TELENGANA STATE POWER GENERATION CORPORATION LIMITED

5X800MW YADADRI TPS

VOLUME – II

TECHNICAL SPECIFICATION FOR

220V DC BATTERY-FGD & OFFSITE AREAS

SPECIFICATION NO: ***PE-TS-417-508-E001A***

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

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	**SPECIFICATION NO. PE-TS-417-508-E001A**
		VOLUME II
		REVISION 0 | **DATE :18.05.2023**
		SHEET 1 OF 1

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TOTAL NO. OF SHEETS = 26 (INCLUDING COVER/ CONTENT SHEETS)

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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

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

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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, assembly, testing and inspection at vendor's/sub vendor's works, packing, despatch to site and supervision of E&C of 220V DC batteries as described in the various sections of this specification. The batteries shall generally conform to IS/ IEC/ IEEE. Erection and commissioning is not included in vendor's scope. However, Vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.

1.2 Technical requirements of 220V DC BATTERY are indicated in Data Sheet-A & Section-II.

1.3 The 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-price schedule as part of NIT.

3.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

3.1 Documents required along with technical offer :

Signed & stamped copy of the following documents :-

a) Battery sizing calculation with respect to load duty cycle as per Annexure-II (a) & II (b) 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.
b) A copy of the sheet "Compliance certificate" with bidder's signature and company stamp.
c) A copy of sheet "Data Sheet-A" with required information and bidder's signature and company stamp.

3.2 Documents required after award of contract :-

BHEL Drawing No.	*Drawing Title*	*Vendor Sub (Days)**	*Bhel comment (Days)*	*Vendor Sub (Days)#*	*Bhel and Customer comment /approval (Days)*	*Total Engg Time (Days)*
Primary Documents						
PE-V0-417-508-E102	GA AND BATTERY ROOM LAYOUT OF BATTERY BANK	21	9	7	18	55
PE-V0-417-508-E101	TDS FOR BATTERY	21	9	7	18	55
PE-V0-417-508-E103	BATTERY SIZING CALCULATION, FAULT CALCULATION AND CONNECTOR SIZING CALCULATION	21	9	7	18	55

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PE-V0-417-508-E104	BILL OF MATERIAL FOR BATTERY	21	9	7	18	55
PE-V0-417-508-E108	LIST OF MANDATORY SPARES FOR BATTERY ($$)	21	9	7	18	55
Secondary Documents						
PE-V0-417-508-E105	FIELD QUALITY PLAN PLAN FOR BATTERY	21	9	7	18	55
PE-V0-417-508-E106	LIST OF E & C SPARES FOR BATTERY	21	9	7	18	55
PE-V0-417-508-E110	TYPE TEST REPORT FOR BATTERY (%%)	21	9	7	18	55
PE-V0-417-508-E111	CABLE TERMINATION ARRANGEMENT FOR BATTERY TERMINAL	21	9	7	18	55
PE-V0-417-508-E109	O & M MANUAL FOR BATTERY	within 30 days of issuance of MDCC				

NOTES:

a) * 1st submission within indicated days from date of purchase order

b) # Submission (within indicated days) after incorporating all BHEL comments

c) $$ Primary document for delivery of Mandatory Spares only and not to be linked with Battery supply.

d) %% Endurance tests report shall be submitted after conduction of the test.

e) Primary documents shall be considered for Delay analysis and secondary documents shall be for engineering completion purpose

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	Rated voltage (V)	:	220V DC
2. 3. 4. 5. 6.	Type of Battery Design Ambient temp. Min Electrolyte temp. Cell Container DC System Earthing	:	Lead Acid Plante high discharge 50°C 7°C Transparent glass Unearthed
7.	Conforming to	:	IEEE/ IEC/ IS standards
8.	No. of cells	:	108
9.	End cell voltage		1.8V
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 calculation along with offer
13.	Arrangement of batteries on racks	:	Single tier for batteries having cell weight 50kg or more.
14.	Connection from battery to DCDB	:	2R-1CX400sqmm (Cu)/ pole (Fire survival cable) Cable diameter over inner sheath: 35.5mm Overall diameter : 43.5 +/-2mm
15.	Fault current (DC)		The battery shall be designed to restrict maximum Fault level on DCDB limited to 25kA for 1Sec.
16.	Battery to be suitable for duty		As per Annexure-I(a) & Annexure-I(b)
17.	Tapping to be provided in battery	:	No
18.	Tapping to be provided at which cell	:	No
19.	Recommended boost charging rate (battery to be charged in 10hrs)	:	Bidder to furnish the detail along with offer
20	Vent plug		For flooded cell, ceramic vent plugs (anti splash type) shall be provided in each cell.
21	Material of Battery rack		Shall be constructed of best quality FRP forming a rigid structure. Battery racks & wooden supports for cable termination shall be painted with at least three (3) coats of electrolyte-resistant paint of approved shade. Racks shall be free standing type, mounted on porcelain/ electrolyte-resistant high impact plastic insulators. The cells shall be supported on insulators fixed on to the rack with adequate clearance between adjacent cells. The name plates, resistant to acid, for each cell shall be attached on the necessary racks.

