

4x270 MW BHADRADRI TPS (FGD)

TECHNICAL SPECIFICATION FOR 220V DC BATTERY

SPECIFICATION NO. : PE-TS-440-508-E001

REVISION 00

VOLUME II B



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP**



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 1 OF 24

CONTENTS

<u>S. NO.</u>	<u>CONTENTS</u>	<u>NO. OF SHEETS</u>
01	COMPLIANCE CERTIFICATE	01
02	SECTION – 'I' SPECIFIC TECHNICAL REQUIREMENT	08
	ANNEXURE-I LIST OF APPLICABLE STANDARDS	01
	ANNEXURE-II LOAD DUTY CYCLE FOR 220V DC SYSTEM	01
	ANNEXURE-III ONE LINE DIAGRAM FOR 220V DC SYSTEM	01
	ANNEXURE-IV DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER	01
	ANNEXURE-V DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT	01
	ANNEXURE-VI NO. OF DRGS / DOCS REQUIRED	01
03	DATASHEET-'A' DC BATTERY	01
04	DATASHEET-'C' DC BATTERY	02
05	QUALITY PLAN	04

TOTAL NO. OF SHEETS = 24 (INCLUDING COVER/ SEPARATOR SHEETS)



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 2 OF 24

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 Annexure-A [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 BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 3 OF 24

SECTION – ‘I’



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 4 OF 24

SECTION – I

SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE OF ENQUIRY

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. 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.

2.0 The stipulations of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I & Datasheet-A.

3.0 EQUIPMENT AND SERVICES TO BE FURNISHED BY THE BIDDER

The bidder shall supply the following equipment in accordance with the various sections of this specification. Quantity requirements shall be as per BOQ cum Unpriced Price Schedule 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) DCDB
- D) Power and control cables
- E) Erection of the equipment
- F) Battery charger, battery fuse box and discharge resistor panel

5.0 CODES AND STANDARDS

Unless otherwise specified, the latest revisions of codes/standards specified in Annexure-I enclosed are applicable and shall be referred to.

6.0 SYSTEM CONCEPT

6.01 220V DC system shall be one no ungrounded system, with each unit comprising of two sets of batteries with associated float cum-boost charger and one sectionalised DCDB. The 220V DC system is designed to cater the control, protection, interlocking, and emergency lighting for FGD control station. The load duty cycle and typical single line diagram for 220V battery and charger connections is enclosed as Annexure-II and Annexure-III respectively.



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 5 OF 24

- 6.02 The battery shall be designed to restrict maximum fault level on DCDB limited to 25kA.
- 6.03 In case of failure of AC, battery will meet the DC load requirement. After restoration of power, the float cum boost charger will continue to supply the loads as well as trickle charge the battery.
- 6.03 The 220V batteries are sized considering emergency load cycle requirement of 600 minutes and design factors (as per Annexure-II).
- 6.04 The voltage at load terminal will not exceed the limits of +10% and -15% of nominal system voltage for 220V DC system.
- 6.05 Batteries shall be connected to DC distribution board through single cores cables copper cable (1CX25sqmm (Cu)/ pole: Tentative size) for each pole. Battery terminals shall be made suitable for above cable.
- 6.06 The equipment will be located indoor but in a hot, humid and tropical atmosphere.
- 6.07 Necessary accessories required for maintenance and testing of batteries shall be supplied with each battery bank as per BOQ cum Unpriced Price Schedule enclosed with NIT.

