4x270 MW BHADRADRI TPS

TECHNICAL SPECIFICATION
FOR
220V DC BATTERY

SPECIFICATION NO. : PE–TS–411–508–E001

REVISION 00

VOLUME II B

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

CONTENTS

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

(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS')

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 10.1 of Section-C, Volume-II-B of the specification, two signed and stamped copies of the following shall be furnished by all bidders as technical offer:

    a. Battery sizing calculation with respect to load duty cycle as per Annexure-III of Section-C to be provided along with supporting documents (capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue) for considered factors.
    b. Unpriced Price Schedule ("Annexure-I: BOQ cum Price Schedule", as enclosed with the specification) with bidder's signature and company stamp.
    c. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
    d. A copy of previous sheet ("List of Contents"), with bidder's signature and company stamp.

2. No technical submittal except as stated above, such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.

3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

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 battery description/ quantities, notes etc. from those given in Annexure-I: BOQ cum Price Schedule shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

6. Bidder 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.

BIDDER'S STAMP & SIGNATURE

PREAMBLE

1.0 The Tender documents contains three (3) volumes. The bidder shall meet the requirements of all three volumes.

1.1 **VOLUME - I** **CONDITIONS OF CONTRACT**

This consists of four parts as below:-

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial conditions for Erection & Commissioning site work, as applicable.

1.2 **VOLUME – II** **TECHNICAL SPECIFICATION**

Technical requirements are stipulated in Volume – II, which comprises of:-

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A This section outlines the Intent of Specification

Section – B This section provides "Project Information".

Section – C This section indicates Technical Requirements specific to Contract.

Data sheet - A :- Specific data and other requirements pertaining to the equipments.

Data sheet – C :- Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)

Quality Plan

2.0 This requirements mentioned in Data Sheet – A shall prevail and govern in case of conflict between the section-c and data sheet-A.)

SECTION - A

SCOPE OF ENQUIRY

1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of 220V DC Battery as mentioned in different sections of this specification for 4x270MW BHADRADRI TPS.

2.0 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.

3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.

4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.

5.0 Bidders shall confirm total compliance to the specification without any deviations from the technical/ quality assurance requirements stipulated.

6.0 The documents shall be in English language and MKS system of units.

SECTION-B

PROJECT INFORMATION

INTRODUCTION

4x270 MW Manuguru TPS is being set up by Telangana State Electricity Corporation Limited (TSGENCO) at Manuguru in the district of Khammam, Telangana, India.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data/information as may be necessary shall have to be obtained /collected by the Bidder.

APPROACH TO SITE

The distance from Manuguru to Major cities in state: Hyderabad-345KM, Warangal-180km, Bhadrachalam-38km, Kothagudem-70km and Khammam-130km, Vijayawada-195km.

District: KHAMMAM

State: TELANGANA

Nearest Airport: The nearest airport is Vijayawada Airport but the most used airport is the Hyderabad International Airport.

Nearest Railway Station: Manuguru railway station is 10KM from nearby town. However Warangal/Vijaywada railway Station is major railway station near to Manuguru.

1. **Owner** TSGENCO
2. **Owner Consultant** DESEIN PRIVATE LIMITED, NEW DELHI

3. **Project Title** 4X270 MW MANUGURU TPS
4. **Location** 16 Km from Manuguru Railway station
5. **Nearest Railway Stn**. Manuguru
6. **Temperature**
   a. Mean daily minimum ambient temperature during oldest month of the year=11.5 Deg.C
   b. Mean daily minimum ambient temperature during hottest month of the year=45.1 Deg.C
7. **Rainfall**

   Intensity of rainfall @ 80 mm/hr considering heaviest fall in 24 hrs
8. **Wind Data**
   a. Basic wind speed at 10m height

      44 m/sec
   b. Wind pressure As per IS: 875 Part III- 1987

9. **Seismic Zone** Zone III as defined in IS:1893 (part-1)-2002according to Indian Standard Seismic Zoning Map