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Note 1: Bidder shall furnish following along with offer:

a) Battery capability/ discharge curve.

b) Battery sizing calculation as per IEEE 485.

c) Indicate value at Sl.No. 11, 12_and 19 above.

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

e) Bidders stand guarantee that the rating offered at_S. No. 12 shall meet 'Load Duty Cycle' taking into factors account for battery sizing as per Annexure I(a) & Annexure-I(b) of specification.

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY DATA SHEET–C	SPECIFICATION NO. PE-TS-417-508-E001A VOLUME II B SECTION C REVISION 0 DATE : 18.05.2023 SHEET 1 OF 2

Sr. 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	

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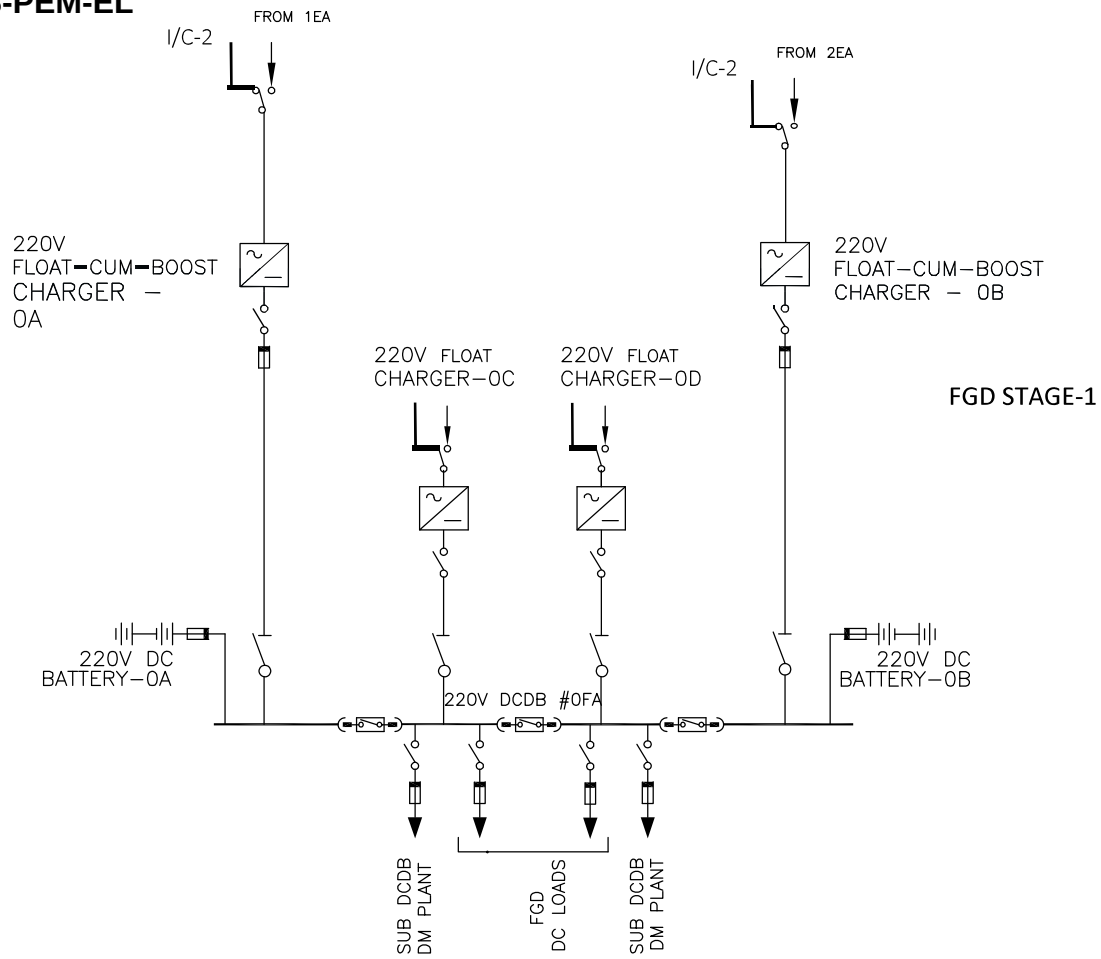
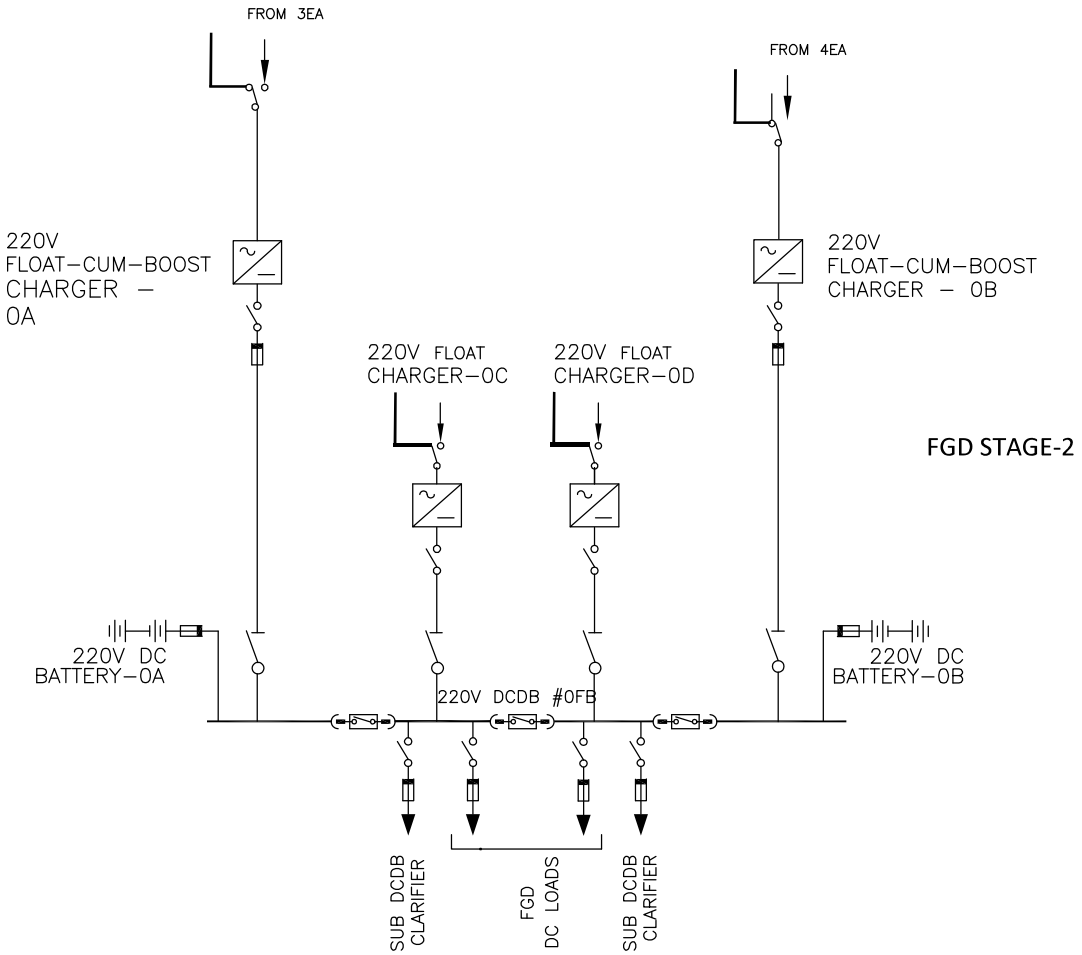
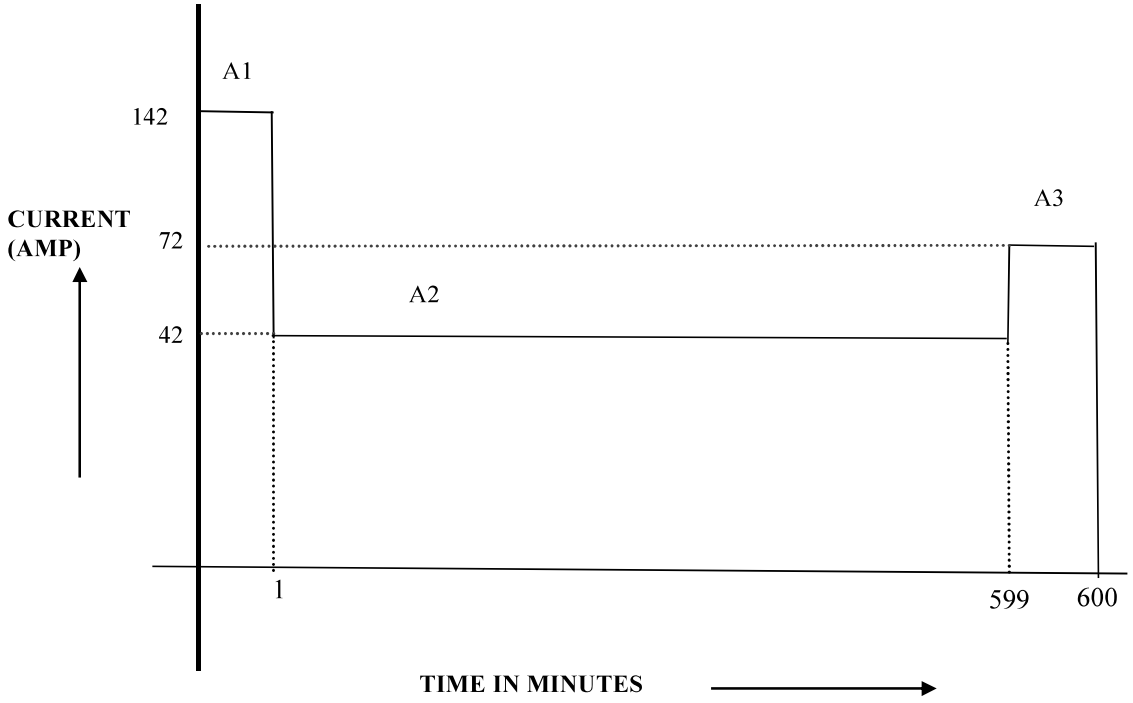
16.0	Allowable ripple content acceptable to battery (r.m.s)	%	
17.0	Hydrogen evaluation		
18.0	Cell designation in accordance with IS: 1651/1652 or equivalent IEC		
19.0	Applicable standard		
20.0	Whether battery performance curve and calculation for capacities enclosed		
21.0	Recommended Maximum period 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 (bus bar/ cable)		
32.0	Recommended size of (bus bar/ 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)


