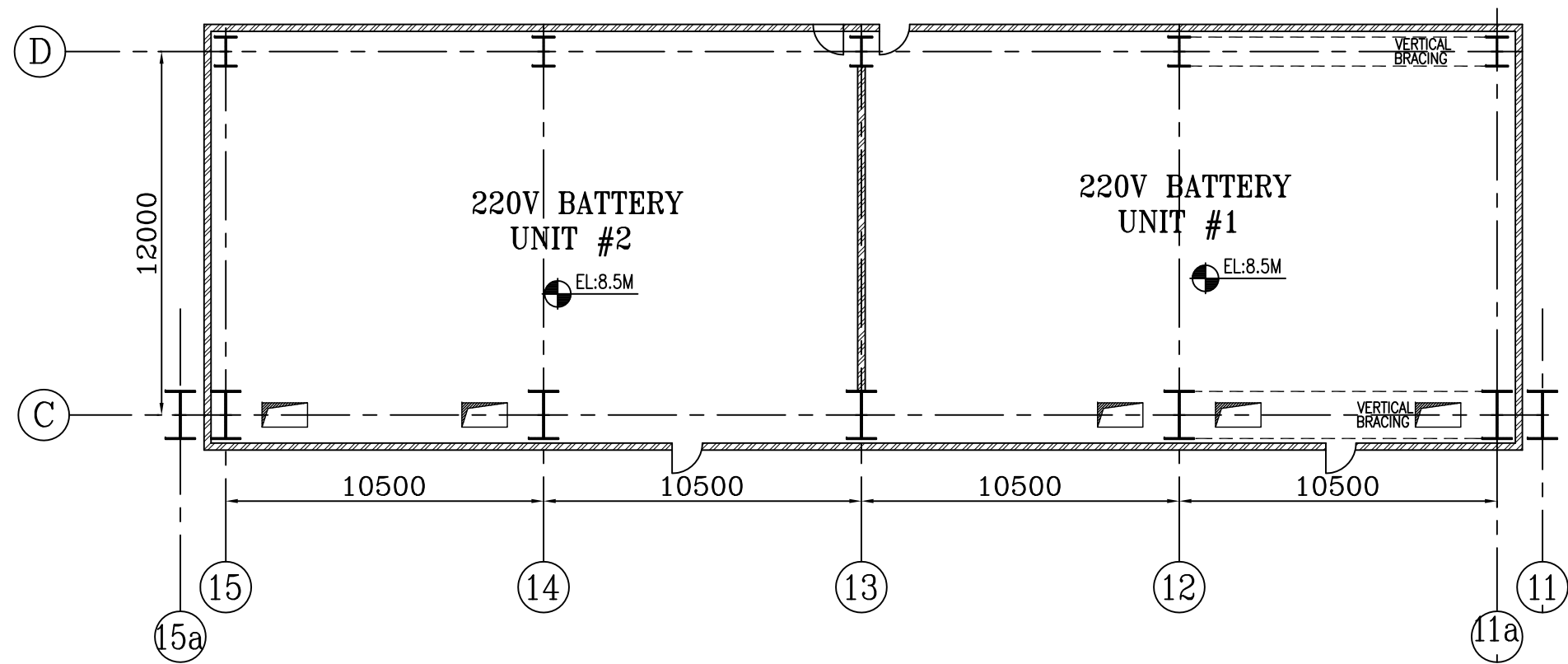
DOCUMENTS REQUIRED AFTER AWARD OF LOI

S. NO	DOCUMENT TITLE	DWG. / DOCUMENT No.	DOCUMENT TYPE (PRIMARY/ SECONDARY)
1	Data Sheet for battery	PE-V0-435-508-E201	<u>Primary</u>
2	General Arrangement Drawing for battery	PE-V0-435-508-E202	<u>Primary</u>
3	Battery sizing calculation (Including battery catalogues, curves etc.)	PE-V0-435-508-E203	<u>Primary</u>
4	Bill of Material for battery	PE-V0-435-508-E204	<u>Primary</u>
5	Quality Plan for battery	PE-V0-435-508-E902	<u>Primary</u>
6	Field Quality Plan for battery	PE-V0-435-508-E903	Secondary
7	List of E&C Spares for battery	PE-V0-435-508-E206	Secondary
8	List of O&M Spares for battery (If applicable)	PE-V0-435-508-E207	Secondary
9	List of Mandatory Spares for battery	PE-V0-435-508-E208	<u>Primary</u>
10	O&M Manual for battery	PE-V0-435-508-E209	Secondary
11	Fault calculation & Connector sizing calculation	PE-V0-435-508-E210	<u>Primary</u>
12	Type test reports for the battery	PE-V0-435-508-E211	Secondary
13	Cable Termination arrangement for battery terminal	PE-V0-435-508-E212	Secondary
14	Loose items to be shipped with battery	PE-V0-435-508-E213	Secondary
15	Battery room layout	PE-V0-435-508-E214	<u>Primary</u>
16	Power Circuit Diagram of BHMS	PE-V0-435-508-E215	<u>Primary</u>
17	GA of BHMS	PE-V0-435-508-E216	<u>Primary</u>
18	QAP of BHMS	PE-V0-435-508-E217	<u>Primary</u>

	TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery	SPECIFICATION NO. PE-TS-435-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 1	DATE: 29.01.2020
		SHEET 2 OF 2	

Notes:

- 1) **Primary documents submission by vendor:** R-0 within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL.
- 2) **Secondary documents submission by vendor:** R-0 within 30 days from PO & subsequent revisions within 10 days of comments received from BHEL.





TITLE :
TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 1 of 7

SECTION - II

STANDARD TECHNICAL REQUIREMENTS



TITLE :
**TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY**

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 2 of 7

1.0 TECHNICAL REQUIREMENTS

This specification covers the design, materials, constructional features, manufacture assembly, testing, packing and dispatch of 220V DC Lead-Acid Battery complete with all accessories.

In this specification, as erection and commissioning is not included in vendor's scope, Vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.

It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee. This enquiry covers the supply of 220V DC LEAD ACID BATTERY conforming to this specification.

2.0 CODES AND STANDARDS

Unless otherwise specified, the latest revisions of codes/standards as specified under Table-1 enclosed are applicable and shall referred to.

3.0 EQUIPMENT AND SERVICES TO BE PROVIDED BY THE BIDDER

The bidder shall supply the equipment and provide the services in accordance with the various sections of this specification and as per BOQ cum unpriced Price Schedule (Annexure-A) enclosed with NIT.

4.0 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. 220V DCDB
- d. Power and control cables
- e. Erection of the equipment
- f. Battery charger, battery fuse box and discharge resistor

5.0 DESCRIPTION OF EQUIPMENT

5.1 BATTERY

All batteries shall be stationary storage Lead-Acid *high discharge* type conforming to IS-1652/IEC60896-11. The batteries shall meet the duty cycle requirements under all site and operating conditions as specified in data sheet 'A'. IEEE 485 shall be the principle for sizing the battery including temperature correction factor.

5.2 CONTAINER

Containers shall be made of transparent polymeric material, robust, heat resistant, leak proof, non-absorbent, acid/alkali resistant, non-bulging type and free from flaws such as wrinkles, cracks, blisters, pinholes etc. The marking for the electrolyte level shall be for upper & lower limits. Container shall be closed/sealed lid type. Open type cells are not



TITLE :
**TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY**

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 3 of 7

acceptable. Lid and sealing compound shall be non-cracking type.

5.3 PLATES

The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load.

The separators shall maintain the electrical insulation between the plates and shall permit free flow of electrolyte. Proper arrangement to keep end plates in position shall be provided. Separators shall be suitable for continuous immersion in the electrolyte without distortion.

The positive and negative terminal posts shall be clearly marked

5.4 CONNECTIONS

Lead coated copper connectors (or a better product) shall be used for connecting up adjacent cells and rows. Bolts, nuts, clamps, washers etc as applicable in shall be provided. All the terminals and inter-cell connectors shall be fully insulated or shrouded. End take of connections from positive and negative poles of batteries shall be done through single core cables. Necessary support equipments and copper lugs for termination of these cables on batteries shall also be supplied by the contractor. Suitable numbers of inter rack connectors shall be supplied by the bidder to suit the battery room layout during detailed engineering.

All connectors and lugs shall be capable of continuously carrying the discharge current of the respective Batteries and through fault short circuit current which the battery can produce and withstand for the period declared. Successful bidder shall furnish necessary sizing calculations to prove compliance to the same.

5.5 VENT PLUG

Vent plug shall be provided in each cell. It shall be anti-splash type and having more than one exit hole to allow the gases to escape freely but prevent the acid spray from the battery. The design shall be such that the water loss due to evaporation is kept to minimum. In addition the ventilator shall be easily removed from topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte sample.