10.0	**Power Supply** **The power supplies for distribution and auxiliaries shall be as under:**	
	a) In plant generation	16.5kV ±5% , 3ph, 50Hz ±5%, high resistance earthed.
	b) MV distribution	6.6kV ±10 %, 3ph, 3w , 50 Hz, + 5 % to – 5%, Medium Resistance grounding
	c) LT distribution	415V ±10%, 3ph, 3W, 50Hz + 5% to –5%, High Resistance Grounding for all plant area shall be provided.
	d) Motor rated 160kW and above 160kW	6.6kV ±10 %, 3 ph, 3W,50Hz +5% to -5%.
	e) Motor rated below 160kW and all motorized actuators.	415V ±10%, 3 ph,3w, 50Hz +5% to -5%.
	f) For motors equal and below 30kW winding heating	24V AC ±10, 50 Hz %, [to be generated in 415V switchgear by vendor]
	g) DC Motors	220V DC + 10% to - 15%, 2 wire ungrounded system

	h) Control supply for relay panel/ 6.6kV breakers/415V breakers and DC emergency lighting.	220V DC + 10% to - 15%, 2 wire ungrounded system
	i) UPS for instrumentation & Control system	240V AC ±1 %, 1 ph ,50Hz ±0.5% 2 Wire AC system
	j) Control supply for 415V Motor contactors/AC Control circuits [to be generated in MCC /panel by vendor]	110V AC ±10%, 50Hz + 5% to –5%.
	k) Diesel Generator emergency supply	415V ±10%, 3ph,3W, 50Hz +5%to –5%.
11.0	**Fault levels**	
	a) 400kV	40kA rms for 1 sec
	b) 6.6kV	40 kA rms for 1 sec.
	c) 415V	50 kA rms for 1 sec.

SECTION – 'C'

SECTION – C

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 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. The BOQ cum Price Schedule is enclosed as Annexure-I.

3.0 SERVICES AND EQUIPMENT TO BE EXCLUDED

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

4.0 CODES AND STANDARDS

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

5.0 **SCHEDULE OF PRICES** – BOQ cum Price Schedule for Battery (Annexure-I) Shall Be Considered For Price Evaluation Purpose.

DELIVERY: Ex-works delivery of equipment shall be as per NIT.

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 no. of float charger for each battery, one common standby FCB charger and one sectionalised DCDB. The 220V DC system is designed to cater the control, protection, interlocking, emergency lighting and emergency dc drives for power station (excluding switchyard, CHP and AWRS requirement). The load duty cycle and

typical single line diagram for 220V battery and charger connections is enclosed as Annexure-III and Annexure-IV respectively.

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/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-III).

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 (**2-1CX300sqmm (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 enclosed Annexure-V.

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.

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 plante positive plates shall be supported from the ledges of the container. They should not be supported at the bottom of container. Sufficient space shall 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 (2-1CX300 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 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 –III 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.

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

a. Capacity test and test for battery voltage during discharge.
b. 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.

10.0 DOCUMENTATION

10.1 By all Bidders as technical offer:

(i) Battery sizing calculation (in IEEE format) with respect to load duty cycle as per Annexure-III of Section-C 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-I: BOQ cum Price Schedule", as enclosed with the specification) with bidder's signature and company stamp.

(iii) A copy of sheet "Instructions to Bidders for Preparing Technical Offer" with bidder's signature and company stamp.

(iv) A copy of sheet "List of Contents" with bidder's signature and company stamp.

10.2 Final documents to be submitted after award of contract shall be as given in Annexure-VI.

10.3 No. of prints to be submitted by vendor after award of contract shall be as specified under Annexure-VII.

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 equip-ment 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 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.