7.0 OTHER TECHNICAL REQUIREMENTS

7.1 Lead-Acid Batteries

- a) Batteries shall be stationery storage Lead Acid Plante high discharge type conforming to IS-1652 / IEC60896-11. The batteries shall meet the 'Load Duty Cycle' requirements under all site-operating conditions as specified.
- b) Containers:
Containers shall be made of transparent glass, hard rubber, robust, heat resistant, shock absorbing, leak proof, non-absorbent, acid resistant, non-bulging type and free from flaws such as wrinkles, cracks, blisters, pinholes etc. The cell shall be mechanically sturdy. Cell shall be provided with Visual Electrolyte level checks for ease in of maintaince. The marking for the electrolyte level shall be for upper & lower limits. Container shall be container closed/sealed lid type. Open type cells are not acceptable. Lid and sealing compound shall be non-cracking type. The type test report for container made of plastics shall be type tested as per IS-1146 to be submitted. All type tests reports for sealing compound as per IS-3116. The pole sealing arrangement shall be such that no acid particle gets entrapped due to acid creep as a result of capillary action and it shall be possible to remove and refit the sealing to carry out maintenance.



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 6 OF 24

c) Vent Plugs:

Ceramic vent plugs shall be provided in each cell. They shall be anti-splash type to prevent explosion and contamination, having more than one exit hole shall allow the gases to escape freely but shall prevent acid 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 from topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte sample.

Bidder also indicate gas emission rate of battery of necessary design of ventilation of battery room.

d) Plates:

The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load. The construction of plate shall be as per IS-1652 / IEC60896-11.

The separators (made of acid resisting material) shall maintain the electrical insulation between the plates and shall permit free flow of electrolyte. Separators shall be suitable for continuous immersion in the electrolyte without distortion. The positive and negative terminal posts shall be clearly marked. The proper arrangement shall be made inside battery to keep endplates in position. The positive plates shall be supported from the ledges of the container. They should not be supported at the bottom of container. Sufficient space shall be allowed to allow the creepage of the plates.

e) 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.

f) 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.

g) Connectors and Fasteners:

Lead or lead coated copper/brass connectors shall be used for connecting up adjacent cells and rows. The cell terminal post shall be provided with bolts, nuts, clamps, connectors and washers shall be lead coated 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 (1CX25 sqmm (Cu)/ pole: Tentative size). The bidder shall supply lead coated bent copper plate, tubular copper lugs, teakwood 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



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 7 OF 24

detailed engineering. Calculation for sizing of connectors and fasteners shall be furnished during detail engineering.

All connectors and lugs shall be capable of continuously carrying the 10 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.

h) Battery Racks:

Wooden/steel racks with anti-corrosive epoxy paint for all the battery shall be provided. These racks shall be made of good quality steel/first class seasoned teak. They shall be free standing type mounted on porcelain / hard rubber / PVC pads insulators. Battery shall preferably be located in the single tier arrangement. However battery having a complete cell weight of lower than 50 Kg could be located in the double tier arrangement. The battery 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 supported on the insulator attached on to the necessary racks with adequate clearance between adjacent cells. 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. The nameplates, resistant to acid, for each cell shall be attached on the necessary racks.

i) Following information shall be indelibly marked on outside of each cell:

- Manufacturer's name and trade marks
- Country and year of manufacturer
- Manufacturer type designation
- AH capacity at 10 hour discharge rate
- Serial number

j) 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.

k) 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

8.0 PERFORMANCE GUARANTEE

8.1 Bidders shall guarantee that battery offered shall meet the 'Load Duty Cycle' and information given in annexure –II 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.



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 8 OF 24

9.0 INSPECTIONS & TESTING

- 9.1 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 & TESGENCO approval and the inspection shall be carried out based on this approved Quality Plan (QP No. PE-QP-999-508-E002, Rev. 00).
- 9.2 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.
- 9.3 Following type tests as per IS-1652 / IEC60896-11 to be conducted on two cells of the battery
- Capacity test and test for battery voltage during discharge.
 - Ampere hour & watt hour efficiency test.
- 9.4 The Capacity test and test for voltage on battery during discharge shall be carried out at site on completion of E&C and immediately prior to putting battery in service. Necessary testing equipment required for testing at site (including site visit) shall be arranged by bidder.
- 9.5 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 9.6 shall not be applicable in such cases).
- 9.6 The bidder shall indicate cost of carrying out all the Type tests as specified in clause 9.3 of the specification. The charges for each of the Type tests shall be given separately in price schedule.
- 9.7 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.



