



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NOIDA

DOCUMENT No.	TB-390-316-025	Rev 00	Prepared	Checked	Appd
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	Vsom	SKS	SKS
220V DC LEAD ACID PLANTE TYPE BATTERY BANK		SIGN			
		DATE	14/11/2017	14/11/17	
		GROUP	TBEM		
		W.O. No	86005		
CUSTOMER/	NTPC SAIL POWER COMPANY (P) LIMITED (NSPCL)				
CONSULTANT	MECON, RANCHI				

PROJECT	NSPCL-Rourkela PP-II Expansion (1x250 MW)
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Contents:

<u>Section No.</u>	<u>Description</u>	<u>No of Pages</u>
SECTION-1	SCOPE, SPECIFIC TECHNICAL REQUIREMENTS and QUANTITIES	1-7
SECTION-2	EQUIPMENT SPECIFICATION	1-14
SECTION-3	PROJECT DETAILS AND GENERAL SPECIFICATION	1-22
SECTION-4	GUARANTEED TECHNICAL PARTICULARS	1-2
SECTION-5	Checklist	1-3
SECTION 6	QUALITY PLAN	1-3
Annexure A	SCHEDULE OF TECHNICAL SPECIFICATION	01

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SECTION - 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of 220V DC Lead acid Plante Type Batteries complete with rack assembly and other accessories as required for trouble free operation of batteries.

This section covers the specific technical requirements of 220V Batteries. In case of any discrepancies between the requirements mentioned in this section and those specified in the following sections of this specification, the specifications given herein shall prevail and shall be treated as binding requirements.

In case of variance in the requirements specified under Section-1 and other Sections of this specification, requirements of Section-1 shall prevail.

No deviation from the requirements specified in various clauses of this specification shall be allowed. A certificate to this effect shall have to be furnished along with the offer as per attached NIL TECHNICAL DEVIATION.

1.1 The equipment is required for the following project.

**Name of the Customer : NTPC SAIL POWER COMPANY (P) LIMITED
(NSPCL)**

**Name of the Project : NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT (PP – III :
1X250 MW)**

Name of the Consultant : M/s MECON

Main Contractor : BHEL

Refer Section - 3 for Project Details and General Specifications.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

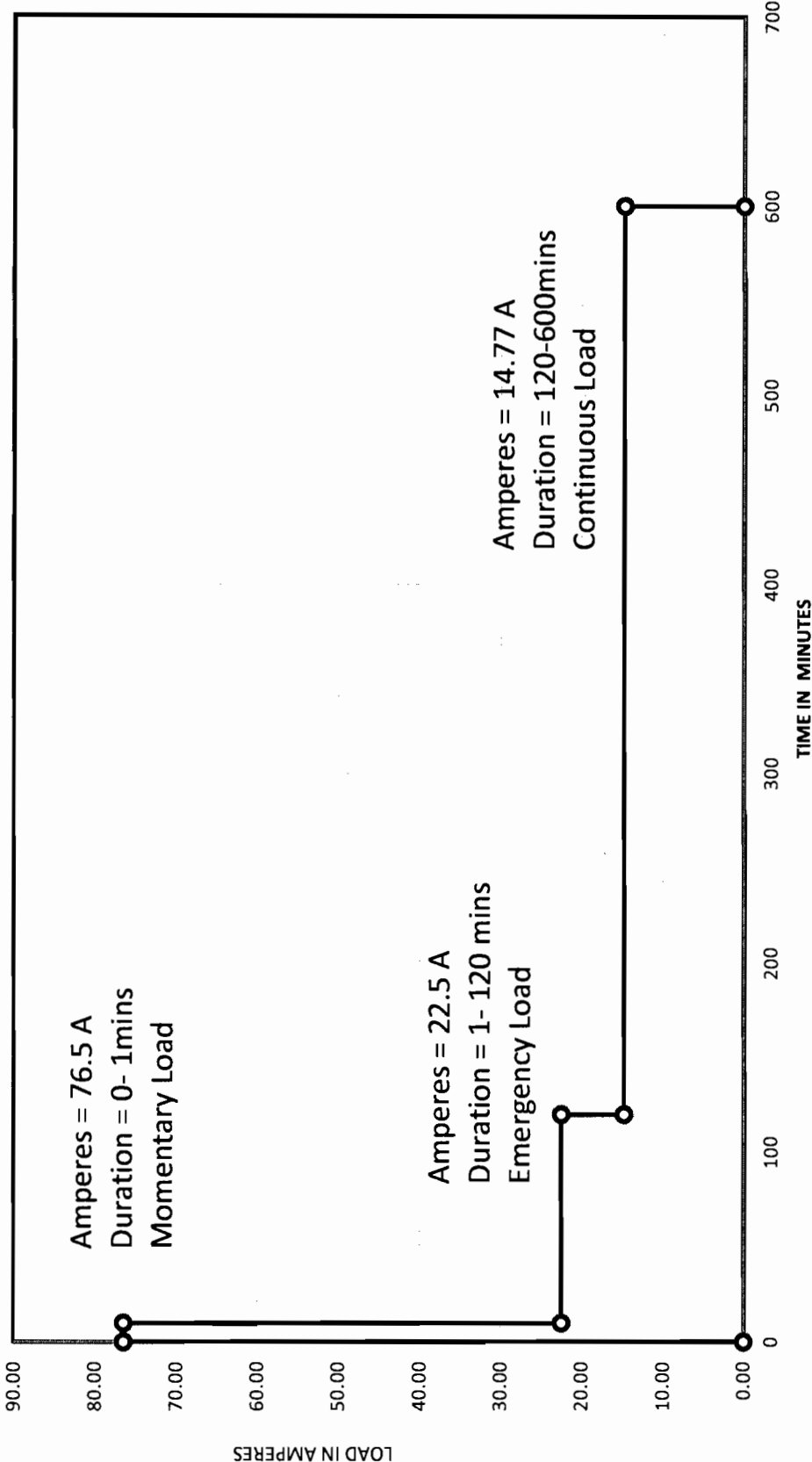
Sl. No.	Parameter	220V Battery Bank
1.	Battery type	Stationary Lead Acid Plante Postive Plate (High Discharge Type)
2.	Nominal voltage rating	220V
3.	Discharge capacity	400AH (5Hrs)
4.	Ageing factor	1.0