5.6 SEDIMENT SPACE

Sufficient sediment space shall be provided beneath the plates to accommodate any plate deposit, which accumulates at the bottom of the cell over a reasonable life of battery without short-circuiting the plates.

5.7 The following information shall be marked on out side of each cell.

- Name, type and trade mark of manufacturer
- Country and year of manufacture
- Capacity at 10 hr discharge rate .
- Upper and lower electrolyte level
- Serial Number



TITLE :
TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY

SPECIFICATION NO.
PE-SS-999-508-E001
VOLUME NO. : II
SECTION : II
REV NO. : 01 DATE : 30/05/2016
SHEET : 4 of 7

5.8 ELECTROLYTE

The electrolyte comprise of battery grade sulphuric acid conforming to IS: 266 and water conforming to IS: 1069. The cells shall be shipped dry, uncharged with electrolyte supplied in non-returnable good quality polyethylene or other suitable containers. Ten percent extra electrolyte shall be supplied to account for any spillage during transit.

5.9 BATTERY RACKS

- a. Wooden/FRP/Steel battery racks to be supplied as specified in datasheet-A. Wooden rack shall be made of best quality treated wood
- b. Racks shall be painted with at least two (2) coats of acid resistant/ anti corrosive paint.
- c. Racks shall be free standing type mounted on porcelain/hard rubber/ PVC Pad insulators as applicable.
- d. Numbering tags for each cell shall be attached on to the battery racks.
- e. Battery racks and other supporting/interconnecting accessories shall be as per layout arrangement to be approved by purchaser during contract engineering stage.
- f. The bottom tier of the stand shall not be less than 150 mm above the floor.
- g. Wherever racks are transported in dismantled conditions, match markings shall be provided to facilitate easy assembly.

6.0 Following minimum information shall be given on the instruction cards:

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

7.0 LIFE

The guaranteed life of battery when operating under the specified conditions shall be furnished.

8.0 ACCESSORIES

Battery accessories shall be provided as specified in BOQ cum unpriced Price Schedule (Annexure-A) enclosed with NIT.

9.0 INSPECTION AND TESTING

Offered equipment shall be of type tested design. The bidder shall confirm compliance to quality plan enclosed with the specification, which is subject to customer/ BHEL approval and the inspection shall be carried out based on this approved Quality Plan (QP no. PE-QP-999-508-E002).

9.1 Quality Assurance



TITLE :
**TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY**

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 5 of 7

All materials components and equipment's covered under this specification shall be procured, manufactured, inspected and tested as per the BHEL standards, quality plan number PE-QP-999-S08-E002 enclosed with this specification and which shall be complied with.

All acceptance and routine tests as per IS-1652 shall be carried out by the manufacturer. Charges for all routine and acceptance tests for all the materials shall be deemed to be included in the bid price.

9.2 Type, Routine and Acceptance Tests

Type, Routine and Acceptance tests to be performed as per Quality Plan(QP no. PE-QP-999-508-E002) enclosed with this specification.

10.0 PERFORMANCE GUARANTEE

Bidders shall guarantee that battery offered shall meet the duty cycle requirements 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.

11.0 INSTRUCTION MANUALS

11.1 Instruction manuals for the installation, operation and maintenance of battery to be supplied shall be furnished. The installation and maintenance manual 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.
- 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) Type and routine test certificates.
- m) Catalogues, literatures and drawings.

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



TITLE :
**TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY**

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 6 of 7

commissioning, post commissioning etc.

13.0 By all Bidders as technical offer:

- i. Battery sizing calculation with respect to load duty cycle enclosed with Section-I to be provided along with supporting documents (capability / **discharge curve**, temperature correction factor, float charging factor & published technical catalogue) for considered factors.
- ii. Unpriced Price Schedule (Annexure-A) as enclosed with NIT with “Quoted” word against items with bidder’s signature and company stamp.
- iii. A copy of the sheet “Compliance certificate” with bidder’s signature and company stamp.
- iv. A copy of sheet “Data Sheet-A” with required information and bidder’s signature and company stamp.



TITLE :
**TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY**

SPECIFICATION NO.
PE-SS-999-508-E001

VOLUME NO. : **II**

SECTION : **II**

REV NO. : **01** DATE : 30/05/2016

SHEET : 7 of 7

LIST OF CODES AND STANDARDS FOR LEAD ACID BATTERY

- | | |
|---|-------------|
| 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. STATIONARY LEAD-ACID BATTERIES – VENTED TYPES – GENERAL REQUIREMENTS & METHODS OF TESTS | IEC60896-11 |
| 12. 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.

