

2 X 500 MW TUTICORIN FGD
NLC TAMILNADU POWER LIMITED (NTPL)

VOLUME – II

TECHNICAL SPECIFICATION FOR
220V DC Lead Acid Battery

BHEL DOCUMENT NO. : PE-TS-483-508-E001
REVISION NO. : 0



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

367021/2021/PS-PEM-EL



TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

2 X 500MW NTPL TUTICORIN FGD

SPECIFICATION NO. PE-TS-483-508-E001

VOLUME II

REVISION 0 | DATE : 14.07.2021

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

BIDDER'S STAMP & SIGNATURE

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SECTION –I
SPECIFIC TECHNICAL REQUIREMENTS

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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. 5.2	Shall be read as: (a) Cell container shall be made of heat & electrolyte resistant, shock absorbing, tough translucent, polypropylene or equivalent plastic material having chemical and electrochemical compatibility. The cell shall be mechanically sturdy. (b) The cell shall be provided with visual electrolyte level checks for ease in of maintenance. Electrolyte level markings shall be for upper and lower limits. (c) For lead acid battery the pole sealing arrangement should be such that no acid particle gets entrapped due to acid creep as a result of capillary action and it should be possible to remove and re-fix the sealing to carry out the maintenance.
2.0	Section-II, Clause no. 5.4: "Bolts, nuts, clamps, washers etc as applicable in shall be provided."	The sentence shall be read as "The cell terminals posts shall be provided with connector bolts and nuts, made of copper/ brass effectively coated with lead to prevent corrosion."
3.0	Section-II, Clause no. 5.9. (a) & (b)	Shall be read as: (a) Battery racks for supporting battery cells shall be constructed of best quality teakwood, forming a rigid

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		structure. (b) Racks shall be painted with at least three (3) coats of electrolyte-resistant paint of approved shade.
4.0	Section-II, Clause no. 13.0	Refer Annexure-IV of Section-I.
5.0	Section-II, Clause no. 9.2 INSPECTIONS & TESTING	Shall be read as: (a) The type, routine and acceptance test on battery will be conducted as per IS-1652. (b) Following type tests on two cells of the battery to be conducted: (i) Discharge performance test at low temperature (Capacity test for voltage on battery during discharge). (ii) Ampere hour & watt hour efficiency test (iii) Endurance test. The charges of the above type test shall be given separately in price schedule as indicated in BOQ-CUM-PRICE SCHEDULE Annexure-I at Sr. No. E.1, 2 & 3. (c) For balance type test as per ANNEXURE-A OF QAP, vendor shall submit type test reports for the type tests as per relevant standards on identical equipment in type and rating. 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. Such Type tests should have been conducted within last 5 years from date of contract i.e. 18-04-2020 from on similar or higher rating of components/ materials of battery in an independent laboratory only or witnessed by third party. (d) The Capacity test and test for voltage on battery during discharge shall also be carried out at/by site on completion of E&C and immediately prior to putting battery in service, under the supervision of vendor. Necessary testing equipment required for testing at site shall be arranged by BHEL. The charges for supervision of this test shall be given separately in price schedule as indicated in BOQ-CUM PRICE SCHEDULE Annexure-I at Sr. No. C.3.

4.0 220V DC SYSTEM

220V DC system will be an ungrounded system comprising of 2x100% batteries with 2x100% charger (1 nos. Float charger (FC) & 1 nos, Float Cum Boost Charger

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(FCBC) for each battery) and 1x100% sectionalised DCDB common for both unit FGD 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 LOAD DUTY CYCLE (Refer Annexure-I enclosed with Section-I).
- 6.0 SINGE LINE DIAGRAM FOR 220V DC SYSTEM (Refer Annexure-II enclosed with Section-I).
- 7.0 LIST OF ACESSORIES (Refer Annexure-III enclosed with Section-I).
- 8.0 DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER (Refer Annexure-IV enclosed with Section-I).
- 9.0 Documents required after award of LOI & Document/ drawing submission/ re-submission schedule shall be as per NIT.
- 10.0 Supplier to also give the following undertaking in the BOM:
"The BoM provided herewith completes the scope (in content and intent) of material supply under PO No. -----, dated -----.
Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