FROM 1EA
I/C-2
FROM 2EA
I/C-2
220V
FLOAT-CUM-BOOST
CHARGER –
0A
220V
FLOAT–CUM–BOOST
CHARGER – 0B
220V FLOAT
CHARGER–0C
220V FLOAT
CHARGER–0D
FGD STAGE-1
220V DC
BATTERY–0A
220V DC
BATTERY–0B
220V DCDB #0FA
SUB DCDB
DM PLANT
FGD
DC LOADS
SUB DCDB
DM PLANT


FROM 3EA
FROM 4EA
220V
FLOAT–CUM–BOOST
CHARGER –
0A
220V
FLOAT–CUM–BOOST
CHARGER – 0B
220V FLOAT
CHARGER–0C
220V FLOAT
CHARGER–0D
FGD STAGE-2
220V DC
BATTERY–0A
220V DC
BATTERY–0B
220V DCDB #0FB
SUB DCDB
CLARIFIER
FGD
DC LOADS
SUB DCDB
CLARIFIER

ANNEXURE-II(a)
LOAD DUTY CYCLE - STAGE 1

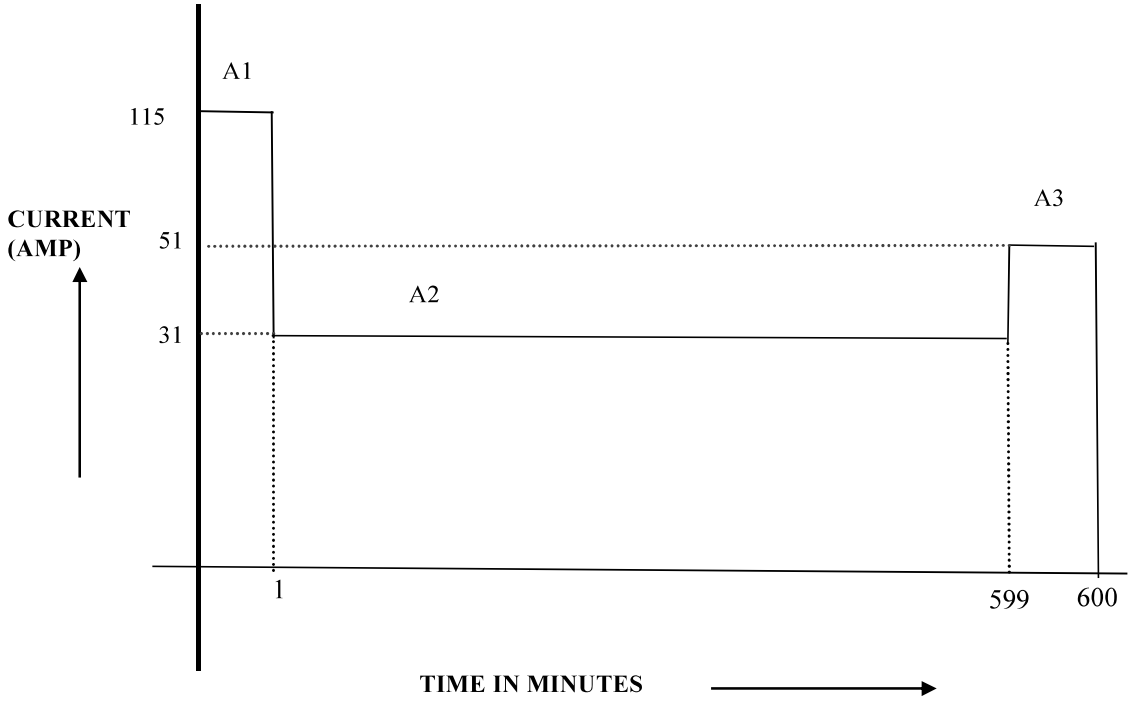


FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR	: 1.25
2. MIN.ELECTROLYTIC TEMP.	: 7 °C
3. END CELL VOLTAGE	: 1.80 V PER CELL
4. TEMPERATURE CORRECTION FACTOR	: As per IEEE 485
5. DESIGN MARGIN	: 20%
6. NO. OF CELLS	: 108

ANNEXURE-II(b)

LOAD DUTY CYCLE – STAGE 2



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR	: 1.25
2. MIN.ELECTROLYTIC TEMP.	: 7 °C
3. END CELL VOLTAGE	: 1.80 V PER CELL
4. TEMPERATURE CORRECTION FACTOR	: As per IEEE 485
5. DESIGN MARGIN	: 20%
6. NO. OF CELLS	: 108

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

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

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

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, 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.

ANNEXURE-A

LIST OF APPLICABLE STANDARDS

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

Note:

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

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ANNEXURE-B

ACCESSORIES

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

1.1 Each battery is furnished with following items

S.No	Fittings
1	Electrolyte (sulphuric acid for first filling plus 10% extra in nonreturnable container)
2	FRP rack properly treated with three coats of anti-acid paints for acid resistance for 220V battery bank
3	Insulators with 5% extra, rubber pad etc. for rack
4	One set of inter cell, inter tie and interbank connectors required for complete installation.
5	Teakwood Cable clamps with hardware/ cable supporting arrangement having L Type copper connectors

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

S.No	NAME OF ACCESSORY	QTY (in Nos.)
1	Hydrometer (in step of 0.005)	1
2	Thermometer with plug & cap, specific gravity correction scale	2
3	Digital Cell testing voltmeter (3-0-3V)	2
4	Pair of rubber hand gloves	2
5	Pair of spanners	1
6	Cell lifting straps	2 set
7	Bridging clamps	2 set
8	Goggles (industrial)	2
9	Instruction card	2
10	Battery log book	1

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11	Electrolyte resistant plastic funnels	2
12	Electrolyte resistant plastic Jugs	2
13	Plastic filling bottles	2
14	Self-adhesive PVC stickers for cell numbering	1 set
15	Pocket Thermometer (digital Type)	3
16	Set of hydrometer syringes (suitable for the vent holes in different cells for specific gravity reading)	1 set
17	Rubber Apron	2
18	No smoking notice	2
	Following set of additional accessories shall be provided for each stage:	
1	Battery trolley	1
2	Hot air gun	1
3	Siphon	1