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Sl. No.	Parameter	220V Battery Bank
5.	Design margin	20%
6.	Float charging voltage	at about 2.25V per Cell
7.	Boost charging voltage	at about 2.7V per cell
8.	End cell voltage	Not less than 1.85V
9.	Nominal cell voltage	2.0V/cell
10.	Min. electrolyte temp. for battery sizing	5°C
11.	Ambient design temperature	50°C
12.	Maximum battery bank voltage	242V
13.	Minimum battery bank voltage	198V
14.	No. of cells per battery	107 nos (Min).
15.	Cell designation	Stationary, Lead acid Type with plante positive Plates, High Discharge Performance Type
16.	Charging method	It shall be suitable for standby duty. It 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.
17.	Battery rack	Seasoned Teak Wood in line with the CPWD Specification.
18.	Battery bank room size	8000x11000 mm, bidder to confirm that all battery banks can be suitably accommodated in room size with 1.0 meter clear space from inside wall surface.

Battery size should be sufficient enough to meet the following Load Cycle.

Load Cycle for 1x250MW PP-2 Expansion Power Plant NSPCL Rourkela



Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

1.3 QUANTITIES

1.3.1 MAIN QUANTITIES

Following are the quantities for Lead Acid Plante type Battery Bank complete with accessories, as per this specification.

<u>S.No.</u>	<u>Description</u>	<u>Unit of Measure</u>	<u>Quantity</u>
	<u>Supply</u>		
1	220V, 400AH, Lead Acid Plante (High discharge type) battery bank excluding fittings & accessories complete in all respect meeting the load cycle requirement as per technical specification.	Set	2
2	Battery health monitoring system (BHMS) with accessories for 220V Battery Bank complete in all respect as per technical specification Annexure-I	Lot	1
3	First charge of electrolyte plus 10% extra	Lot	1
4	Teakwood racks with 3 coats of anti-acid paint.	Lot	1
5	Stand insulators plus 5% extra	Lot	1
6	Cell insulators plus 5% extra	Lot	1
7	Cell inter-connectors with 5% extra and end take-off with one no. extra	Lot	1
8	Lead-coated connection hardware plus 5% extra	Lot	1
9	Cell numbering tags with fixing arrangements	Lot	1
10	Teakwood cable clamps with hardware.	Lot	1
11	Six (6) extra cell with all accessories but without acid.	Lot	1
12	One (1) inter-connector bolt wrench (1 of each type)	Set	1
13	One (1) hydrometer syringe	Set	1
14	One (1) thermometer with plug & cap and with specific gravity correction scale.	Nos	1
15	One (1) cell testing voltmeter with leads	Nos	1
16	Pocket thermometer	Nos	1
17	Acid resisting funnels	Lot	1
18	Acid resisting jugs of adequate capacity	Lot	1
19	Rubber aprons	Nos	2
20	Rubber gloves	Sets	2
21	Cell lifting straps	Lots	2
22	PVC spill trays under the battery cells	Set	1
23	Bridging clamps (each type)	Lot	1
24	Spanner for cells (1 Nos	Set	1
25	Float type level indicator	Set	1
26	First aid box	Set	1
27	Any other item/accessories that may be required for the complete installation and commissioning of the Battery Sets at Sno 1	Lot	1
	<u>Services</u>		
28	Supervision of erection, testing & commissioning at site for 220V, 400AH, Lead Acid Plante (High discharge type) battery bank with fittings & accessories complete in all respect.	Lot	2
29	Supervision of erection, testing & commissioning at site for Battery health monitoring system (BHMS) complete in all respect.	Set	01