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TECHNICAL SPECIFICATION FOR 220V DC Lead Acid Battery

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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	:	Seasoned Teak Wood battery coated with three (3) coats of electrolyte resistant paint of approved shade
6.	Design Ambient Temperature	:	50 Deg. C
7.	Minimum Electrolyte Temperature to be considered for Battery Sizing	:	5 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-I)
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	:	2 RUNS 1C x 400 sq.mm (Cu) XLPE CABLE/ pole (TENTATIVE SIZE-to be confirmed during detailed engg.)
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:

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

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DATASHEET-C

DC LEAD ACID BATTERY

A. BATTERY

1.0 General

1.1 Make :

1.2 Cat No. :

1.3 Type :

1.4 Reference Standard :

2.0 Rating

2.1 Rated Voltage Volt :

2.2 10-hour rating at 27 °C
to 1.85 Volt per cell AH :

2.3 1-hour discharge rate
to 1.75 Volt per cell Amp :

2.4 1-minute discharge rate
to 1.75 Volt per cell Amp :

3.0 Performance

3.1 Does the battery meet the
Required duty cycle curve? Yes/No :

3.2 Cell voltage characteristics
during duty cycle furnished? Yes/No :

3.3 Minimum cell voltage
during duty cycle Volt :

3.4 AH efficiency at 10-hour discharge rate % :

3.5 Expected life of Battery Hr. :

3.6 Design margin considered Yes/No :

3.7 Ageing compensation
Factor considered Yes/No :

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DATASHEET-C

DC LEAD ACID BATTERY

- 4.0 Battery Characteristics
- 4.1 Recommended charging rate for Volt/Cell Amp :
- a) Float charging :
- b) Equalising Charge :
- c) Boost charging in 10 hrs.
- i) Start :
- ii) Finish :
- 4.2 Recommend specific gravity at 27 °C
- a) For first filling :
- b) At full charge :
- c) At end of 10-hour discharge :
- 4.3 Short-circuit current for a dead-short Across battery terminals, when
- a) Float charge at 2.15 Volt/Cell KA :
- b) Boost charge at 2.75 Volt/Cell KA :
- 4.4 Battery internal resistance Ohm :
- 4.5 Cell voltage characteristics during charging furnished? :
- 5.0 Cells
- 5.1 Number of cells per battery :
- 5.2 Type of the cell :
- 5.3 Cell designation as per I.S. :
- 5.4 Material of the container
- 5.5 Overall dimension of each cell mm :
- 5.6 Weight of complete cell
- a) Without acid Kg :
- b) With acid Kg :

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DC LEAD ACID BATTERY

- 5.7 Internal resistance of cell Ohm :
- 6.0 Inter-cell Connector
- 6.1 Inter-cell connector furnished? :
- 6.2 Type of inter-cell connector bolted/burned :
- 6.3 Material of inter-cell connector :
- 7.0 Plates
- 7.1 Number of positive plates per cell :
- 7.2 Type of positive plate :
- 7.3 Type of negative plate :
- 8.0 Separator
- 8.1 Type :
- 8.2 Material :
- 8.3 Thickness :
- 9.0 Electrolyte
- 9.1 Amount of electrolyte for first filling
- a) Per cell litre :
- b) Per set litre :
- 9.2 First filling with 10% extra furnished? :
- 9.3 Electrolyte conforms to :
- 10.0 Racks
- 10.1 Number of racks per battery :
- 10.2 Number of cells per rack :
- 10.3 Type of racks Rows/tiers :
- 10.4 Material of rack :
- 10.5 Racks provided with
- a) Numbering tags for cells :