4 X 270 MW BHADRADRI TPS
BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY (LEAD -ACID PLANTE)
ANNEXURE -I

Sr. No.	Item code	Item Description	Unit	Quantity	UNIT PRICE	TOTAL PRICE	Remarks
(A)	**MAIN ITEMS**						
1.0	**508-14001-A**	**220V BATTERY 1**	Sets	8			
		Break up detail					
		220V DC, AH capacity to be decided by bidder as per Annexure-III of Section-C, 1.85 ECV, 107 cells, Lead-Acid plante High discharge type battery with all accessories listed as 1.1 below.	Sets	8			
		Electrolyte (sulphuric acid for first filling plus10% extra)	Sets	8			
		Wooden/Steel battery racks with 3 coats of anti elctrolyte resistant paints for 220V DC Battery	Sets	8			
		Stand insulators plus 5% extra	lot	8			
		Cell interconnectors with 5% extra and end take-off with one no. extra	lot	8			
		Lead coated connection hardware plus 5% extra	lot	8			
		Cell numbering tags with fixing arrangement (1set)	lot	8			
		Teakwood Cable clamps with hardware	lot	8			
1.1		**LIST OF ACCESSORIES (for each set of battery)**		8			
a		Hydrometer	Nos	1			Part of item 1.0
b		Set of hydrometer syringes (suitable for the vent holes in different cells for specific gravity reading)	SET	1			
c		pocket Thermometer for measuring electrolyte temperature	Nos	3			
d		Specific gravity correction chart	Nos	2			
e		Wall mounting type holder for hydrometer and thermometer	Nos	2			
f		Cell testing digital voltmeter (3-0-3V) with testing leads	Nos	2			
g		Rubber apron	Nos	2			
h		Pair of rubber hand gloves	PAIR	2			
i		Set of insulated spanners	SET	2			
j		`No smoking' notice	Nos	2			
k		Goggles (industrial)	Nos	2			
l		Instruction card	Nos	10			
m		Minimum and maximum temperature indicator for Battery Room	Nos	1			
n		Acid/alkali mixing jar and funnels	Nos	2			
o		Battery Log Book	Nos	1			
p		Self adhesive PVC stickers for cell numberings	Nos	10			
q		Cell lifting straps	Nos	2			
r		Hot air gun	Nos	1			
s		Battery trolley with Nylon wheels	Nos	1			
t		One set of inter cell, inter tie and interbank connectors	Nos	1			
3.0	**508-14010-A**	**E & C SPARES**					
a		GLOVES	SET	4			
b		VENT PLUGS	NOS	40			
c		Intercell connectors	NOS	40			
4.0	**508-14013-A**	**MANDATORY SPARES**					
		Complete dry cell	NOS.	2% or 2 Nos. whichever is more for each battery set			
		Intercell connectors with hardware	NOS.	10% or 5 nos. whichever is more for total puplation of 8 sets of battery			
		Vent plug	NOS.	10% or 5 nos. whichever is more for total puplation of 8 sets of battery			
		Acid level indicating float (for opaque containers only)	NOS.	10% or 5 nos. whichever is more for total puplation of 8 sets of battery			
		Stand insulator	NOS.	10% or 5 nos. whichever is more for total puplation of 8 sets of battery			
		Cell insulator	NOS.	10% or 5 nos. whichever is more for total puplation of 8 sets of battery			
	Note:	Detailed list of Mandatory spares (for meeting the above requirement) shall be submitted by vendor after award of contract. This list shall be subjected to approval of BHEL/ Customer without any price implication to BHEL.					
5.0	**508-11029-A**	**TYPE TEST**	Lot	1			Type test on Two cells of Battery
5.1		Test for capacity & test for voltage during discharge	Lot	1			
5.2		Ampere hour & watt hour efficiency test	Lot	1			
6.0	**508-14016-A**	**SUPV.OF E&C**					
	(i)	SUPV.OF E&C OF 220V DC Battery	SET	1			Refer Annexure-1A

Note: Cable Lugs at battery terminals shall be in bidder's scope & cable sizes shall be informed during detailed engineering.

4 X 270 MW BHADRADRI TPS **ANNEXURE-IA**

BOQ CUM PRICE SCHEDULE FOR SUPERVISION OF E&C CHARGES

SL.NO.	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM CHARGES PER VISIT FOR ENGINEER (EXCEPT DAILY CHARGES)	4 VISITS		
2	LUMP SUM DAILY CHARGES FOR ENGINEER	12 DAYS		

NOTES:

1) AMOUNT PAYABLE FOR ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (DAILY CHARGES AS PER SL. NO. 2 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE).

2) FREE SHARED ACCOMODATION, FOOD FACILITIES, LOCAL CONVEYANCE AT SITE, STORAGE SPACE FOR TOOLS SHALL BE PROVIDED F.O.C TO VENDOR.

