BHEL	**PRE-QUALIFICATION REQUIRMENTS FOR DC LEAD ACID / NI-Cd BATTERIES** **[2X500 MW MAUDA FGD PROJCT]**	PE-PQ-444-508-E006 REVISION NO. 01 DATE 17/11/2023 SHEET NO. 1 OF 1

ITEMS AND TYPE OF BATTERY: DC Lead Acid / Ni-Cd Battery.

Vendor may be considered for evaluation for one or more of the following type of 220V of DC batteries:

Type 1 - Lead Acid (Plante) – 150AH & above
Type 2 - Ni Cd (Positive Pocket Plate) – 90AH & above

SCOPE: Supply : YES; Erection & Commissioning : NO; Supervision of Erection & Commissioning : 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	Option-1: Performance certificates for min. 2 years of trouble-free operation at two (2) different installations/sites for the applicable type of batteries. Performance certificate should be from end user only. Performance certificates should not be more than ten (10) years old from the date of techno- commercial bid opening. OR Option-2: Repeat order received from 2 different purchaser's / end users for the applicable type of batteries during last ten (10) years provided the gap between award of two POs is minimum 2 years. OR Option-3: 1 no. performance certificate (as per Option-1) and 1 no. repeat order (as per Option-2).
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 for establishing continuity in business.

Notes:

1. Consideration of offer shall be subject to customer's approval of bidders, 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 also 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. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
17.11.2023	17/11/23	17/11/2023	17/11/2025
NAME: VIKAS KUMAR SINGH DESIGNATION: MGR (E)	NAME: ANKUR ARORA DESIGNATION: SR. MGR (E)	NAME: SANDEEP LODH DESIGNATION: SR. DGM (E)	NAME: DEBASISA PATH DESIGNATION: AGM & DH (E)

2X500 MW MAUDA STAGE-I FGD

VOLUME – II

TECHNICAL SPECIFICATION FOR

220V DC Lead Acid / Ni-Cd BATTERY

SPECIFICATION NO: *PE-TS-444-508-E001*

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

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	**SPECIFICATION NO.** PE-TS-444-508-E001
		VOLUME II
		REVISION 0 | **DATE :** 16.11.2023
		SHEET 1 OF 1

CONTENTS

TOTAL NO. OF SHEETS =37 (INCLUDING COVER/ SEPARATOR SHEETS)

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001	
		VOLUME II	
		REVISION 0	DATE: 16.11.2023
		SHEET 1 of 1	

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in BOQ-Cum-Price schedule enclosed with NIT shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE: 16.11.2023
		SHEET 1 OF 3	

SECTION –I

SPECIFIC TECHNICAL REQUIREMENTS

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE: 16.11.2023
		SHEET 2 OF 3	

1.0 SCOPE OF ENQUIRY

1.1 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site & supervision of E&C of **220V DC BATTERY**.

1.2 Standard technical requirements of the **220V DC BATTERY** are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I & Data Sheet-A.

1.3 The stipulations of Section-I, followed by those of Data Sheet-A, followed by Section-II shall prevail in case of any conflict between the stipulations of Section-I, Section-II & Datasheet-A.

2.0 BILL OF QUANTITIES:

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

2.0 SPECIFIC TECHNICAL REQUIREMENTS:

3.1 Technical /Quality/ Inspection:

S. No.	*Reference clause No. of Section II (if any)*	*Specific Requirement/ Change*

3.2 In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM.
Supplier to give following undertaking in BOM:
" The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ----- Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

3.3 Documents required after award of LOI shall be as follows:

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE: 16.11.2023
		SHEET 3 OF 3	

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-V0-444-508-E102	GA AND BATTERY ROOM LAYOUT OF BATTERY BANK	21	9	7	18	55
PE-V0-444-508-E101	TDS FOR BATTERY	21	9	7	18	55
PE-V0-444-508-E103	BATTERY SIZING CALCULATION, FAULT CALCULATION AND CONNECTOR SIZING CALCULATION	21	9	7	18	55
PE-V0-444-508-E104	BILL OF MATERIAL FOR BATTERY	21	9	7	18	55
PE-V0-444-508-E108	LIST OF MANDATORY SPARES FOR BATTERY	21	9	7	18	55
PE-V0-444-508-E902	QUALITY PLAN FOR BATTERY	21	9	7	18	55
Secondary Documents						
PE-V0-444-508-E105	FIELD QUALITY PLAN PLAN FOR BATTERY					
PE-V0-444-508-E106	LIST OF E&C SPARES FOR BATTERY					
PE-V0-444-508-E107	LIST OF O&M SPARES FOR BATTERY					
PE-V0-444-508-E110	TYPE TEST REPORT FOR BATTERY					
PE-V0-444-508-E111	CABLE TERMINATION ARRANGEMENT FOR BATTERY TERMINAL					
PE-V0-444-508-E109	O&M MANUAL FOR BATTERY					

NOTES:

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

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

c) Primary documents shall be considered for Delay analysis

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO.PE-TS-444-508-E001	
		VOLUME II	
		SECTION I	
	DATA SHEET–A	REVISION 0	DATE :16.11.2023
		SHEET 1 OF 1	

1.	Rated voltage (V)	:	220V DC
2.	Type of Battery	:	Lead-Acid Plante OR Ni-Cd high discharge Pocket Plate type
3.	Conforming to	:	IEEE/ IEC/ IS standards
4.	DC system Fault level & duration	:	*25KA for 1 Sec*
5.	Material of Battery Rack	:	*Seasoned Teak Wooden for Lead Acid Battery/ Mild Steel Racks for Ni-CD battery*
6.	Design Ambient Temperature	:	50 Deg. C
7.	Minimum Electrolyte Temperature to be considered for Battery Sizing	:	*15* Deg. C
8.	No. of cells	:	*108 for Lead Acid Battery/ 170 for Ni-Cd Battery*
9.	End cell voltage		*1.85V/cell (Lead Acid) / 1.14V/ cell (Ni- Cd)*
10.	Nominal Float voltage (V)	:	2.25 V/cell (Lead-Acid)/1.42V/cell (Ni-Cd)
11.	Boost voltage (Maximum) (V)	:	2.7V/cell (Lead-Acid)/1.54 to 1.7V/cell(Ni-Cd)
12.	Minimum AH rating of Battery	:	150AH for Lead acid plante type / 90 AH for NiCd high discharge pocket plate type battery
13.	Load Cycle for sizing battery	:	Refer attached Annexure-II **
14.	Arrangement of batteries on racks	:	Single tier for batteries having cell weight 50kg or more.
15.	Cable size to be terminated at Battery end	:	*2 Run-1Cx630 sq.mm*
16.	Tapping to be provided in battery	:	*No*
17.	Tapping to be provided at which cell (if Tapping is applicable)	:	*NA*
18.	Recommended boost charging rate	:	Bidder to furnish the detail along with offer
19.	Recommended trickle charging rate	:	Bidder to furnish the detail along with offer

Notes :

1. Suitable number of copper lugs for cable termination at battery terminals shall be provided by bidder as per cable size to be informed by BHEL during detailed engineering. Tentative size of cable is mentioned above at sl. no. 15.

** If battery AH as per load cycle exceeds minimum value mentioned against sr. no. 12 of data sheet , bidder has to quote for that battery rating . If battery AH as per load cycle is below the minimum value mentioned against sr. no. 12 of data sheet , bidder has to quote for battery rating mentioned at sr. no. 12 of data sheet

	TECHNICAL SPECIFICATION FOR 220V BATTERY DATA SHEET–C	SPECIFICATION NO. PE-TS-444-508-E001
		VOLUME II B
		SECTION C
		REVISION 0 | DATE : 16.11.2023
		SHEET 1 OF 2