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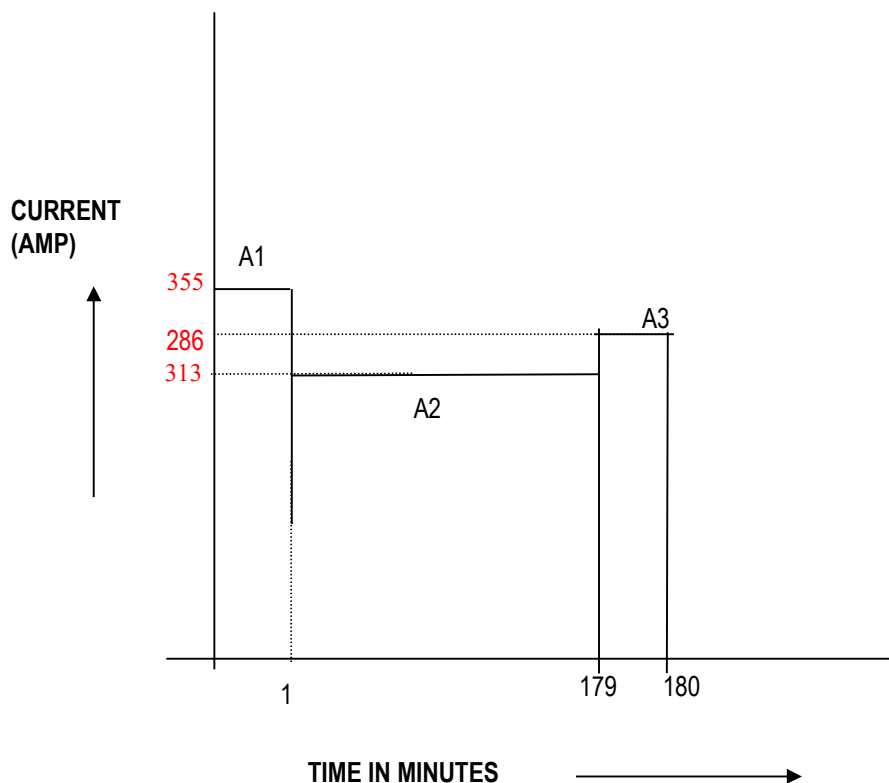
DATASHEET-C

DC LEAD ACID BATTERY

- b) Teakwood clamps for cables :
- 10.6 Insulator with 5% extra furnished for
- a) Cell Yes/No :
- b) Stand Yes/No :
- 10.7 Inter-row, Inter-tier connectors and end take-off furnished? :
- 10.8 Connection hardware with 5% extra furnished :
- 11.0 Dimension & Weights
- 11.1 Overall dimension (L x B x H) mm :
- 11.2 Approx. Weight Kg :
- 11.3 Battery layout drawing furnished? :
- 12.0 Ventilation requirements :
- 12.1
- 12.2
- 12.3
- 12.4
- 12.5
- 13.0 Accessories furnished with each battery :
- 13.1
- 13.2
- 13.3
- 13.4
- 13.5
- 13.6
- 13.7
- 13.8
- 13.9

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**ANNEXURE-I
LOAD DUTY CYCLE OF FGD AREA**



Duration	0-1 min	1-179min	179-180 min
Current	355	286	313

FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1.0 for Lead-Acid
2. MIN.ELECTROLYTIC TEMP. : 5 °C
3. END CELL VOLTAGE : 1.85V/cell for Lead-Acid
4. DESIGN MARGIN : 1.2
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.