ANNEXURE-II

LIST OF APPLICABLE STANDARDS

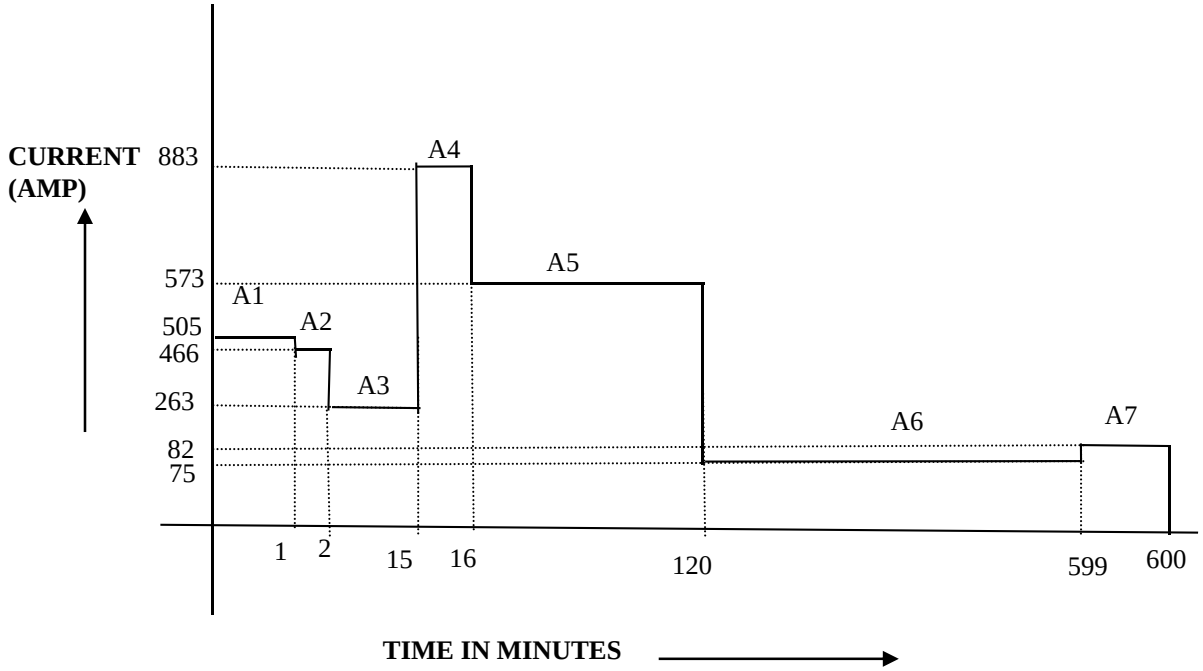
1.	STATIONERY LEAD ACID PLANTE BATTERY	IS 1652
2.	RECOMMENDED PRACTICE FOR SIZING LEAD ACID BATTERIES	IEEE 485
3.	SPECIFICATION FOR WATER FOR STORAGE BATTERIES	IS 1069
4.	SPECIFICATION FOR SULPHURIC ACID FOR LEAD ACID BATTERIES	IS 266
5.	RUBBER & PLASTIC CONTAINERS FOR LEAD ACID BATTERIES	IS 1146
6.	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.