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 9 OF 24

10.0 DOCUMENTATION

- 10.1 Documents to be submitted by all bidders along with the offer shall be as per Annexure-IV.
- 10.2 Final documents to be submitted after award of contract shall be as per Annexure-V.
- 10.3 No. of prints to be submitted by vendor after award of contract shall be as specified under Annexure-VI.

10.4 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.
- O) Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

- 10.5 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.

11.0 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



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 10 OF 24

above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

12.0 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.

13.0 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.

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



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 11 OF 24

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 BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

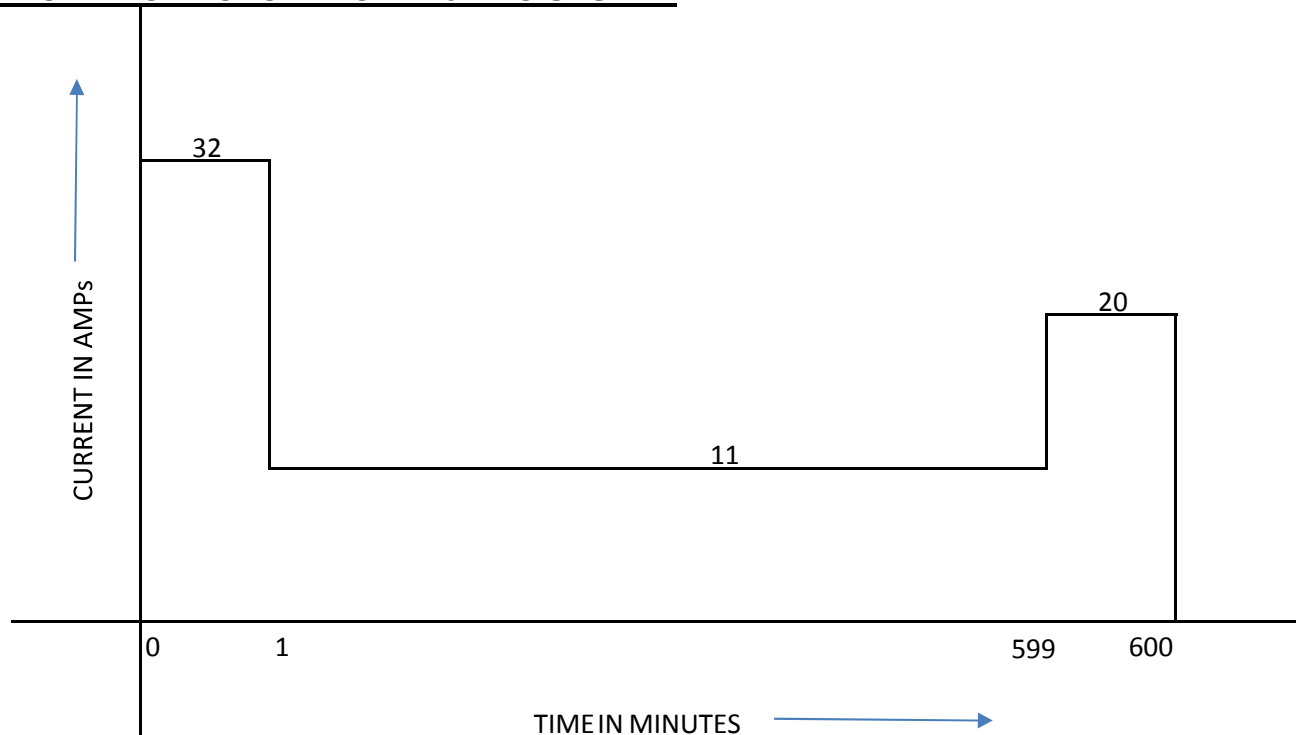
SECTION -I

REVISION 0

SHEET 12 OF 24

ANNEXURE-II

(a) LOAD DUTY CYCLE FOR 220V DC SYSTEM



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1
2. MIN.ELECTROLYTIC TEMP. : 6.5 °C
3. END CELL VOLTAGE : 1.85V PER CELL
4. DESIGN MARGIN : 20%
5. TEMPERATURE CORRECTION FACTOR : As per manufacturer's data