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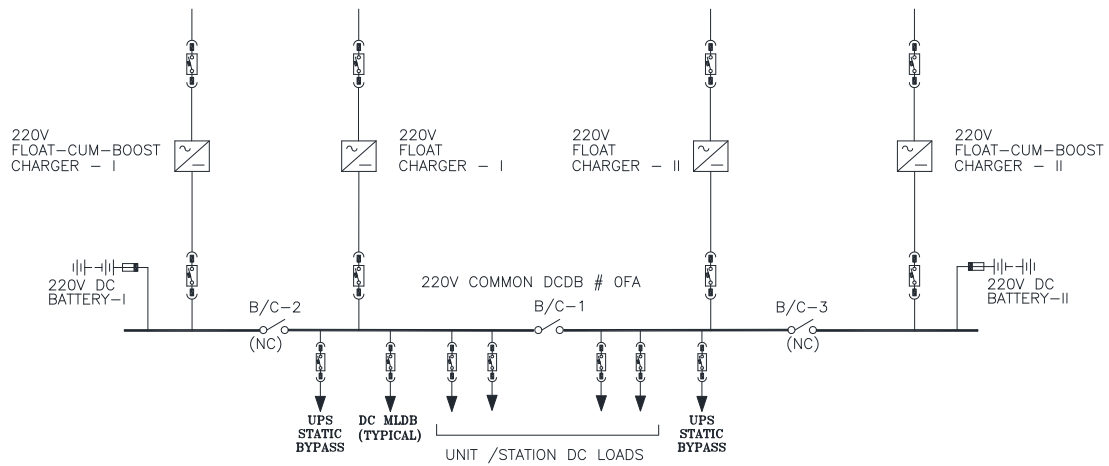
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ANNEXURE-II

SINGE LINE DIAGRAM FOR 220 V DC SYSTEM OF FGD AREA



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ANNEXURE-III

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	Electrolyte (sulphuric acid for first filling plus 10% extra in non-returnable container)
2	Seasoned Teak Wood battery rack coated with three (3) coats of anti-alkali paint
3	Stand insulators, rubber pad etc for rack plus 5% extra
4	One set of inter cell, inter tie and inter-bank connectors required for complete installation.
5	One set cell bridging connector
5	Cell numbering tags with fixing arrangement (1 Set) (self-adhesive PVC stickers)

1.2 Following accessories shall be provided for each battery bank of 108 cells

Sl. No.	Accessories	QTY
1	Rubber syringe type Hydrometer to measure specific gravity (in step of 0.005)	1 Nos
2	Thermometer (0 to 100 deg C) with plug & cap, specific gravity correction scale	1 Nos
3	Cell testing voltmeter (digital) with leads (3-0-3V)	1 Nos
4	Pocket Thermometer (digital)	3 Nos
5	Electrolyte resisting funnels	2 Nos
6	Electrolyte resisting jug of adequate capacity	2 Nos
7	Pair of rubber hand gloves	2 Set
8	Cell lifting straps	2 Set
9	Pair of Spanners for cells	1 Set
10	Battery log Book	1 Nos
11	Goggles (industrial)	2 Nos
12	Printed instruction sheet	2 Nos
13	Plastic filling bottle for filling up	2 Nos

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ANNEXURE-IV

DOCUMENTS REQUIRED ALONG WITH THE TECHNICAL OFFER

- i. Battery sizing calculation with respect to load duty cycle (Annexure-I) 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.

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SECTION - II
STANDARD TECHNICAL REQUIREMENTS



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



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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

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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

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

- 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

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).



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9.1 Quality Assurance

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.

367021/2021/PS-PEM-EL



TITLE :

TECHNICAL SPECIFICATION FOR
220V DC LEAD ACID BATTERY

SPECIFICATION NO.

PE-SS-999-508-E001VOLUME NO. : **II**SECTION : **II**REV NO. : **01** DATE : 30/05/2016

SHEET : 6 of 7

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, 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.

367021/2021/PS-PEM-EL



TITLE :

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SHEET : 7 of 7

Table-1**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.			
Prepared By	Sign & Date	Name	Prepared By	Sign & Date	Name	Seal		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	Yes	Yes
		• AH & WH efficiency Test	IS:1652	Yes	Yes
		• Retention of Charge	IS:1652	No	Yes
		• Endurance Test	IS:1652	Yes	Yes
		• Loss of water test	IS:1652	No	Yes
		• Test for suitability for floating battery operation	IS:1652	No	Yes
		• Internal resistance and short circuit test	IS:1652	No	Yes