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD		QP NO.:-PE-QP-999-508-E002, REV.01	DATE:- 29/01/2020
	PROJECT	5X800 MW YADADRI TPS			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	-	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	-	IS:1652 & MFR's Std.	IS:1652 & MFR's Std.	Test Cert.	√	P	V	-	
b)	Physical	Physical	MA	Physical	Random Sample	-	-do-	-do-	-co-	√	P	V	-	
c)	Chemical	Chemical	MA	Chemical	Random Sample	-	(For Synthetic IS : 6071)	(For Synthetic IS : 6071)	-co-	√	P	V	-	
d)	Electrical Resistance Test	Electrical	MA	Electrical	Random Sample	-	-do-	-do-	-co-	√	P/V	V	-	
e)	Acceptance test Dimension, Volume Porosity, Wetability of separator	Test	MA	Test	Random Sample	-	-do-	-do-	-co-	√	P	V	-	
1.3	TERMINAL POST													
a)	Dimensional Conformance	Dimension	MA	Measurement	Random Sample	-	IS:1652, IS:8320 & MFR's Std.	IS:1652, IS:8320 & MFR's Std.	Test Cert.	√	P	V	-	
b)	Material Conformance	Chemical	CR	Chemical	Random Sample	-	-do-	-do-	-co-	√	P	V	-	
c)	Thread size depth & chamfer	Physical	MA	Measurement	Random Sample	-	-do-	-do-	-co-	√	P	V	-	
d)	Surface finish & defects	Visual	MA	Visual	100%	-	-do-	-do-	-co-	√	P	V	-	
e)	Plating Quality	Thickness	CR	Measurement	Random Sample	-	-do-	-do-	-co-	√	P	V	-	
1.4	CONNECTOR													
a)	Dimension	Dimension	MA	Measurement	Random Sample	-	IS:1652, IS:6848 & Appd. Drg./Dcc.	IS:1652, IS:6848 & Appd. Drg./Doc.	Test Cert.	√	P/V	V	V	
b)	Thickness of lead coating	Visual	CR	Measurement	Random Sample	-	-do-	-do-	-co-	√	P/V	V	V	
1.5	VENT CAP													
a)	Dimensional Conformance	Dimension	MA	Measurement	Random Sample	-	IS:1652 & Appd. Drg./Dcc. 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			
ENGGINEERING			QUALITY			Sign & Date		Doc No.			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shuda	Checked By		Ritesh K Jaiswal			Checked By			

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDFESS	QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD		QP NO.:-PE-QP-999-508-E002, REV.01	DATE:- 29/01/2020
	PROJECT	5X800 MW YADADRI TPS		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	
2.0	FINISHED BATTERY	Routine Test	CR	Electrical & Measurement	100%	100%	IS:1652 & IS:8320	IS:1652 & IS:8320	Inspection Report	√	P	V	V	
3.0	FINAL INSPECTION													
3.1	Type Test ##													
a)	Verification Constructional requirement	Visual	MA	Visual	Sample as per IS: 8320/IS:1652	Sample as per IS: 8320/S:1652	IS:1652	IS:1652	Inspection Report	√	P	W	W	
b)	Verification of Markings	Visual	MA	Visual	-do-	-do-	-dc-	-do-	-do-	√	P	W	W	
c)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	W	W	
d)	Test for Capacity & Voltage during discharge	Test	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	Type Test report	√	P	V	V	# # Conduction of Type Tests from S.No. (d) to (j) shall be as per Annexure-A enclosed. If Conduction of Type test is required as per Annexure-A, then Same shall be Witnessed ('W') by BHEL/Customer in place of Verification('V') under column 'C' and 'N' of AGENCY(10) Above.
e)	AH & WH efficiency Test	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	
f)	Test for loss of capacity on storage	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	
g)	Endurance Test	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	
h)	Loss of water test	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	
i)	Test for suitability for Floating Battery Operation	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	
j)	Internal Resistance and Short Circuit Test	-do-	CR	Electrical & Measurement	-do-	-do-	-dc-	-do-	-do-	√	P	V	V	