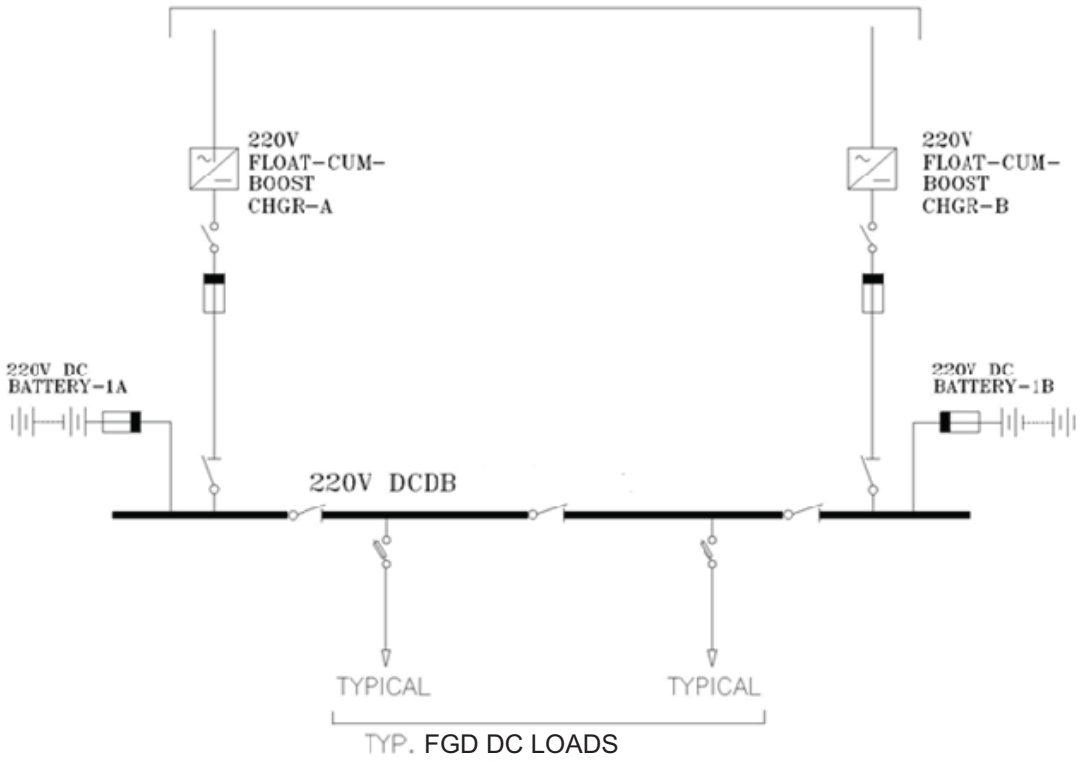
Sr. No.	PARAMETER	UNIT	VALUE
1.0	Make and Type		
2.0	AH capacity at 27º C and end voltage		
2.1	At 10 Hr discharge rate	AH	
2.2	At 1 Hr discharge rate	AH	
3.0	Battery Discharge current		
3.1	At one minute rate	Amp	
3.2	At 30 minutes rate	Amp	
3.3	At 30 minutes rate at end voltage	Amp	
3.4	At 60 minutes 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	
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 (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		

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO.PE-TS-444-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE: 16.11.2023
		SHEET 1 OF 1	

ANNEXURE-I

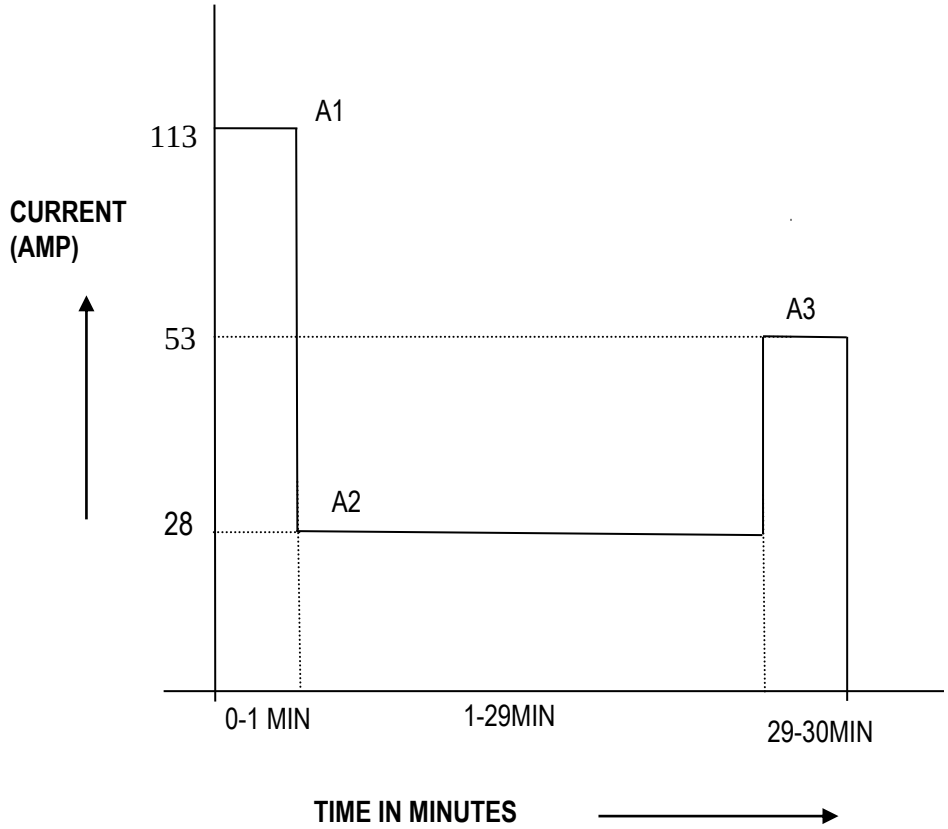
SINGE LINE DIAGRAM FOR 220V DC SYSTEM FOR FGD SYSTEM



	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001
		VOLUME II
		SECTION I
		REVISION 0 / DATE 16.11.2023
		SHEET 1 OF 1

ANNEXURE-II

LOAD DUTY CYCLE



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

MINIMUM ALLOWABLE CABLE VOLTAGE DROP	12.8 V for lead acid battery (108 x 1.85 V /cell - 187 V) / 6.8 V for Ni-Cd battery (170 x 1.14 V/ cell -187 V)
AGEING FACTOR	1.25
MIN.ELECTROLYTIC TEMP.	15 °C
DESIGN MARGIN	-NA-
BATTERY LOAD CYCLE DURATION	Supply total DC load of the associated area at an acceptable voltage for at least 30 minutes including DC lighting.
TEMPERATURE CORRECTION FACTOR	As per manufacturer's data.

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY	SPECIFICATION NO. PE-TS- 444-508-E001	
		VOLUME II	
		SECTION I	
		REVISION 0	DATE: 16.11.2023
		SHEET 1 OF 1	

ANNEXURE-III

DOCUMENTS REQUIRED ALONG WITH THE TECHNICAL OFFER

i. Capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue for considered factors.
ii. Unpriced Price Schedule as enclosed with NIT with “Quoted” word against items with bidder’s signature and company stamp.
iii. A copy of the sheet “Compliance certificate” with bidder’s signature and company stamp.
iv. A copy of sheet “Data Sheet-A” with required information and bidder’s signature and company stamp.

SECTION - II

STANDARD TECHNICAL REQUIREMENTS

CLAUSE NO.	TECHNICAL REQUIREMENTS

2.07.00 D.C. Systems

Complete DC system, comprising of batteries, battery charges, relays, contactors, timers etc shall be suitable for continuous operation at the maximum continuous float voltage including suitable temperature correction factors.

The battery sizing shall be done based on different types of continuous and intermittent loads including motor starting (wherever applicable) under complete blackout condition, for the duration specified so as to meet the system requirement (30 minutes minimum). All intermittent loads shall be considered with minimum 1 minute duration. The battery shall be sized considering a minimum electrolyte temperature of 15Deg C along with temperature correction factors as per relevant standard. An ageing factor of 1.25 shall be considered. The no. of cells and end cell voltage shall be considered based on the minimum and maximum voltage window and cable drop etc. as per system requirement.

Each system shall comprise of two nos. of batteries and two nos. of float-cum-boost chargers each rated for 100% capacity.

Boost/ fast charging time shall be as per worst operating condition and would satisfy technical requirements recommended by battery manufacturer.

Battery size shall be as per the following:

Area	DC Voltage	Load	Minimum Battery Bank Rating
FGD	220 V	supply total DC load of the associated area at an acceptable voltage for at least 30 minutes including DC Lighting	150AH for lead acid Plante type /90 AH for Ni-Cd High Discharge (KPH) type batteries

Note: Bidder has to calculate the actual rating of battery based on attached load cycle.

CLAUSE NO.	TECHNICAL REQUIREMENTS

BATTERY

1.00.00 BATTERY RATINGS

1.	**For Ni-Cd Type Battery**	
a)	Battery Voltage	220 V DC
b)	No. of Cells	170
c)	Battery type	Stationary Nickel-Cadmium Pocket Plate High discharge type (KPH)
d)	Capacity for five(5)hour rate	As per requirement
e)	Nominal discharge voltage per Cell	1.2 V
f)	Float voltage	As per manufacturer's standards for float application
2.	**For Lead Acid Plante type Battery**	
a)	Battery Voltage	220 V DC
b)	No. of Cells	As per Sizing Calculations
c)	Battery type	Stationary Lead Acid Plante high discharge type
d)	Capacity for ten(10)hour rate	As per requirement
e)	Nominal voltage per cell discharge	2.0 V
f)	Float Voltage	As per manufacturer's standards for float application

1.01.00 Commissioning of Battery

Commissioning of each battery at site shall only be carried out under the supervision of the battery manufacturer.