ANNEXURE-III

(a) LOAD DUTY CYCLE FOR 220V DC SYSTEM



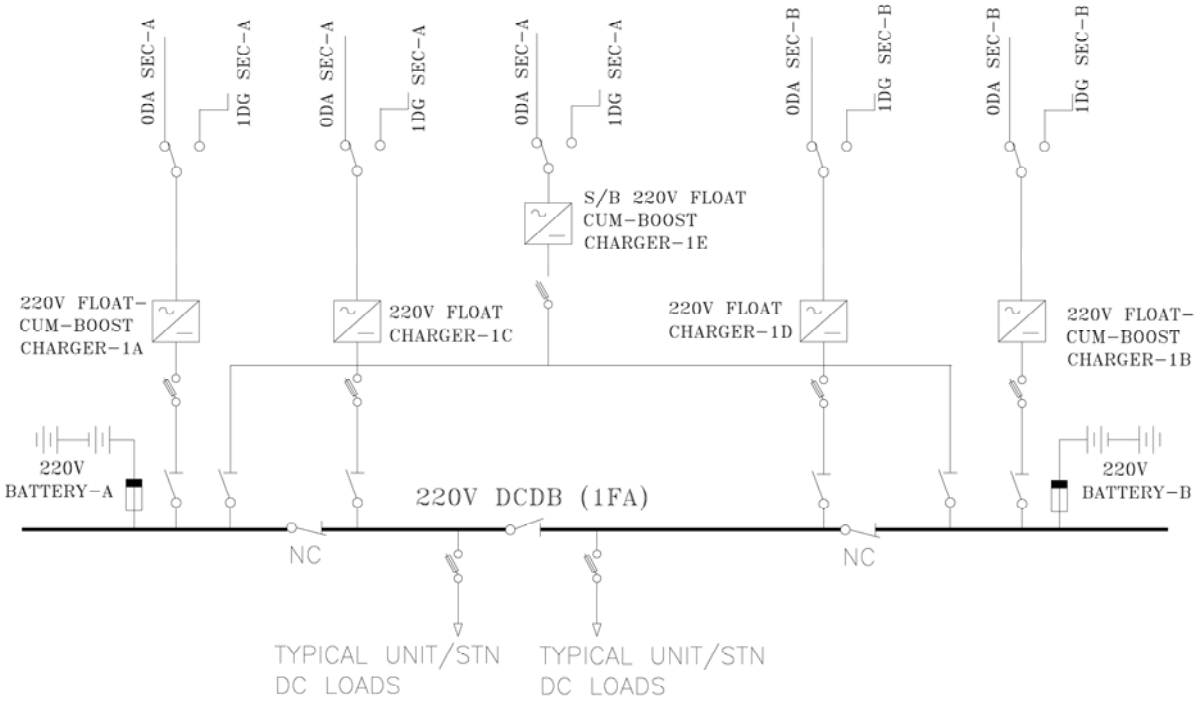
SL. No.	LOAD DESCRIPTION	QTY	AME PLAT RATING	LOAD(A) CONSRD	LOAD IN AMPS FOR 0-1 MIN	1-2MIN	2-15MIN	15-16MIN	16-120 MIN	120-599 MIN	599-600 MIN	CONT.	REV.
1	ELECTRICAL CONTROL PANEL	1+1		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
2	AVR PANEL	1+1		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0
3	EM.LUBE OIL PUMP(TURBINE)	1	13.0KW	97.00	0.00	300.70	97.00	97.00	97.00	0.00	0.00		0
4	SEAL OIL PUMP	1	9 KW	60.00	337.20	60.00	60.00	60.00	60.00	0.00	0.00		0
5	JACKING OIL PUMP	1	55.0KW	310.00	0.00	0.00	0.00	620.00	310.00	0.00	0.00		0
6	Accoustic Enclosure DC Lighting	1	3KW	13.64	13.64	13.64	13.64	13.64	13.64	13.64	13.64		0
7	DC LIGHTING	LOT		30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00		0
8	SCANNER AIR FAN	1	5.5KW	31.00	62.00	31.00	31.00	31.00	31.00	0.00	0.00		0
10	FSSS PANEL	1		4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	0
12	BTS PANEL	1+1		1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
13	6.6kV SWITCHBOARD TRIP COIL			21.00	21.00	0.00	0.00	0.00	0.00	0.00	0.00		0
14	6.6KV SWITCHBOARD CLOSING COIL			1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00		0
15	6.6KV SWITCHBOARD SPRING CHARGING MOTOR			2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00		0
16	415V SWITCHBOARD TRIP COIL			9.50	9.50	0.00	0.00	0.00	0.00	0.00	0.00		0
17	415V SWITCHBOARD CLOSING COIL			2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00		0
18	415 V SWITCHBOARD SPRING CHARGING MOTOR			2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00		0
19	GEN. RELAY PANEL	1+1		1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
20	GEN.TRANSFOMER COOLER CONTROL CAB.	1+1		1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
21	UT-1 COOLER CONTROL CAB.	1+1		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
22	UT-2 COOLER CONTROL CAB.	1+1		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
23	ST COOLER CONTROL CAB.	1+1		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
24	INDICATING LAMP	LOT		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0
25	NUMERICAL RELAY	LOT		3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	0
26	MULTIFUNCTION METER	LOT		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0
27	AUX. RELAY	LOT		7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	0
28	DATA CONCENTRATOR -MV	1+1		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
29	DATA CONCENTRATOR -LV	1+1		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
	TOTAL LOAD			**611.19**	**504.89**	**465.89**	**262.19**	**882.19**	**572.19**	**74.19**	**81.19**	**30.55**	
	LOAD AFTER ROUNDING OF FOR BATTERY / CHARGER SIZING				**505.0**	**466.0**	**263.0**	**883.0**	**573.0**	**75.0**	**82.0**	**31.0**	

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
6. MINIMUM RATING OF BATTERY : 2250Ah at 27 °C at 1.85 ECV

ANNEXURE-IV

ONE LINE DIAGRAM FOR 220V UNIT DC SYSTEM



ANNEXURE-V

ACCESSORIES

Following accessories shall be provided for each battery bank:

7.1 Each battery is furnished with following items

Sl. No.	Fittings
1	First charge of electrolyte plus 10% extra
2	Wooden/steel racks with 3 coats of electrolyte resistant paint
3	Stand insulators plus 5% extra
4	Cell inter-connectors with 5% extra and end take-off with one no. extra
5	Lead coated connection hardware plus 5% extra
6	Cell numbering tags with fixing arrangement (1 set)
7	Teakwood cable clamps with hardware (1 set)