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

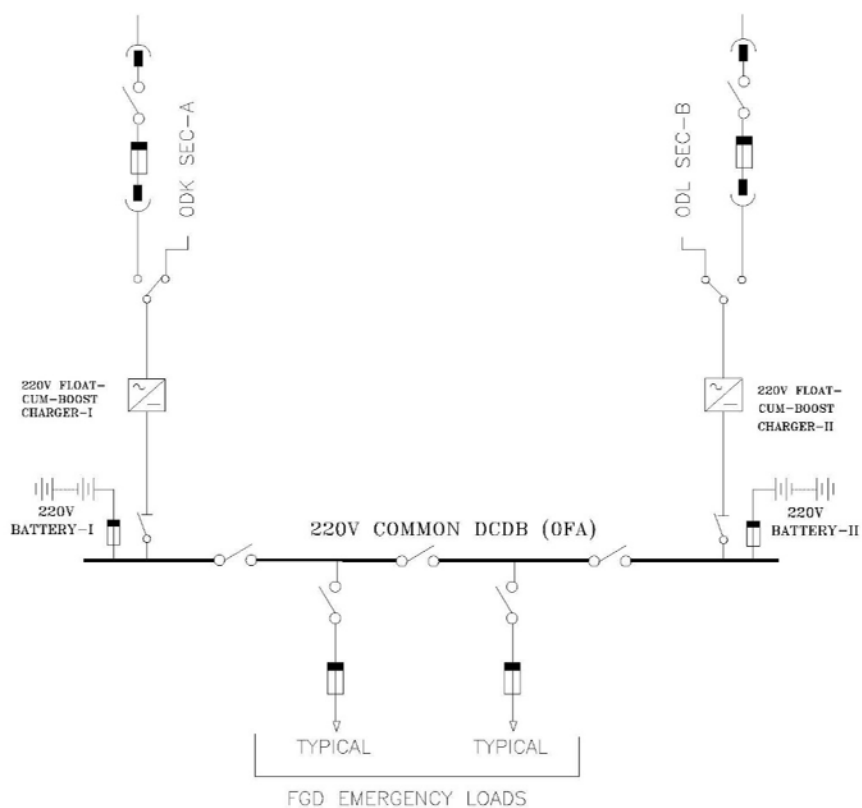
SECTION -I

REVISION 0

SHEET 13 OF 24

ANNEXURE-III

ONE LINE DIAGRAM FOR 220V UNIT DC SYSTEM



	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS-440-508-E001
		VOLUME II B
		SECTION -I
	4x270MW BHADRADRI TPS (FGD)	REVISION 0
		SHEET 14 OF 24

ANNEXURE-IV

DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER

- i. Battery sizing calculation (in IEEE format) with respect to load duty cycle as per Annexure-II of Section-I to be provided along with supporting documents like 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.

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS-440-508-E001
		VOLUME II B
		SECTION -I
	4x270MW BHADRADRI TPS (FGD)	REVISION 0
		SHEET 15 OF 24