CLAUSE NO.	TECHNICAL REQUIREMENTS
PART-A:	**NICKEL-CADMIUM BATTERY**
2.00.00	**CODES AND STANDARDS**
2.01.00	All standards, specifications and codes of practice referred to herein, shall be the latest editions including all applicable official amendments and revisions as on date of opening of techno-commercial bid. In case of conflict between this specification and those (IS codes, Standards etc.) referred to herein, the former shall prevail. All works shall be carried out as per the following standards and codes: IEC 60623 / IS 10918 Specification for vented type Nickel Cadmium Batteries. IS 1069 Quality tolerances for water for storage batteries IEC 60993 Electrolyte for vented Nickel-Cadmium cells Indian electricity rules Indian Electricity Acts
2.02.00	Equipment complying with other internationally accepted standards such as IEC., BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of techno-commercial bid and shall clearly bring out the salient features for comparison.
3.00.00	**GENERAL TECHNICAL REQUIREMENT**
3.01.00	Equipments (a.) DC Batteries shall be stationary Nickel Cadmium Pocket plate type (KPH)/ (KPL) conforming to IS 10918. The batteries shall be high discharge performance type as specified. For the purpose of design an ambient temperature of 50 degree centigrade and relative humidity of 85% shall be considered. (b.) DC batteries shall be suitable for standby duty. The batteries shall normally be permanently connected to the load in parallel with a charger and shall supply the load during emergency conditions when AC supplies are lost. Batteries shall be suitable for a long life under continuous float operations and occasional discharges. The batteries shall be boost charged at about 1.54 to 1.7 volts per cell maximum and float charged at about 1.42 V/cell.

CLAUSE NO.	TECHNICAL REQUIREMENTS
	(c.) Batteries should be suitable for continuous operation for the maximum ambient temperature as defined in technical parameters.
3.02.00	Construction Features
3.02.01	Containers Containers shall be made of polypropylene plastic material. Containers shall be robust, heat resistance, leak proof, non absorbent, alkali resistant, non-bulging type and free from flaws, such as wrinkles, cracks, blisters, pin holes etc. Electrolyte level lines shall be marked on container in case of translucent containers.
3.02.02	Vent Plugs Vent plugs shall be provided in each cells. They shall be anti-splash type, having more than one exit hole shall allow the gases to escape freely but shall prevent alkali 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 for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte samples.
3.02.03	Plates The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuations of load. The construction of plates shall conform to latest revisions of IS 10918. The separators shall maintain the electrical insulation between the plates and shall allow the electrolyte to flow freely. Separators should be suitable for continuous immersion in the electrolyte without distortion. The positive and negative terminal posts shall be clearly marked.
3.02.04	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.
3.02.05	Electrolyte The electrolyte shall be prepared from battery grade potassium hydroxide conforming to IEC 60993. The cells can be shipped either in charged condition or in dry condition. Necessary electrolyte for make-up shall be supplied separately.

CLAUSE NO.	TECHNICAL REQUIREMENTS
3.02.06	Connectors and Fasteners Nickel plated copper connectors shall be used for connecting adjacent cells and PVC insulated flexible copper cables shall be used for inter-row / inter-tier / inter-bank connections. Bolts, nuts and washers shall be Stainless Steel / Nickel coated steel to prevent corrosion. The thickness of Nickel coating of connectors should be not less than 0.02 mm. All the terminals and cells inter-connectors shall be fully insulated or have insulation shrouds. End take off connections from positive and negative poles of batteries shall be made by single core cables having stranded AL conductors and XLPE insulation. Necessary supports and lugs for termination of these cables on batteries shall also be supplied by the contractor. All connectors and lugs shall be capable of continuously carrying the 30 minutes discharge current of the respective batteries and through fault short circuit current which the battery can produce and withstand for the period declared. Contractor shall furnish necessary sizing calculations to prove compliance to the same. Suitable number of Inter-rack connectors shall be supplied by the Bidder to suit the battery room layout during detailed engineering. End take-off cables shall be supplied by BHEL. Bidder to make suitable provision for terminating end take-off cables.
3.02.07	Battery racks Mild steel racks for all the batteries shall be provided. They shall be free standing type mounted on porcelain/hard rubber/PVC pads insulators/High impact plastic insulators. Batteries shall preferably be located in the single tier arrangement. However, batteries having a complete cell weight of lower than 50 Kg could be located in the double tier arrangement. The batteries racks and supports for cable termination shall be coated with three (3) coats of anti-alkali paint of approved shade. Name plates, resistant to alkali, for each cell shall be attached on to the necessary racks. The bottom tier of the stand shall not be less than 150 mm above the floor. Wherever racks are transported in dismantled conditions, match markings shall be provided to facilitate easy assembly.
3.02.08	Manufacturer's Identification System The following information shall be indelibly marked on outside of each cell. (a.) Manufacturers' name and trade marks (b.) Country and year of manufacture. (c.) Manufacturer type designation. (d.) AH capacity at 5 hour discharge rate.

CLAUSE NO.	TECHNICAL REQUIREMENTS
	(e.) Serial number
4.00.00	**THE FOLLOWING INFORMATION SHALL BE GIVEN ON THE INSTRUCTION CARDS SUPPLIED WITH THE BATTERY:**
	(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 IS 10918.
	(d.) Storing conditions of electrolyte.
5.00.00	**TESTS**
5.01.00	All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of techno-commercial bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
5.02.00	However, if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of techno-commercial bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.
5.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
5.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design change”. Minor changes if any shall be highlighted on the endorsement sheet.
5.05.00	GENERAL The Contractor shall submit for Owner’s approval the reports of all the type tests carried out as per latest IS-1146 (for all applicable tests for containers) / IS-10918 (for Ni-Cd batteries). The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.

26.02.2018

CLAUSE NO.	TECHNICAL REQUIREMENTS
5.06.00	Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of battery.
5.07.00	Commissioning Checks: All tests as listed below shall be carried out on sample cell selected at random by the employer at site after completion of installation. (a.) Physical Examination (b.) Dimensions, Mass & layout (c.) MARKING (d.) Polarity and absence of short circuit. (e.) Ampere - hour capacity--4 Cycles (f.) Retention of charge (g.) Insulation resistance The Contractor shall arrange for all necessary equipment, including the variable resistor, tools, tackles and instruments.

CLAUSE NO.	TECHNICAL REQUIREMENTS
PART-B:	**LEAD –ACID PLANTE BATTERY**
6.00.00	**CODES & STANDARDS**
6.01.00	All standards, specification and codes of practice, referred to herein, shall be the latest edition including all applicable official amendments and revisions as on date of opening of techno-commercial bid. In case of conflict between this specification and those (IS Codes Standards etc.) referred to herein, the former shall prevail. All works shall be carried out as per the following standards and codes: IEC 60896 Stationary Lead-Acid Batteries IS 266 Specification for sulphuric acid IS 1069 Specification for water for storage batteries IS 1146 Specification for rubber & plastic containers for lead acid storage batteries. IS 1652 Specification for stationary cells and batteries, lead acid type (with plante positive plates). IS 3116 Specification for sealing compound for lead acid batteries. IS 8320 General requirements and methods of tests for lead acid storage batteries. IS 6071 Specification for synthetic separators for lead acid batteries. Indian Electricity Rules Indian Electricity Acts
6.02.00	Equipment complying with other internationally accepted standards such as IEC, BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards alongwith copies of all official amendments and revisions in force as on date of opening of techno-commercial bid and shall clearly bring out the salient features for comparison.