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Note:

1. Refer to 220V load duty cycle for battery sizing.
2. Minimum size of batteries shall be as details mentioned in above BOQ. (Sl.no.1).
3. Bidder to quote battery size meeting the load duty cycle requirement. The sizing calculation should be in line with applicable IEEE shall be submitted with offer for review.
4. Special tools & tackles, which are sufficient and necessary for convenient election, commissioning maintenance & overhauling, if required, of the equipment shall be supplied free of cost and hence, its price shall be included in main equipment price.
5. Size of cable between battery and battery charger shall be informed during detail engineering.
6. The quantity for individual item may vary up to any extent, however total contract value shall not vary more than +/- 30% during contract execution stage. It is also to be noted that any item can be completely/ partially deleted during detailed engineering stage.

1.4 TYPE TEST REPORTS

The 220V DC Lead acid plante type Batteries to be supplied shall be of type tested design. During detail engineering, the Bidder / Contractor shall furnish 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 bid opening. Date of bid opening is 02.04.2015. 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.

However if contractor is not able to submit report of type test(s) conducted in last ten years from the date of bid opening, or in 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.

All acceptance and routine tests as per specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

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.

1.5 PRE QUALIFYING REQUIREMENTS

The Bidder / sub vendor should have manufactured and supplied at least two (2) numbers of required rating or above of High Discharge type Plante positive plate type battery (██████████), at least one (1) each at two (2) different

industrial installations, which should have been in successful operation for at least two (2) years prior to the date of Techno-Commercial bid opening 02.04.2015.

NOTE: Two different installations mean two different project sites or two different contracts.

1.6 MANUFACTURING QUALITY PLAN

Refer **Section 6**

1.7 SUPERVISION AT SITE

Bidders shall quote for the following supervision charges:

1. Supervision of Erection at site for battery sets.
2. Supervision of testing and commissioning at site for battery sets.

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ANNEXURE-1**DC HEALTH MONITORING SYSTEM**

1. DC Health Monitoring System shall include microprocessor based hardware and software to monitor the condition of each battery cell of 220V DC systems battery banks on-line on 24x7 basis. With DC Health Monitoring System it shall be possible to measure & analyse the individual cell and battery parameters so that any damage to battery shall be prevented by pro-active maintenance. A typical Architecture is shown in Drg. No. MECFTS/11/E1/G24F/E/088. Each Battery set shall have its own independent DC Health Monitoring System.
2. DC Health Monitoring System shall measure and store the following parameters at predetermined time interval as decided by the owner during detail engineering:
 - a) Each Cell Voltage
 - b) Battery DC Current
 - c) Ambient and Cell temperature

Further, DC Health Monitoring System module shall have additional provision of accepting at least 6 Nos. of Digital inputs and 2 Nos. of Analog inputs(4-20mA). DC Health Monitoring System shall also be able to store these inputs status for future reference.

3. Technical Parameters

- a) Input Power Supply 230V AC(UPS) /220V DC
- b) Voltage Measurement Accuracy 0.5% or better
- c) Current Measurement Accuracy 0.5% or better
- d) Operating Temperature Range 0-50°C
- e) Mounting Panel Mounting
- f) IP Protection IP42