ANNEXURE-V

DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

BHEL Drawing No	Drawing Title	Primary/Secondary	Remarks
PE-V0-440-508-E101	TDS FOR BATTERY	Primary	
PE-V0-440-508-E102	GA AND BATTERY ROOM LAYOUT OF BATTERY BANK	Primary	Battery Room Layout will be provided by BHEL after P.O Placement
PE-V0-440-508-E103	BATTERY SIZING CALCULATION, FAULT CALCULATION AND CONNECTOR SIZING CALCULATION	Primary	
PE-V0-440-508-E104	BILL OF MATERIAL FOR BATTERY	Primary	
PE-V0-440-508-E108	LIST OF MANDATORY SPARES FOR BATTERY	Primary (for MS)	
PE-V0-440-508-E902	QUALITY PLAN FOR BATTERY	Primary	
PE-V0-440-508-E105	FIELD QUALITY PLAN PLAN FOR BATTERY	Secondary	
PE-V0-440-508-E106	LIST OF E & C SPARES FOR BATTERY	Secondary	
PE-V0-440-508-E107	LIST OF O&M SPARES FOR BATTERY	Secondary	
PE-V0-440-508-E110	TYPE TEST REPORT FOR BATTERY	Secondary	
PE-V0-440-508-E111	CABLE TERMINATION ARRANGEMENT FOR BATTERY TERMINAL	Secondary	
PE-V0-440-508-E109	O & M MANUAL FOR BATTERY	Secondary	

NOTE:

Drawing/Documents indicated above shall be submitted through document management system (DMS).

**TECHNICAL SPECIFICATION FOR
220V DC BATTERY****4x270MW BHADRADRI TPS (FGD)****SPECIFICATION NO. PE-TS-440-508-E001****VOLUME II B****SECTION -I****REVISION 0****SHEET 16 OF 24****ANNEXURE-VI****No. OF DRAWINGS / DOCUMENTS REQUIRED FROM VENDOR**

S. NO.	DESCRIPTION	No. hard prints/copies	No. of CD- ROMs	REMARKS
1	First Submission/subsequent submission	soft copy pdf format		
2	Final approval drgs. / docs. for Distribution	10 Copies	4 CD-ROMS	
3	Operation & Maintenance manual for approval	soft copy pdf format		
4	Approved Operation & Maintenance Manual for distribution	10 Copies	4 CD-ROMS	
5	Type Test Certificates/ Reports	10 Copies	4 CD-ROMS	



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 17 OF 24

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	:	50°C
4.	Min Electrolyte temp.	:	6.5°C
5.	Cell Container	:	Transparent glass
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)	:	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	:	1CX25sqmm (Cu)/ pole (Fire survival cable) (Tentative Size)
14.	Fault current (DC)	:	25 kA (Max)

Notes:

1. Bidder shall furnish following along with offer:

- Battery capability / discharge curve.
- Battery sizing calculation
- Indicate value at sl. No. 10 & 11 above. 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.**



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 18 OF 24

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	
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	



TECHNICAL SPECIFICATION FOR 220V DC BATTERY

4x270MW BHADRADRI TPS (FGD)

SPECIFICATION NO. PE-TS-440-508-E001

VOLUME II B

SECTION -I

REVISION 0

SHEET 19 OF 24

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		

		QUALITY PLAN		CUSTOMER : TSGENCO		PROJECT: 4x270 MW BHADRADRI TPS(FGD)		SPECIFICATION NO. PE-TS-440-508-E001				
				VENDOR :		TITLE 220V DC BATTERY		SPECIFICATION TITLE TS FOR 220V DC BATTERY				
		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
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
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	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											
a)	Visual	Visual	MA	Visual	Random Sample	IS:1652 & MFR's Std.	IS:1652 & MFR's Std.	Test Cert.	3/2	-	1	
b)	Physical	Physical		Physical	-do-	-do-	-do-	-do-	3/2	-	1	
c)	Chemical	Chemical		Chemical	-do-	(For Synthetic IS : 6071)	(For Synthetic IS : 6071)	-do-	3/2	-	1	
d)	Electrical Resistance Test	Electrical		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											
a)	Dimensional Conformance	Visual	MA	Visual	Random Sample	IS:1652, IS:8320 & MFR's Std.	IS:1652, IS:8320 & MFR's Std.	Test Cert.	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									
			SIGNATURE									
			DATE						BIDDER'S/ VENDORS COMPANY SEAL			