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.00.00	**GENERAL TECHNICAL REQUIREMENTS**
7.01.00	Equipments DC Batteries shall be stationary lead acid Plante positive plate type conforming to IS 1652. The battery shall be high discharge performance type. For the purpose of design an ambient temperature of 50 degree centigrade and relative humidity of 85% shall be considered. DC Batteries shall be suitable for standby duty. The Batteries shall normally be permanently connected to the load in parallel with a charger and shall supply the load during emergency conditions when AC supplies are lost. Batteries shall be suitable for a long life under continuous float operations and occasional discharges. The batteries shall be boost charged at about 2.7 volts per cell maximum and float charged at about 2.25 V/cell: Batteries should be suitable for continuous operation for the maximum ambient temperature as defined in technical parameters.
7.02.00	Construction Features
7.02.01	Containers Containers shall be made of transparent glass, hard rubber, suitable robust, heat resistance, leak proof, non absorbent, acid resistant, non-bulging type and free from flaws, such as wrinkles, cracks, blisters, pin holes etc. Electrolyte level lines shall be marked on container in case of transparent containers. Float type level indicator shall be provided in case of opaque containers. The stem portion of the float should be long enough to prevent falling of the float inside the container even if there is no electrolyte in the container. The marking for the electrolyte level should be for the upper and lower limits. The material of level indicator shall be acid proof and oxidation proof. Container shall be closed/sealed lid type. Lid and sealing compound shall be non-cracking type. The container made of hard rubber and plastics shall be type tested as per IS 1146. All type tests shall be carried out for sealing compound as per IS 3116. The pole sealing arrangement should be such that no acid particle get entrapped due to acid creep as a result of capillary action and it should be possible to remove and refix the sealing to carry out the maintenance.
7.02.02	Vent Plugs Vent plugs shall be provided in each cells. They shall be antis-plash type, 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

CLAUSE NO.	TECHNICAL REQUIREMENTS
	kept to minimum. In addition the ventilator shall be easily removed for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte sample.
7.02.03	Plates The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuations of load. The construction of plates shall conform to latest revisions of IS 1652 as applicable. The separators shall maintain the electrical insulation between the plates and shall allow the electrolyte to flow freely. Separators should be suitable for continuous immersion in the electrolyte without distortion. The positive and negative post shall be clearly marked.
7.02.04	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.
7.02.05	Cell Insulator Each cell shall be separately supported on PVC/porcelain/hard rubber insulators fixed on the racks with adequate clearance between adjacent cells. Minimum distance between adjacent cells shall be more than the bulge allowed for two cells in accordance with IS 1146.
7.02.06	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 dry uncharged. The electrolyte shall be supplied separately.
7.02.07	Connectors and Fasteners Lead or Lead coated copper connectors shall be used for connecting up adjacent cells and rows. Bolts, nuts and washers shall be effectively lead coated to prevent corrosion. The thickness of lead-coating of connectors should not be less than 0.025 mm. The lead coating thickness shall be measured in accordance with APPENDIX F of IS 6848 (latest edition). All the terminals and cells inter-connectors shall be fully insulated or have insulation shrouds. End take off connections from positive and negative poles of batteries shall be made by single core cables having stranded copper conductors and PVC insulation. Necessary supports and lugs for termination of these cables on batteries shall also be supplied by the contractor. All connectors and lugs shall be capable of continuously carrying the 30 minutes discharge current

CLAUSE NO.	TECHNICAL REQUIREMENTS

of the respective Batteries and through fault short circuit current which the battery can produce and withstand for the period declared. Contractor shall furnish necessary sizing calculations to prove compliance to the same. End take-off cables shall be supplied by BHEL. Bidder to make suitable provision for terminating end take-off cables.

7.02.08 Battery racks

Wooden racks for all the batteries shall be provided. These racks shall be made of good quality first class seasoned teak wood in line with CPWD specification. They shall be free standing type mounted on porcelain/hard rubber/PVC pads insulators/High impact plastic insulators. Batteries shall preferably be located in the single tier arrangement. However, batteries having a complete cell weight of lower than 50 Kg could be located in the double tier arrangement. The batteries 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 attached on to the necessary racks. 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.

7.02.09 Manufacturer's Identification Systems

The following information shall be indelibly marked on outside of each cell.

(a.) Manufacturer's name and trade marks

(b.) Country and year of manufacture.

(c.) Manufacturer type designation.

(d.) AH capacity at 10 hour discharge rate.

(e.) Serial number

8.00.00 TESTS

8.01.00 All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of techno-commercial bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

26.02.2018

8.02.00 However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of techno-commercial bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the

CLAUSE NO.	TECHNICAL REQUIREMENTS
	owner either at third party lab or in presence of client/owners representative and submit the reports for approval.
8.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
8.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design change". Minor changes if any shall be highlighted on the endorsement sheet.
8.05.00	GENERAL The Contractor shall submit for Owner's approval the reports of all the type tests carried out as per latest IS-1146 (for rubber & plastic containers for lead-acid storage batteries)/IS 1652 (for lead-acid plante batteries). The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.
8.06.00	Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of battery.
8.07.00	Commissioning Checks: All tests as listed below shall be carried out on sample cell selected at random by the employer at site after completion of installation. 1) Verification of markings. 2) Verification of dimensions. 3) Test for capacities for 10 hrs discharge rate alongwith the test for voltage during discharge. The Contractor shall arrange for all necessary equipment, including the variable resistor, tools, tackles and instruments.

Note : NTPC approved QAP available with vendor for any previous projects shall also be accepted.

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 1 OF 7

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	**CELL CONTAINER**													
a)	Dimensional & Constructional Conformance	Visual	MA	Measurement	Sampling as per IS-2500(1)-2000, S-3 Level	-	IS-10918/ Manufacturer's Drg./ Std.	IS-10918/ Manufacturer's Drg./ Std.	Inspection Report	√	P	V	-	
b)	Ball Drop Test	Mechanical	MA	Mechanical	1 Sample/Batch	-	IS-1146/ Manufacturer's Drg./ Std.	IS-1146/ Manufacturer's Drg./ Std.	Manufacturer's TC	√	P	V	-	
c)	Hydraulic Thrust Endurance Test	Physical	MA	Physical	1 Sample/Batch	-	-do-	-do-	-do-	√	P	V	-	
d)	Resistance to Acid	Chemical	MA	Chemical	1 Sample/Batch	-	-do-	-do-	-do-	√	P/V	V	-	
e)	HV Test	Electrical	MA	Electrical	3 Sample/Batch	-	-do-	-do-	-do-	√	P/V	V	-	
f)	Shade Difference, Straightness of Side Walls, Free from Burrs, Flash lines etc.	Visual	MA	Visual	100%	-	-	Free From Visual Defects	Inspection Report		P	-	-	
1.2	**TERMINAL POST**													
a)	Dimensional Conformance	Visual	MA	Measurement	Sampling as per IS-2500(1)-2000, S-3 Level	-	IS-10918/ Manufacturer's Drg./ Std.	IS-10918/ Manufacturer's Drg./ Std.	Inspection Report	√	P	V	-	
b)	Material Conformance	Chemical	CR	Chemical	1 Sample/Batch	-	As per IS-2062	IS-2062	Manufacturer's TC	√	P	V	-	External Report
c)	Thread size depth & chamfer	Physical	MA	Measurement & Visual	1 Sample/Batch	-	-do-	-do-	-do-	√	P	V	-	
d)	Surface finish & defects	Visual	MA	Visual	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Inspection Report	√	P	V	-	
e)	Plating Quality	Physical/ Visual	CR	Visual & Thickness	Sampling as per IS-2500(1)-2000, S-3 Level	-	-do-	-do-	Plating Report	√	P	V	-	
1.3	**CONNECTOR**													
a)	Material Conformance	Chemical	CR	Chemical	1 Sample/Batch	-	As per IS-1897/ IS-191	As per IS-1897/ IS-191	Manufacturer's TC	√	P/V	V	V	External Report
b)	Dimensional Conformance	Visual	MA	Measurement	Sampling as per IS-2500(1)-2000, 2.5%AQL	-	Approved drg/ doc & Manufacturer's Std.	Approved drg/ doc & Manufacturer's Std.	Inspection Report	√	P	V	V	
c)	Visual Defects	Visual	MA	Visual	100%	-	-	Free From Visual Defects & Burrs	-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		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN Date: 2020.12.01 17:02:27 +05'30'

MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manish.shukla@bhel.in, c=IN Date: 2020.12.01 17:51:15 +05'30'

Kunal Gandhi Digitally signed by Kunal Gandhi DN: cn=Kunal Gandhi, o=BHEL, ou=PEM, email=kunalgandhi@bhel.in, c=IN Date: 2020.12.02 08:26:30 +05'30'

RITESH KUMAR JAISWAL

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
		CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
		PROJECT			P.O NO.:-	DATE:-
		ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 2 OF 7