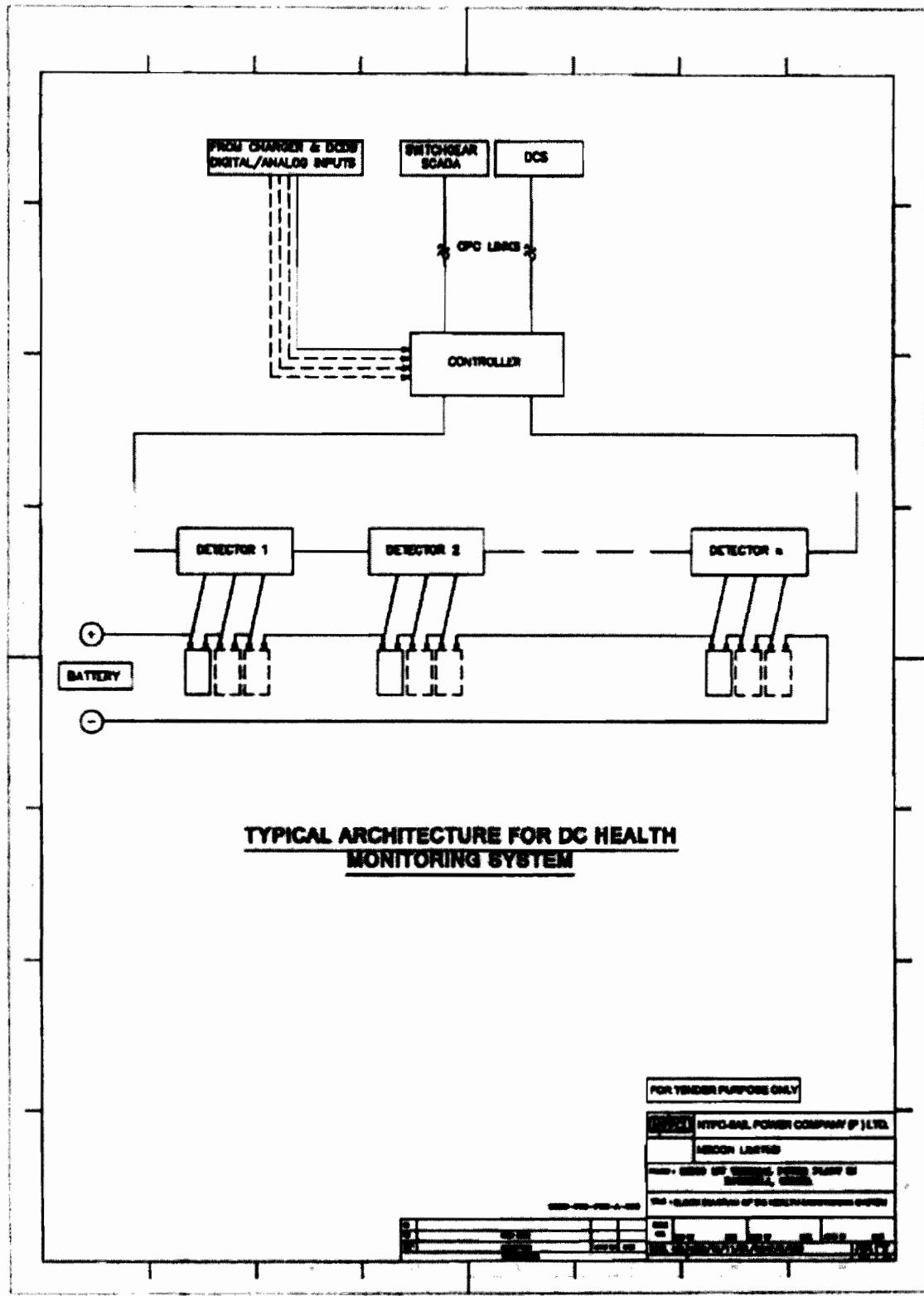
4. Communication

DC Health Monitoring System shall communicate with the Switchgear SCADA System and provide alarms for abnormal condition of Cell/Battery as finalized by owner during detailed engineering. DC Health Monitoring System modules shall have one port suitable for connecting laptop locally and one port suitable for TCP/IP protocol for communication to SCADA system. The Cable required for connecting the cells to DC Health Monitoring System and DC Health Monitoring System to SCADA system shall also be under contractor's scope. DC FAIL alarm shall be generated and given in Central Control Room buzzer (Audio Visual Fascia).

5. Software

Necessary software for communication between DC Health Monitoring System and Switchgear SCADA System as well as for analysis of stored data shall be provided by the contractor. The software for analysis shall be capable of showing graphical representation of various stored parameters and shall give some corrective suggestion based on the abnormal parameters. The software shall calculate and show battery Ah during charge/discharge cycles.

Logging of cell/battery parameters (voltage, current and temperature) and alarm conditions as well as event log of all activities affecting the battery bank shall be possible with date/time stamp. Logged data can be exported in MS Excel format.



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Section 2

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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CHAPTER-14.0

TECHNICAL SPECIFICATION FOR BATTERY AND BATTERY CHARGER

01.00.00 **SCOPE OF SUPPLY**

01.01.01 a) 220 V DC system [REDACTED] 1 set [REDACTED] 220kV Switchyard.