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN				SPEC NO.: -PE-TS-XXX-508-E001		DATE:-			
				CUSTOMER						QP NO.: -PE-QP-999-508-E002, REV.01		DATE:- 29/01/2020	
				PROJECT						P.O NO.:-		DATE:-	
				ITEM:- DC LEAD ACID BATTERY		SYSTEM:- DC SYSTEM		SECTION:-		SHEET 1 OF 3			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY	REMARKS	
1	2	3	4	5	6		7	8	9	D *	10	11	
					M	C/N					M C N		
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	(Pure Lead for Pos. plate, Lead Alloy for Neg. plate & Sulphuric acid)	Chemical	MA	Chemical Analysis	Random Sample	Random Sample	IS:1652, IS:266, IS:1069 & MFR's Std.	IS:1652, IS:266, IS:1069 & MFR's Std.	Test Cert.		P V V		
1.2	SEPARATOR												
a)	Visual	Visual	MA	Visual	Random Sample	Random Sample	IS:1652 & MFR's Std.	IS:1652 & MFR's Std.	Test Cert.		P V V		
b)	Physical	Physical	MA	Physical	-do-	-do-	-do-	-do-	-do-		P V V		
c)	Chemical	Chemical	MA	Chemical	-do-	-do-	(For Synthetic IS : 6071)	(For Synthetic IS : 6071)	-do-		P V V		
d)	Electrical Resistance Test	Electrical	MA	Electrical	-do-	-do-	-do-	-do-	-do-		P V V		
e)	Acceptance test Dimension, Volume Porosity, Wettability of separator	Test	MA	Test	-do-	-do-	-do-	-do-	-do-		P V V		
1.3	TERMINAL POST												
a)	Dimensional Conformance	Dimension	MA	Measurement	Random Sample	Random Sample	IS:1652, IS:8320 & MFR's Std.	IS:1652, IS:8320 & MFR's Std.	Test Cert.		P V V		
b)	Material Conformance	Chemical	CR	Chemical	-do-	-do-	-do-	-do-	-do-		P V V		
c)	Thread size depth & chamfer	Physical	MA	Measurement	-do-	-do-	-do-	-do-	-do-		P V V		
d)	Surface finish & defects	Visual	MA	Visual	100%	100%	-do-	-do-	-do-		P V V		
e)	Plating Quality	Thickness	CR	Measurement	Random Sample	Random Sample	-do-	-do-	-do-		P V V		
1.4	CONNECTOR												
a)	Dimension	Dimension	MA	Measurement	Random Sample	Random Sample	IS:1652, IS:6848 & Appd. Drg./Doc.	IS:1652, IS:6848 & Appd. Drg./Doc.	Test Cert.		P V V		
b)	Thickness of lead coating	Thickness	CR	Measurement	-do-	-do-	-do-	-do-	-do-		P V V		
1.5	VENT CAP												
a)	Dimensional Conformance	Dimension	MA	Measurement	Random Sample	Random Sample	IS:1652 & Appd. Drg./Doc. Also Refer Remarks#	IS:1652 & Appd. Drg./Doc. Also Refer Remarks#	Test Cert.		P V V	# Vent cap shall be easily removed from topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into vent to take electrolyte sample.	

BHEL				BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No.		Seal	
Prepared By	Sign & Date	Name	Prepared By	Sign & Date	Name	Reviewed By	Sign & Date	Name	Seal
Checked By			Checked By			Checked By			