BHEL						BIDDER/SUPPLIER	FOR CUSTOMER REVIEW & APPROVAL			
ENGGINEERING			QUALITY			Sign & Date	Doc No.			
	Sign & Date	Name		Sign & Date	Name	Seal		Sign & Date	Name	Seal
Prepared By		Kannaiya Kumar	Prepared By		Kunal Ganchi		Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal		Checked By			

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MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E0C1	DATE:-
	CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD		QP NO.:-PE-QP-999-508-E0C2, REV.01	DATE:- 29/01/2020
	PROJECT	5X800 MW YADADRI TPS		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	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
4.0	**Container**													
a)	Verification Constructional requiremen:	Visual	MA	Visual	Sample Plan as per IS:1146	-	IS:1146	IS:1146	Test Cert.	√	P	W	W	
b)	Verification of Markings	Visual	MA	Visual	-do-	-	-do-	-do-	-do-	√	P	W	W	
c)	High Voltage Test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	W	W	
d)	Drop ball test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	W	W	
e)	Plastic yield test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	W	W	
f)	Acid resistance test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	W	W	
g)	Hydraulic thrust endurance test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	W	W	
5.0	**Accessories**	Visual & Dimension	MA	Visual & Dimension	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	
6.0	**Cable Lugs**	Visual	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	

NOTES:-

1. Wherever IS standard is mentioned, equivalent IEC/Internaticnal standard is also acceptable as per applicability of test n case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.
2. BHEL Reserves the right for conductirg repeat test, if required.
3. Phctographs of complete Battery Package items after packaging to be sent to BHEL-Purchase Grcup for review before issuing MDCC.

LEGEND :-

* RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DCCUMENTATION,

** **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, **D:** DOCUMENTATION

BHEL						BIDDER/SUPPLIER	FOR CUSTOMER REVIEW & APPROVAL			
ENGGINEERING			QUALITY			Sign & Date	Doc No.			
	Sign & Date	Name		Sign & Date	Name			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gardhi	Seal	Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal		Checked By			

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ANNEXURE-A

STANDARD QUALITY PLAN

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

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD

PROJECT: 5X800 MW YADADRI TPS

ITEM: DC LEAD ACID BATTERY

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	Ampere hour & watt hour efficiency test	IS:1652	Yes	Yes
		Test for retention of charge	IS:1652	Yes	Yes
		Endurance test	IS:1652	Yes	Yes
		Capacity test and test for voltage on battery during discharge / Discharge performance test	IS:1652	Yes	Yes

1) As per contract, Type Tests as per Annexure-A shall be conducted separately as per schedule.

2)Test for retention of charge shall be conducted at Vendor works.

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1822557/2023/PS-PEM-EL

	5 X 800 MW YADADRI TPS	PE-PQ-417-508-E003
	PRE-QUALIFYING REQUIREMENTS FOR	REV. 00 / DATE: 29/06/2023
	DC LEAD ACID BATTERIES	SHEET 1 OF 1

ITEMS & TYPE OF BATTERY : 220V DC LEAD ACID (Plante) battery of rating 600AH & above	
SCOPE: Supply : YES Erection & Commissioning: No Sup of E&C : YES	
1	Vendor should be designer & manufacturer of the applicable type of battery
2	Vendor to furnish published technical catalogue for the applicable type of batteries
3	Availability of type test certificates conducted at independent lab or witnessed by third party as per IS/ international standards for the applicable type of batteries
4	In-house capability to carry out all routine and acceptance tests as per IS/ international standards for the applicable type of batteries
5	Vendor should have manufactured and supplied at least two (2) numbers of highest offered rating or above of high discharge type Plante positive plate type battery at least one (1) each at two (2) different industrial installations, which should be in successful operation for at least two (2) years as on 17.10.2017.
6	Minimum two (2) nos. purchase orders for the applicable type of batteries shall be submitted which should not be more than five (5) years old from the date of techno-commercial bid opening for establishing continuity in business.

Notes:

1. Consideration of offer shall be subject to customer's approval of bidder, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
4. Any satisfactory fulfilment of all the above criteria/ pre qualifying requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
5. PQR Clause no. 5 above is in line with end customer proven make criteria.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
29/06/23	29/6/23	29/6/2023	29/6/23
ANSHIKA DALAL (ENGINEER)	KHUSHBU AGRAWAL (MANAGER)	PRAVEEN DUTTA (AGM)	DEBASISA RATH (AGM & DH ELECTRICAL)