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	
d)	Plating Quality (Duplex)	Physical/ Visual	CR	Visual & Thickness	Sampling as per IS-2500(1)-2000, S-3 Level	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Manufacturer's TC	√	P	V	V	External Report
1.4	**SEPARATOR**													
a)	Dimensional Conformance	Visual	MA	Measurement	Sampling as per IS-2500(1)-2000, S-3 Level	-	IS-10918/ Manufacturer's Drg./ Std.	IS-10918/ Manufacturer's Drg./ Std.	Inspection Report	√	P	V	-	
b)	Colour shade difference, burrs, flash at the edge	Visual	MA	Visual	Sampling as per IS-2500(1)-2000, S-3 Level	-	-	Free From Visual Defects	-do-		P	-	-	
1.5	**VENT CAPS**													
a)	Dimensional Conformance	Visual	MA	Visual & Measurement	Sampling as per IS-2500(1)-2000, S-3 Level	-	-	Refer Remarks#	Inspection Report	√	P	V	V	# Vent cap shall be easily removed for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into vent to take electrolyte sample.
1.6	**RUBBER COMPONENTS (GASKETS & SEALING RING ETC)**													
a)	Material Quality	Physical	CR	Shore Hardness	1 Sample/Lot	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Inspection Report	√	P	V	-	
b)	Resistance to alkali & oil	Chemical	MA	Chemical	3 Sample/Lot	-	-do-	-do-	Manufacturer's TC	√	P	V	-	External Report
c)	Dimensional Conformance	Visual	MA	Measurement	Sampling as per IS-2500(1)-2000, S-3 Level	-	-do-	-do-	Inspection Report	√	P	V	-	
d)	Flash or burrs	Visual	MA	Visual	100%	-	-	Free from Defects	-do-		P	-	-	
1.7	**STRIPS**													
a)	Plating Quality including thickness	Dimension	CR	Measurement	1 sample/ coil	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Inspection Report	√	P	V	V	Nickel plating thickness of steel strip will be as per vendor specific design, meeting cell capacity and other technical parameters of the spec

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR Date: 2020.12.01 17:03:34 +05'30'

MANISH Digitally signed by MANISH Date: 2020.12.01 17:51:57 +05'30'

Digitally signed by Kunal Gandhi Date: 2020.12.02 08:26:42 +05'30'

RITESH KUMAR JAISWAL

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 3 OF 7

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	**IN-PROCESS**													
2.1	**BRIQUETTE FORMATION**													
a)	Visual Checks for Empty Pockets	Visual	CR	Measurement	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Inspection Report	√	P	V	V	
b)	Weight Check	Visual	CR	Measurement	Sample	-	-do-	-do-	-do-	√	P	V	V	
2.2	**PLATE BLANK MANUFACTURING**													
a)	Dimesional Conformance	Visual	MA	Measurement	10 Sample/Batch	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Process Quality Report	√	P	V	V	
b)	Absence of Defects	Visual	MA	Measurement	100%	-	-do-	-do-	-do-	√	P	V	V	Empty Pockets not Allowed in any Form
2.3	**PLATE ASSEMBLY**													
a)	Dimesional Conformance	Visual	MA	Measurement (Thick. & Width)	5 Sample/Batch	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Process Quality Report		P	-	-	
b)	Quality of Spot Welding	Visual	MA	Visual Inspection	100%	-	-do-	-do-	-do-		P	-	-	
2.4	**PLATE BLOCK ASSEMBLY**													
a)	Assembly Correctness of +Ve & -Ve Groups	Visual	MA	Visual	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Process Quality Report		P	-	-	
b)	Correctness of Insulation grid	Visual	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
c)	Tightness of Stack	Visual	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
d)	Plate Block Tightness	Physical	CR	Measurement	100%	-	-do-	-do-	-do-		P	-	-	
e)	Position of Terminals	Visual	MA	Gauging	100%	-	-do-	-do-	-do-		P	-	-	
f)	Dimensional Conformance	Visual	MA	Measurement	100%	-	-do-	-do-	-do-		P	-	-	
2.5	**FORMATION ASSEMBLY**													
a)	Function/ Capacity	Measurement	CR	Charging & Discharging	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Test Report	√	P	V	V	
2.6	**CELL ASSEMBLY**													
a)	Correctness of Plate Block	Visual	MA	Visual	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Process Quality Report	√	P	V	V	
b)	Position of Inner Sealing Parts	Visual	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
c)	Lock Washer Fitment	Visual	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR

MANISH

Kunal Gandhi

RITESH KUMAR JAISWAL

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 4 OF 7

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	
d)	Polarity of Terminals	Visual & Measurement	CR	Voltage Checking according to Polarity Marking	100%	-	Manufacturer's Drg./ Std.	Manufacturer's Drg./ Std.	Process Quality Report	√	P	V	V	
e)	Soundness of Sealing & Welding	Visual & Measurement	MA	Pneumatic Pressure Test	100%	-	-do-	-do-	-do-	√	P	V	V	In case of Leakage, Bubble, the Container is rejected
f)	Cell Identification	Visual	MA	Visual	100%	-	-do-	-do-	-do-	√	P	V	V	
3.0	**IN-PROCESS(CHEMICAL CONTROL)**													
3.1	**POTTASSIUM HYDROXIDE (SOLID KOH)**													
a)	Determination of Assay(KOH)	Chemical	MA	Quantitative Analysis	As per Chemical supplier Instruction	-	IEC-60993/IS-6831	Analysis Report	Manufacturer's TC		P	-	-	External Report
b)	Determination of K2Co3	Chemical	MA	-do-	-do-	-	-do-	-do-	-do-		P	-	-	-do-
c)	Determination of KCL	Chemical	MA	-do-	-do-	-	-do-	-do-	-do-		P	-	-	-do-
3.2	**LITHIUM HYDROXIDE (SOLID LIOH)**													
a)	Determination of Assay(LIOH) H2O	Chemical	MA	Quantitative Analysis	As per Chemical supplier Instruction	-	IEC-60993	Analysis Report	Manufacturer's TC		P	-	-	External Report
b)	Determination of Li2Co3	Chemical	MA	Quantitative Analysis	-do-	-	-do-	-do-	-do-		P	-	-	-do-
c)	Determination of LiCL	Chemical	MA	Quantitative Analysis	-do-	-	-do-	-do-	-do-		P	-	-	-do-
d)	Determination of Other Impurities	Chemical	MA	Quantitative Analysis	-do-	-	-do-	-do-	-do-		P	-	-	-do-
3.3	**DI WATER PREPARATION**													
a)	Determination of Chlorides	Chemical	MA	Quantitative Analysis	As per Chemical supplier Instruction	-	IEC-60993	Analysis Report	Manufacturer's TC		P	-	-	External Report
b)	Sulpahtes	Chemical	MA	Quantitative Analysis	-do-	-	-do-	-do-	-do-		P	-	-	-do-
c)	Nitrates	Chemical	MA	Quantitative Analysis	1 Sample	-	-do-	-do-	-do-		P	-	-	-do-
d)	Silicons	Chemical	MA	Quantitative Analysis	1 Sample	-	-do-	-do-	-do-		P	-	-	-do-

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN Date: 2020.12.01 17:04:43 +05'30'

MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manish.shukla@bhel.in, c=IN Date: 2020.12.01 17:53:09 +05'30'

Kunal Gandhi Digitally signed by Kunal Gandhi DN: cn=Kunal Gandhi, o=BHEL, ou=PEM, email=kunalgandhi@bhel.in, c=IN Date: 2020.12.02 08:27:07 +05'30'

RITESH KUMAR JAISWAL

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 5 OF 7

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	
e)	Aluminium	Chemical	MA	Quantitative Analysis	1 Sample	-	IEC-60993	Analysis Report	Manufacturer's TC		P	-	-	External Report
f)	Calcium, Magnesium	Chemical	MA	Quantitative Analysis	1 Sample	-	-do-	-do-	-do-		P	-	-	-do-
g)	Organic Impurities	Chemical	MA	Quantitative Analysis	1 Sample	-	-do-	-do-	-do-		P	-	-	-do-
h)	PH	Chemical	MA	Quantitative Analysis	1 Sample/day	-	-do-	-do-	-do-	√	P	V	V	-do-
i)	Conductivity	Chemical	MA	Quantitative Analysis	1 Sample/day	-	-do-	-do-	-do-	√	P	V	V	-do-
3.4	**TYPE-B ELECTROLYTE PREPARTION**													
a)	Specific Gravity	Chemical	CR	Hydrometeric Test	1 Sample/Batch	-	As per Chemical Supplier Instruction	As per Chemical Supplier Instruction	Manufacturer's TC	√	P	V	V	External Report
3.5	**ELECTROLYTE TYPE B22 HAVING LIOH 55% PURITY (i.e. 40gms/litre) WILL BE USED FOR FIRST FILLING**													
a)	Determination of Carbonisation gms/Ltr.	Chemical	CR	Quantitative Analysis	1 Sample/Batch	-	IEC-60993	As per Chemical Supplier Instruction	Manufacturer's TC	√	P	V	V	External Report
b)	Determination of Chlorides	Chemical	MA	Quantitative Analysis	1 Sample/Batch	-	-do-	-do-	-do-	√	P	V	V	-do-
c)	Determination of Sulphates	Chemical	MA	Quantitative Analysis	1 Sample/Batch	-	-do-	-do-	-do-	√	P	V	V	-do-
c)	Determination of Lithium Hydroxide (LIOH)	Chemical	MA	Quantitative Analysis	1 Sample/Batch	-	-do-	-do-	-do-	√	P	V	V	-do-
4.0	**FINISHED BATTERY**													
	Note: Before Start of Inspection, Manufacturer Internal Inspection Record(QC) of the offered Batteries to be Verified													
4.1	**ROUTINE TEST**													
a)	Physical Examination	Visual	MA	Visual	Sampling as per IS-8320	Sampling as per IS-8320	IS:10918 & IS:8320	IS:10918 & Approved drg/ doc	Inspection Report	√	P	V	V	
b)	Dimension, Mass and Layout	Dimension & Visual	MA	Measurement & Visual	-do-	-do-	Approved drg/ doc	-do-	-do-	√	P	V	V	
c)	Cell Marking	Visual	MA	Visual	100%	100%	-do-	-do-	-do-	√	P	V	V	
d)	Polarity & Absence of Short Circuit	Electrical	MA	Electrical	100%	100%	IS:10918	-do-	-do-	√	P	V	V	By Voltage Meas. accordingly to Polarity