7.2 Additionally, following set of accessories shall be provided for each battery:

S no	Name of accessory	QTY (in Nos.)
1	Hydrometer to measure specific gravity(in step of 0.005)	1
2	Set of hydrometer syringes (suitable for the vent holes in different cells for specific gravity reading)	1
3	Specific gravity correction chart	2
4	Battery trolley with nylon wheels and siphon	1
5	Digital Cell testing voltmeter (3-0-3V) with leads	2
6	Pocket thermometer for measuring electrolyte temperature	3
7	Set of Acid resisting funnel and jar of adequate capacity	2
8	Set of Rubber apron	2
9	Pair of rubber hand gloves' set	2
10	Insulated Spanners	2
11	Cell lifting straps	2
12	'No smoking' notice	2
13	Hot air gun	1

14	Goggles (industrial)	2
15	Instruction card	10
16	One set of inter cell, inter tie and interbank connectors	1
17	Battery log book	1
18	Wall mounting type holder for hydrometer and thermometer	2
19	Minimum and maximum temperature indicator for battery room	1
20	Self-adhesive PVC sticker for cell numberings	10

ANNEXURE-VI

LIST OF STANDARD DELIVERABLES

S. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.
1	Data Sheet for battery	PE-V0-411-508-E201
2	Battery sizing calculation (Including battery catalogues, curves etc)	PE-V0-411-508-E202
3	Fault calculation & Connector sizing calculation	PE-V0-411-508-E203
4	General Arrangement drawing for Battery	PE-V0-411-508-E204
5	Bill of Material for the battery	PE-V0-411-508-E205
6	List of Mandatory Spares for battery	PE-V0-411-508-E206
7	O & M manual for battery	PE-V0-411-508-E207
8	Field Quality Plan for battery	PE-V0-411-508-E208
9	Type test reports for the battery	PE-V0-411-508-E209
10	Cable Termination arrangement for battery terminal	PE-V0-411-508-E210
11	Quality Plan for battery	PE-QP-999-508-E002
12	Loose items to be shipped with battery	PE-V0-411-508-E211
13	Packing list (to be submitted after dispatch of battery)	PE-V0-411-508-E212
14	Battery room lay out	PE-V0-411-508-E213

ANNEXURE-VII

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	

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	:	107 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 (Min 2250Ah)
12.	Arrangement of batteries on racks	:	Single tier for batteries having cell weight 50kg or more.
13.	Connection from battery to Charger	:	2-1CX300sqmm (Cu)/ pole (Fire survival cable) (Tentative Size)
14.	Fault current (DC)	:	25 kA (Max)

Notes:

1. Bidder shall furnish following along with offer:

i) Battery capability / discharge curve.

ii) Battery sizing calculation

iii) 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-III of specification.**

DATA SHEET -C

S. No.	PARAMETER	UNIT	VALUE
1.0	Make and Type		
2.0	AH capacity at 27º 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	

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 27º C		
23.0	Recommended specific gravity of electrolyte at 27º 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		

BHEL	**QUALITY PLAN**		CUSTOMER : TESGENCO			PROJECT: 4x270 MW BHADRADRI TPS TITLE 220V DC BATTERY			SPECIFICATION NO. PE-TS-411-508-E001			
			BIDDER/ VENDOR :			STANDARD QUALITY PLAN NO.- PE-QP-999-508-E002, REV.			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 P	AGENCY W	AGENCY V	REMARKS
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/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

BHEL	**QUALITY PLAN**		CUSTOMER : TESGENCO			PROJECT: 4x270 MW BHADRADRI TPS TITLE 220V DC BATTERY			SPECIFICATION NO. PE-TS-411-508-E001			
			BIDDER/ VENDOR :			STANDARD QUALITY PLAN NO.- PE-QP-999-508-E002, REV.0			SPECIFICATION TITLE 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 P	AGENCY W	AGENCY V	REMARKS
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	
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	*# 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.*
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 enduarnce 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	-	*# Conduction of Type Tests from S.No. (d) to (g) shall be as per Annexure-A enclosed.*
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/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN		CUSTOMER : TESGENCO			PROJECT: 4x270 MW BHADRADRI TPS TITLE 220V DC BATTERY			SPECIFICATION NO. PE-TS-411-508-E001			
			BIDDER/ VENDOR :			STANDARD QUALITY PLAN NO.- PE-QP-999-508-E002, REV.0			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
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
e)	AH & WH efficiency Test	-do-	CR	As per IS:1652	Sample Plan as per IS:8320	IS:1652	IS:1652	Inspection Report	3/2	1	-	
f)	*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/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

ANNEXURE-A

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

LIST OF TYPE TEST FOR LEAD ACID BATTERY

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