20/1/2020

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN			SPEC NO.: PE-TS-XXX-508-E001		DATE:-			
				CUSTOMER			QP NO.: PE-QP-999-508-E002, REV.01		DATE:- 29/01/2020			
				PROJECT			P.O NO.:-		DATE:-			
				ITEM:- LEAD ACID BATTERY			SYSTEM:- DC SYSTEM		SECTION:-		SHEET 2 OF 3	
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	D *	10	11	
					M	C/N						
										M	C	N
1.6	CONTAINER											
a)	Verification Constructional requirement	Visual	MA	Visual	Sample Plan as per IS:1146	Sample Plan as per IS:1146	IS:1652, IS:1146, IS:8320	IS:1652, IS:1146, IS:8320	Test Cert.	P	V	V
b)	Verification of Markings	Visual	MA	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
c)	High Voltage Test	Electrical	MA	Electrical	-do-	-do-	-do-	-do-	-do-	P	V	V
d)	Drops Ball Test	Mechanical	MA	Mechanical	-do-	-do-	-do-	-do-	-do-	P	V	V
e)	Plastic Yield Test	-do-	MA	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
f)	Acid Resistance Test	Chemical	MA	Chemical	-do-	-do-	-do-	-do-	-do-	P	V	V
g)	Hydraulic thrust endurance test	Physical	MA	Physical	-do-	-do-	-do-	-do-	-do-	P	V	V
2.0	FINISHED BATTERY	Routine Test	CR	Electrical & Measurement	100%	100%	IS:1652 & IS:8320	IS:1652 & IS:8320	Test Cert.	P	V	V
3.0	FINAL INSPECTION											
3.1	Type Test ##											
a)	Verification Constructional requirement	Visual	MA	Visual	Sample Plan as per IS: 8320	Sample Plan as per IS: 8320	IS:1652	IS:1652	Inspection Report	P	W	W
b)	Verification of Markings	Visual	MA	Visual	-do-	-do-	-do-	-do-	-do-	P	W	W
c)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	-do-	P	W	W
d)	Test for Capacity & Voltage during discharge	Test	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	P	V	V
e)	AH & WH efficiency Test	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
f)	Test for loss of capacity on storage	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
g)	Endurance Test	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
h)	Loss of water test	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
i)	Test for suitability for Floating Battery Operation	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V
j)	Internal Resistance and Short Circuit Test	-do-	CR	-do-	-do-	-do-	-do-	-do-	-do-	P	V	V

BHEL				BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No.		Sign & Date	
Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Seal	
Prepared By	KANHASIA X.R.	Prepared By	KUNAL GANDHI	Seal		Reviewed By			
Checked By		Checked By	R. K. Jain			Checked By			

30/1/2020

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		QUALITY PLAN				SPEC NO.: PE-TS-XXX-508-E001		DATE:-					
				CUSTOMER				QP NO.: PE-QP-999-508-E002, REV.01		DATE:- 29/01/2020					
				PROJECT				P.O NO.:-		DATE:-					
				ITEM:- LEAD ACID BATTERY				SYSTEM:- DC SYSTEM		SECTION:-		SHEET 3 OF 3			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS	
1	2	3	4	5	6		7	8	9	D *	10			11	
					M	C/N						M	C	N	
3.2	Acceptance Test														
a)	Verification of Markings	Visual	MA	Visual	Sample Plan as per IS: 8320	Sample Plan as per IS: 8320	IS:1652	IS:1652	Inspection Report			P	W	W	
b)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	-do-			P	W	W	
c)	Test for Capacity	Capacity	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-			P	W	W	
d)	Test for Voltage during discharge	Voltage during discharge	CR	-do-	-do-	-do-	-do-	-do-	-do-			P	W	W	
4.0	ACCESSORIES	Visual & Dimension	MA	Visual & Dimension	100%	100%	Appd. Drg./Doc.	Appd. Drg./Doc.	-do-			P	W	-	
5.0	CABLE LUGS	Visual	MA	Visual	100%	100%	Appd. Drg./Doc.	Appd. Drg./Doc.	-do-			P	W	-	

- NOTES:-**
- Wherever IS standard is mentioned, equivalent IEC/International standard is also acceptable as per applicability of test. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.
 - BHEL Reserves the right for conducting repeat test, if required.
 - Photographs of complete Battery Package items after packaging to be sent to BHEL-Purchase Group for review before issuing MDCC.

LEGEND :-

- * RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
- ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER
- P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
- MA: MAJOR, MI: MINOR, CR: CRITICAL

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No.			
Prepared By	Sign & Date	Name	Prepared By	Sign & Date	Name	Seal		Reviewed By	Sign & Date	Name	Seal
Checked By			Checked By					Checked By			

30/1/2020

ANNEXURE-A

QUALITY PLAN

STANDARD QP NO. : PE-QP-999-508-E002, REV. 01

LIST OF TYPE TEST FOR LEAD ACID BATTERY

S No	Test	Type test description	Referred standard	Type Test to be specifically conducted (Yes/No)	BHEL/Customer's approval/Review Req. on test certificate (Yes/No)
1	Type Test	• Test for Capacity & Voltage during discharge	IS:1652	No	Yes
		• AH & WH efficiency Test	IS:1652	No	Yes
		• Test for loss of capacity on storage (Retention of Charge)	IS:1652	No	Yes
		• Endurance Test	IS:1652	No	Yes
		• Loss of water test	IS:1652	No	Yes
		• Test for suitability for floating batteryoperation	IS:1652	No	Yes
		• Internal resistance and short circuit test	IS:1652	No	Yes