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN Date: 2020.12.01 17:05:13 +05'30'

MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manish.shukla@bhel.in, c=IN Date: 2020.12.01 17:53:43 +05'30'

Kunal Gandhi Digitally signed by Kunal Gandhi DN: cn=Kunal Gandhi, o=BHEL, ou=PEM, email=kunalgandhi@bhel.in, c=IN Date: 2020.12.02 08:27:19 +05'30'

RITESH KUMAR JAISWAL

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E004, REV.02	DATE:-03/11/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- DC NI-CD BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 6 OF 7

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	
4.2	**TYPE TEST # #**													
a)	Physical Examination	Visual	MA	Visual	Sampling as per IS-8320/IS-10918	Sampling as per IS-8320/IS-10918	IS:10918 & Approved drg/ doc	IS:10918 & Approved drg/ doc	Type Test Report	√	P	W	W	
b)	Dimensions, Mass & Layout	Dimension & Visual	MA	Measurement & Visual	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
c)	Cell Marking	Visual	MA	Visual	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
d)	Polarity & absence of short circuit	Electrical	MA	Electrical	-do-	-do-	-do-	-do-	-do-	√	P	W	W	By Voltage Meas. accordingly to Polarity
e)	Air pressure test	Visual	MA	Meas. of Pr. Drop in 15 Sec	-do-	-	-do-	-do-	-do-	√	P	V	V	# # Conduction of Type Tests from S.No. (e) to (l) shall be as per Annexure-A enclosed. If Conduction of Type test is required as per Ann-A, then Same shall be Witnessed ('W') by BHEL/Customer in place of Verification('V') under column 'C' and 'N' of AGENCY(10) Above
f)	Insulation Resistance	Electrical	MA	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
g)	Ampere-hour capacity	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
h)	Retention of Charge	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
i)	Test for discharge performance at low temp.	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
j)	Life Cycle Test	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
k)	Dielectric Test	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
l)	Storage Test	Electrical	CR	Electrical & Measurement	-do-	-	-do-	-do-	-do-	√	P	V	V	
4.3	**ACCEPTANCE TEST**													
a)	Physical Examination	Visual	MA	Visual	Sampling as per IS-8320	Sampling as per IS-8320	IS:10918 & Approved drg/ doc	IS:10918 & Approved drg/ doc	Inspection Test Report	√	P	W	W	
b)	Dimensions, Mass & Layout	Dimension & Visual	MA	Measurement & Visual	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
c)	Cell marking	Visual	MA	Visual	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
d)	Polarity and absence of short circuit	Electrical	MA	Electrical	-do-	-do-	-do-	-do-	-do-	√	P	W	W	By Voltage Meas. accordingly to Polarity
e)	Air pressure test	Visual	MA	Meas. of Pr. Drop in 15 Sec	-do-	-do-	-do-	-do-	-do-	√	P	W	W	

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN Date: 2020.12.01 17:05:41 +05'30'

MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN Date: 2020.12.01 17:54:26 +05'30'

Digitally signed by Kunal Gandhi DN: cn=Kunal Gandhi, o=BHEL, ou=PEM, email=kunalgandhi@bhel.in, c=IN Date: 2020.12.02 08:27:31 +05'30'

RITESH KUMAR JAISWAL

BHEL	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN						SPEC NO.:-PE-TS-XXX-508-E001		DATE:-				
		CUSTOMER						QP NO.:-PE-QP-999-508-E004, REV.02		DATE:-03/11/2020				
		PROJECT						P.O NO.:-		DATE:-				
		ITEM:- DC NI-CD BATTERY			SYSTEM:- DC SYSTEM			SECTION:-		SHEET 7 OF 7				
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**	
f)	Insulation Resistance	Electrical	MA	Electrical & Measurement	Sampling as per IS-8320	Sampling as per IS-8320	IS:10918 & Approved drg/ doc	IS:10918 & Approved drg/ doc	Inspection Report	√	P	W	W	
g)	Ampere-hour capacity	Electrical	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
5.0	**BATTERY RACKS**	Visual & Dimension	MA	Visual & Dimension	1 Sample	1 Sample	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	V	
6.0	**ACCESSORIES**	Visual & Dimension	MA	Visual & Dimension	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	
7.0	**CABLE LUGS AND TERMINAL PLATE**	Visual	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	
8.0	**PACKING**	Verification of Packing Methods, Finish & Completeness	MA	Visual	100%	100%	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	-do-	√	P	W	-	($$)- Approved Packing Drg./ Doc Applicable for Export Job/Projects

NOTES:-

1. Wherever IS standard is mentioned, equivalent IEC/International standard is also acceptable as per applicability of test. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.
2. BHEL Reserves the right for conducting repeat test, if required.
3. Photographs of complete Battery Package items after packaging to be sent to BHEL-Purchase Group for review before issuing MDCC.
4. In case, any changes in QAP commented by customer at contract stage shall be carried out by bidder without any implication to BHEL/Customer.
5. Project Specific QAP to be developed based on customer requirement. .
6. For Export Job, BHEL technical specification for sea worthy packing to be followed.
7. Packing shall be suitable for storage at site in tropical climate conditions.

LEGEND :

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

** **M:** SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N:** CUSTOMER

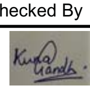
P: PERFORM**, W:** WITNESS**, V:** VERIFICATION**,** AS APPROPRIATE

MA: MAJOR**, MI:** MINOR**, CR:** CRITICAL**, D:** DOCUMENTATION

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.12.01 17:06:11 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.12.01 17:54:58 +05'30'



Digitally signed by Kunal Gandhi
DN: cn=Kunal Gandhi, o=BHEL, ou=PEM, email=kunalgandhi@bhel.in, c=IN
Date: 2020.12.02 08:27:42 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.12.02 09:44:23 +05'30'

ANNEXURE-A

STANDARD QUALITY PLAN
STANDARD QP NO. : PE-QP-999-508-E004, REV. 02

LIST OF TYPE TEST FOR NI-CD 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	• Air pressure test	IS:10918	NO	*YES
		• Insulation Resistance	IS:10918	NO	*YES
		• Ampere-hour capacity	IS:10918	NO	*YES
		• Retention of Charge	IS:10918	NO	*YES
		• Test for discharge performance at low temp.	IS:10918	NO	*YES
		• Life Cycle Test	IS:10918	NO	*YES
		• Dielectric Test	IS:10918	NO	*YES
		• Storage Test	IS:10918	NO	*YES

26.02.2018

NOTES: (*)
1) Type test reports to be submitted which should be carried out within last 10 years from the date of techno commercial bid opening

2) All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the indicated date. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
3) However, if the contractor is not able to submit report of the type test(s) conducted within last ten years from the indicated date, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

Note : NTPC approved QAP available with vendor for any previous projects shall also be accepted.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
		CUSTOMER			QP NO.:-PE-QP-999-508-E002, REV.01	DATE:- 30/06/2020
		PROJECT			P.O NO.:-	DATE:-
		ITEM:- DC LEAD ACID BATTERY		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 1 OF 3