LEGEND : 1 - BHEL/ TSGENCO 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

		QUALITY PLAN		CUSTOMER : TSGENCO		PROJECT: 4x270 MW BHADRADRI TPS(FGD)		SPECIFICATION NO. PE-TS-440-508-E001				
				VENDOR :		TITLE 220V DC BATTERY		SPECIFICATION TS FOR 220V DC BATTERY				
		SHEET 2 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
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.4	CONNECTOR											
a)	Dimension	Dimension	MA	Measurement	Random Sample	IS:1652, IS:6848 & Appd. Drg./Doc.	IS:1652, IS:6848 & Appd. Drg./Doc.	Test Cert.	3/2	-	1	<i># 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.</i>
b)	Thickness of lead coating	Visual		Visual	-do-	-do-	-do-	-do-	3/2	-	1	
1.5	VENT CAP											
a)	Dimensional Conformance	Dimension	MA	Measurement	-do-	Refer Remarks#	Refer Remarks#	-do-	3/2	-	1	
1.6	CONTAINER											
a)	Verification Constructional requirement	Visual	MA	Visual	Sample Plan as per IS:1146	IS:1652, IS:1146, IS:8320	IS:1652, IS:1146, IS:8320	Test Cert.	3/2	-	1	
b)	Verification of Markings	Visual	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
c)	High Voltage Test	Electrical	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
d)	Drops Ball Test	Mechanical	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
e)	Plastic Yield Test	-do-	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
f)	Acid Resistance Test	Chemical	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
g)	Hydraulic thrust enduarnc test	Physical	MA	-do-	-do-	-do-	-do-	-do-	3/2	-	1	
2.0	FINISHED BATTERY	Routine Test	CR	Elec. & Meas.	100%	IS:1652 & IS:8320	IS:1652 & IS:8320	Test Cert.	3/2	-	1	
3.0	FINAL INSPECTION											
3.1	Type Test #											
a)	Verification Constructional requirement	Visual	MA	Visual	Sample Plan as per IS: 8320	IS:1652	IS:1652	Inspection Report	3/2	1	-	<i># Conduction of Type Tests from S.No. (d) to (g) shall be as per Annexure-A enclosed.</i>
b)	Verification of Markings	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	3/2	1	-	
c)	Verification of Dimensions	-do-	MA	-do-	-do-	-do-	-do-	-do-	3/2	1	-	
d)	Test for Capacity & Voltage during discharge	Test	CR	As per IS: 1652	-do-	-do-	-do-	-do-	3/2	1	-	
BHEL			PARTICULARS			BIDDER/ VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/ VENDORS COMPANY SEAL			

LEGEND : 1 - BHEL/ TSGENCO

2 - VENDOR

3 - SUB- VENDOR

P - PERFORM

W - WITNESS

V - VERIFICATION

		QUALITY PLAN		CUSTOMER : TSGENCO		PROJECT: 4x270 MW BHADRADRI TPS(FGD)		SPECIFICATION NO. PE-TS-440-508-E001					
				VENDOR:		TITLE 220V DC BATTERY		SPECIFICATION TITLE TS FOR 220V DC BATTERY					
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			REMARKS	
1	2	3	4	5	6	7	8	9	10	P	W	V	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)	*Retension of Charge	-do-	CR	-do-	-do-	-do-	-do-	-do-	-	-	1		
g)	*Endurance Test	-do-	CR	-do-	-do-	-do-	-do-	-do-	-	-	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. *Type test report of identical battery to be submitted.													
BHEL			PARTICULARS			BIDDER/ VENDOR							
			NAME										
			SIGNATURE										
			DATE										
BIDDER'S/ VENDORS COMPANY SEAL													

LEGEND : 1 - BHEL/ TSGENCO 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

ANNEXURE-A

PROJECT: 4x270 MW BHADRADRI TPS
CUSTOMER: TSGENCO
VENDOR :

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	IS:1652	Yes	Yes
		• AH & WH efficiency Test	IS:1652	Yes	Yes
		• Retention of Charge	IS:1652	No	No
		• Endurance Test	IS:1652	No	No