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**													
1.1	(Pure Lead for Pos. plate, Lead Alloy for Neg. plate & Sulphuric acid)	Chemical	MA	Chemical Analysis	Random Sample	-	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-	-do-	√	P	V	-	
c)	Chemical	Chemical	MA	Chemical	Random Sample	-	(For Synthetic IS : 6071)	(For Synthetic IS : 6071)	-do-	√	P	V	-	
d)	Electrical Resistance Test	Electrical	MA	Electrical	Random Sample	-	-do-	-do-	-do-	√	P/V	V	-	
e)	Acceptance test Dimension, Volume Porosity, Wettability of separator	Test	MA	Test	Random Sample	-	-do-	-do-	-do-	√	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-	-do-	√	P	V	-	
c)	Thread size depth & chamfer	Physical	MA	Measurement	Random Sample	-	-do-	-do-	-do-	√	P	V	-	
d)	Surface finish & defects	Visual	MA	Visual	100%	-	-do-	-do-	-do-	√	P	V	-	
e)	Plating Quality	Thickness	CR	Measurement	Random Sample	-	-do-	-do-	-do-	√	P	V	-	
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.	√	P/V	V	V	
b)	Thickness of lead coating	Thickness	CR	Measurement	Random Sample	-	-do-	-do-	-do-	√	P/V	V	V	
1.5	**VENT CAP**													
a)	Dimensional Conformance	Dimension	MA	Measurement	Random Sample	-	IS:1652 & Appd. Drg./Doc. Also Refer Remarks#	IS:1652 & Appd. Drg./Doc. Also Refer Remarks#	Test Cert.	√	P	V	V	*# Vent cap shall be easily removed from topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into vent to take electrolyte sample.*

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:39:00 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:48:02 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:12:36 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb1 89777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e 93ff20530f462c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:10:07 +05'30'

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN					SPEC NO.:-PE-TS-XXX-508-E001			DATE:-			
		CUSTOMER					QP NO.:-PE-QP-999-508-E002, REV.01			DATE:- 30/06/2020			
		PROJECT					P.O NO.:-			DATE:-			
		ITEM:- LEAD ACID BATTERY			SYSTEM:- DC SYSTEM		SECTION:-			SHEET 2 OF 3			

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
1.6	**CONTAINER**													
a)	Verification Constructional requirement	Visual	MA	Visual	Sample Plan as per IS:1146	-	IS:1652, IS:1146, IS:8320	IS:1652, IS:1146, IS:8320	Test Cert.	√	P	V	-	
b)	Verification of Markings	Visual	MA	Visual	-do-	-	-do-	-do-	-do-	√	P	V	-	
c)	High Voltage Test	Electrical	MA	Electrical	-do-	-	-do-	-do-	-do-	√	P	V	-	
d)	Drops Ball Test	Mechanical	MA	Mechanical	-do-	-	-do-	-do-	-do-	√	P	V	-	
e)	Plastic Yield Test	Mechanical	MA	Mechanical	-do-	-	-do-	-do-	-do-	√	P	V	-	
f)	Acid Resistance Test	Chemical	MA	Chemical	-do-	-	-do-	-do-	-do-	√	P	V	-	
g)	Hydraulic thrust enduarnce test	Physical	MA	Physical	-do-	-	-do-	-do-	-do-	√	P	V	-	
2.0	**FINISHED BATTERY**	Routine Test	CR	Electrical & Measurement	100%	100%	IS:1652 & IS:8320	IS:1652 & IS:8320	Inspection Report	√	P	V	V	
	Note: Before Start of Inspection, Manufacturer Internal Inspection Record(QC) of the offered Batteries to be Verified													
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/IS:1652	IS:1652	IS:1652	Inspection Report	√	P	W	W	
b)	Verification of Markings	Visual	MA	Visual	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
c)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
d)	Test for Capacity & Voltage during discharge	Test	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	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 Ann-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-	-do-	-do-	-do-	√	P	V	V	
f)	Test for loss of capacity on storage	-do-	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	V	V	
g)	Endurance Test	-do-	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	V	V	
h)	Loss of water test	-do-	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	V	V	
i)	Test for suitability for Floating Battery Operation	-do-	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	V	V	
j)	Internal Resistance and Short Circuit Test	-do-	CR	Electrical & Measurement	-do-	-do-	-do-	-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		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:39:29 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:48:29 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:12:51 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a2815238f78b46a8e18c5cd0bb189777532609b5349aeb87191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff20530416f2c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:12:30 +05'30'

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC NO.:-PE-TS-XXX-508-E001	DATE:-
	CUSTOMER		QP NO.:-PE-QP-999-508-E002, REV.01	DATE:- 30/06/2020
	PROJECT		P.O NO.:-	DATE:-
	ITEM:- LEAD ACID BATTERY	SYSTEM:- DC SYSTEM	SECTION:-	SHEET 3 OF 3

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
3.2	**Acceptance Test**													
a)	Verification of Markings	Visual	MA	Visual	Sample Plan as per IS: 8320	Sample Plan as per IS: 8320	IS:1652	IS:1652	Inspection Report	√	P	W	W	
b)	Verification of Dimensions	Dimension	MA	Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
c)	Test for Capacity	Capacity	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
d)	Test for Voltage during discharge	Voltage during discharge	CR	Electrical & Measurement	-do-	-do-	-do-	-do-	-do-	√	P	W	W	
4.0	**Battery Racks**	Visual & Dimension	MA	Visual & Dimension	1 Sample	1 Sample	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	V	
5.0	**Accessories**	Visual & Dimension	MA	Visual & Dimension	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	
6.0	**Cable Lugs and Terminal Plate**	Visual	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	-	
7.0	**Packing**	Verification of Packing Methods, Finish & Completeness	MA	Visual	100%	100%	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	-do-	√	P	W	-	($$)- Approved Packing Drg./ Doc Applicable for Export Job/Projects

NOTES:-

1. Wherever IS standard is mentioned, equivalent IEC/International standard is also acceptable as per applicability of test. In case of any technical requirement not covered by IEC, technical requirement as per IS shall prevail.
2. BHEL Reserves the right for conducting repeat test, if required.
3. Photographs of complete Battery Package items after packaging to be sent to BHEL-Purchase Group for review before issuing MDCC.
4. In case, any changes in QAP commented by customer at contract stage shall be carried out by bidder without any implication to BHEL/Customer.
5. Project Specific QAP to be developed based on customer requirement. .
6. For Export Job, BHEL technical specification for sea worthy packing to be followed.
7. Packing shall be suitable for storage at site in tropical climate conditions.

LEGEND :-

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

** **M:** SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N:** CUSTOMER

P: PERFORM, **W:** WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI:** MINOR, **CR:** CRITICAL, **D**: DOCUMENTATION

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 Shukla	Checked By		Ritesh K Jaiswal			Checked By			

KANHAIYA KUMAR
Digitally signed by KANHAIYA KUMAR
DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN
Date: 2020.08.28 12:40:17 +05'30'

MANISH
Digitally signed by MANISH
DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN
Date: 2020.08.28 14:48:54 +05'30'

Digitally signed by Kunal
DN: cn=Kunal, o, ou, email=kunalgandhi@bhel.in, c=IN
Date: 2020.08.28 15:13:04 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=Bharat Heavy Electricals Ltd, ou=BHEL / PS-PEM, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ae8d7191a9e51174, serialNumber=8cfaddf001b4875a8b03a31b000e93ff205304f62c650e6d5f9d9980e09bc448, cn=RITESH KUMAR JAISWAL
Date: 2020.08.28 16:13:00 +05'30'

ANNEXURE-A

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

LIST OF TYPE TEST FOR LEAD ACID BATTERY

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

26.02.2018

NOTES: (*)
1) Type test reports to be submitted which should be carried out within last 10 years from the date of techno commercial bid opening

2) All equipment to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the indicated date. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
3) However, if the contractor is not able to submit report of the type test(s) conducted within last ten years from the indicated date, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

NTPC MAUDA FGD STAGE-I (2X500MW)
ANNEXURE - IA
BOQ-CUM-PRICE SCHEDULE: DC Lead Acid Battery

Sr. No.	Item code	Item Description	Unit	HSN CODE	Quantity	Quote/Unquote	Freight in terms of total Ex-works price in %	GST rate in %
A	**508-14001-A**	**220V BATTERY**	Sets	8507	2			
A.1		**Break up detail**						
A.1.1		220V , Lead acid plante battery (1 set comprises 108 nos cell) as per load duty cycle (minimum 150AH)	Sets	8507	2			
A.1.2		Electrolyte (sulphuric acid for first filling plus10% extra)	Sets	2807	2			
A.1.3		Teakwood racks with 3 coats of anti acid paints for 220V DC Battery	Sets	4415	2			
A.1.4		Stand insulators plus 5% extra	lot	4415	2			
A.1.5		Cell interconnectors (inter cell,inter row & inter bank connectors)with 5% extra and end take-off with one no. extra	lot	8507	2			
A.1.6		Lead coated connection hardware plus 5% extra	lot	8507	2			
A.1.7		Cell numbering tags with fixing arrangement (1set)	lot	3919	2			
A.1.8		Teakwood Cable clamps with hardware	lot	8507	2			
A.1.9		PVC spill trays under battery set(battery to have spill tray covering every cell)	Set	3926	1			
A.2		**LIST OF ACCESSORIES (for each set of battery)**						
A.2.1		Rubber syphon	Nos	4015	1			
A.2.2		Hydrometer (in step of 0.005)	Nos	9025	1			
A.2.3		Set of hydrometer syringes (suitable for the vent holes in different cells)	Nos	9025	1			
A.2.4		Specific gravity correction chart	Nos	4901	1			
A.2.5		Thermometer with plug & cap, specific gravity correction scale (for measuring electrolyte temperature)	Nos	9025	1			
A.2.6		Wall mounting type holder made of teak wood for hydrometer and thermometer	Nos	8466	1			
A.2.7		Digital Cell testing voltmeter (2-0-2V) with leads	Nos	9030	1			
A.2.8		Acid Resistance Funnel	Nos	3924	1			
A.2.9		Acid Resistance jug of adequate capacity	Nos	3924	1			
A.2.10		Rubber apron	Nos	4015	1			
A.2.11		Rubber hand gloves	Pair	4015	1			
A.2.12		Set of insulated spanners	Nos	8204	1			
A.2.13		Cell lifting straps	Set	8507	1			
A.2.14		`No smoking' notice	Nos	3926	2			
A.2.15		Bridging Clamp for cutting out individual cells in the event of defect.	set	8507	1			
A.2.16		Goggles (industrial)	Nos	9004	1			
A.2.17		Instruction card	Nos	4901	4			
A.2.18		Pocket Thermometer (digital Type)	Nos	9025	1			
A.2.19		First aid box	Set	3006	1			
A.2.20		Cable clamps with fixing hardware	set	8507	1			
A.2.21		Battery log book	Nos	4901	1			
B	**508-14010-A**	**E & C SPARES**						
B.1		GLOVES	Pair	4015	1			
B.2		VENT PLUGS	Nos	8507	5			
B.3		Intercell connectors	Nos	8507	5			
C	**508-14016-A**	**SUPERVISION OF E&C (All the equipment will be provided by BHEL).**						
C.1		LUMP SUM CHARGES PER VISIT FOR ENGINEER (EXCEPT DAILY CHARGES)	VISIT	9987	1			
C.2		LUMP SUM DAILY CHARGES FOR ENGINEER	DAYS	9987	4			

Notes

1.0	AMOUNT PAYABLE FOR ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO (C.1) ABOVE + (DAILY CHARGES AS PER SL. NO (C.2) ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE).
2.0	THE VISIT CHARGES SHALL BE INCLUSIVE OF CHARGES OF AIR FARE/TRAIN FARE , BOARDING/LODGING, LOCAL CONVEYANCE, MEDICAL , INSURANCE ETC.
3.0	SITE VISIT CHARGES SHALL BE APPLICABLE FOR ANY VISIT MADE BY VENDOR AT SITE AFTER RECEIVING THE INSTRUCTION FROM BHEL FOR DEPUTATION OF VENDOR REPRESENTATIVE. THE VISIT CAN BE CALLED FOR SUPERVISION OF COMMISSIONING & TESTING ETC.
4.0	COPPER LUGS FOR CABLE TERMINATION AT BATTERY TERMINALS SHALL BE IN BIDDER'S SCOPE & CABLE SIZES SHALL BE INFORMED DURING DETAILED ENGINEERING.
5.0	BIDDERS TO QUOTE EITHER FOR LEAD ACID OR NI-CD BATTERY
6.0	EACH SET / LOT MENTIONED AGAINST ITEM AT S.NO A.1.2 TO A.1.9 CORRESPONDS TO REQUIRED QUANTITY FOR 1 SET OF ITEM AT S.NO.A.1.1.

NTPC MAUDA FGD STAGE-I (2X500MW)
ANNEXURE - IIA
BOQ-CUM-PRICE SCHEDULE: DC Ni-Cd battery

Sr. No.	Item code	Item Description	Unit	HSN CODE	Quantity	Quote/Unquote	Freight in terms of total Ex-works price in %	GST rate in %
A	**508-14001-A**	**220V BATTERY**	Sets	8507	2			
A.1		**Break up detail**						
A.1.1		220V , Ni-Cd battery (1 set comprises 170 nos. cell) as per load duty cycle (minimum 90AH)	Sets	8507	2			
A.1.2		Electrolyte (For first filling plus10% extra)	Sets	2815	2			
A.1.3		MS racks with 3 coats of anti alkali paints for 220V DC Battery	Sets	7301	2			
A.1.4		Stand insulators plus 5% extra	lot	3923	2			
A.1.5		Cell interconnectors (inter cell,inter row & inter bank connectors) with 5% extra and end take-off with one no. extra	lot	8507	2			
A.1.6		Nickel coated connection hardware plus 5% extra	lot	8507	2			
A.1.7		Cell numbering tags with fixing arrangement (1set)/ Self adhesive PVC numbering stickers.	lot	3919	2			
A.1.8		PVC/ CFRP spill trays under battery set(battery to have spill tray covering every cell)	Set	3926	1			
A.2		**LIST OF ACCESSORIES (for each set of battery)**						
A.2.1		Mercury in chemical glass Thermometer (0 - 100 deg C)	Nos	9025	1			
A.2.2		Alkali resistance funnel	Nos.	3924	1			
A.2.3		Alkali Resistance jug of 2 L capacity	Nos	3924	1			
A.2.4		Rubber Syphon	Nos	4015	1			
A.2.5		Rubber apron	Nos	4015	1			
A.2.6		Rubber hand gloves	Pair	4015	1			
A.2.7		Bridging Clamp for cutting out individual cells in the event of defect.	Nos.	8507	1			
A.2.8		Cell testing digital voltmeter (2-0-2V) with testing leads	Nos	9030	1			
A.2.9		Set of insulated spanners	Nos	8204	1			
A.2.10		Goggles (industrial)	Nos	9004	1			
A.2.11		Instruction card	Nos	4901	4			
A.2.12		Battery log book	Nos	4901	1			
A.2.13		`No smoking' notice	Nos	3926	2			
A.2.14		First aid box	Set	3006	1			
A.2.15		Cable clamps with fixing hardware (If applicable).	set	8507	1			
A.2.16		Cell lifting straps/ Cell lifting puller.	set	8507	1			
A.2.17		Copper Cell Connector	Nos	8507	5			
B	**508-14010-A**	**E & C SPARES**						
B.1		GLOVES	Pair	4015	1			
B.2		VENT PLUGS	Nos	8507	5			
B.3		Intercell connectors	Nos	8507	5			
C	**508-14016-A**	**SUPERVISION OF E&C**						
C.1		LUMP SUM CHARGES PER VISIT FOR ENGINEER (EXCEPT DAILY CHARGES)	VISIT	9987	1			
C.2		LUMP SUM DAILY CHARGES FOR ENGINEER	DAYS	9987	4			

Notes

1.0	AMOUNT PAYABLE FOR ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO (C.1) ABOVE + (DAILY CHARGES AS PER SL. NO (C.2) ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE).
2.0	THE VISIT CHAGRES SHALL BE INCLUSIVE OF CHARGES OF AIR FARE/TRAIN FARE , BOARDING/LODGING, LOCAL CONVEYANCE, MEDICAL , INSURANCE ETC.
3.0	SITE VISIT CHARGES SHALL BE APPLICABLE FOR ANY VISIT MADE BY VENDOR AT SITE AFTER RECEIVING THE INSTRUCTION FROM BHEL FOR DEPUTATION OF VENDOR REPRESENTATIVE. THE VISIT CAN BE CALLED FOR SUPERVISION OF COMMISSIONING & TESTING ETC.
4.0	COPPER LUGS FOR CABLE TERMINATION AT BATTERY TERMINALS SHALL BE IN BIDDER'S SCOPE & CABLE SIZES SHALL BE INFORMED DURING DETAILED ENGINEERING.
5.0	BIDDERS TO QUOTE EITHER FOR LEAD ACID OR NI-CD BATTERY
6.0	EACH SET / LOT MENTIONED AGAINST ITEM AT S.NO A.1.2 TO A.1.8 CORRESPONDS TO REQUIRED QUANTITY FOR 1 SET OF ITEM AT S.NO.A.1.1.