The 220V DC system is designed to cater the control, protection, interlocking, annunciation and emergency DC drives and DC lighting for [REDACTED] 220kV Switchyard.

- [REDACTED]
- [REDACTED]

Each set shall be provided with two (2) x 100% rated battery banks associated with two (2) x 100% float-cum-boost chargers and 1x100 % sectionalized DCDB with all other related equipment & accessories.

Battery shall be [REDACTED] Lead Acid Plante [REDACTED]

01.01.02 One set of special tools and tackle.

01.01.03 Mandatory spares.

01.01.04 All relevant drawings, data and instruction manuals.

Note : Ratings, requirements, fittings and accessories of the equipment have been further detailed in this specification, enclosed drawings and annexure. Equipment shall be furnished in strict accordance with the same.

02.00.00 **GENERAL REQUIREMENTS**

02.01.00 Codes and Standards

Major standards, which shall be followed, are listed below. Other applicable standards for any component if not covered in the listed standard shall also be followed.

Indian Title
Standards

International &
Internationally
Recognized
Standards

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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IS : 1652	Stationary cells and batteries, Lead acid batteries with Plante' positive plates	IEC896-1
IS : 266	Sulphuric acid	
IS : 8320	General requirements and methods of tests for lead-acid Storage batteries	
IS : 1146	Specification for rubber and plastics container for lead acid storage batteries	
IS : 6071	Synthetic separator for lead acid batteries	
BS-6290	Lead acid stationary cells and batteries. Specification for High Performance Plante' cells	
IS : 1885 (Part-15)	Electrical vocabulary, primary cells and batteries	
IS : 1069	Quality Tolerances for Water for storage batteries	IEC-60050
	IEEE Recommended practice for sizing for lead acid batteries for stationary application	IEEE-485
	IEEE Recommended practice for installation design and installation of vented lead acid Batteries stationary application	IEEE-484
IS : 10918	Specification for vented type Nickel Cadmium Batteries	
IS : 1069	Quality tolerances for water for storage batteries	
ANSI-C37.90a	Guide for surge withstand capability tests	
IS:5	Colours for ready mix paints.	
IS : 694	PVC Insulated Cable for working voltages upto and including 1100V.	
IS : 1248	Specification for Direct acting indicating analogue electrical measuring instruments.	
IS:13947 Part-1	Degree of protection provided by enclosures for low voltage switch gear and control gear.	
IS : 13947	Specification for low voltage switch gear and control gear	
IS : 3231	Electrical relays for power system protection.	
IS : 3842	Application guide for Electrical relays for AC System	
IS : 3895	Mono-crystalline semi-conductor Rectifier Cells and Stacks	
IS : 4540	Mono crystalline semi-conductor Rectifier assemblies and equipment.	

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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IS:6005	Code of practice for phosphating of Iron and Steel.
IS:6619	Safety Code for Semi-conductor Rectifier Equipment.
IS:6875	Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages upto 1000 V AC or 1200 V DC.
IS : 9000	Basic environmental testing procedures for electronic and electrical items.
IS:13703	Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC.
EEUA-45D	Performance requirements for electrical Alarm Annunciation System Indian Electricity Rules Indian Electricity Act.

03.00.00 DESIGN CRITERIA

03.01.00 Design Basis and Sizing Criteria for 220 V Battery

03.01.01 220 V D.C. system provides reliable sources of D.C. power for control, indication, protection and annunciation of power plant equipment. In addition, it provides for the emergency loads/services on failure of A.C. supply.

03.01.02 Each 220 V D.C. system comprises of two (2) sets of storage battery sets.

All sets of batteries mentioned above shall be lead acid PLANTE [REDACTED]

03.01.03 The batteries [REDACTED] shall be installed indoor in a clean but hot, humid and tropical atmosphere.

03.01.04 The battery [REDACTED] combinations shall be such as to ensure continuity of D.C. supply at load terminals without even momentary interruption.

03.01.05 For continuous operation at specified ratings, temperature rise of the various components of battery and charger shall be limited to the permissible values as stipulated in relevant standards.

03.01.06 Battery shall be sized to cater for the following loads with minimum duration as indicated.

Momentary Load (For duration upto 1 minute)

- Tripping / closing load of 220kV, 6.6 kV and 415V breakers
- Starting current of all automatically started DC drives
- Solenoid valves

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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d) In rush current of excitation system

Emergency Load (For 2 hours duration)

- a) Running currents of essential DC motors
- b) Emergency lighting

Continuous Load (For 10 hours duration)

- a) Indicating lamps on switchgears and control panels
- b) Control room emergency lighting
- c) Auxiliary relays
- d) Numerical relays auxiliary power supply (220kV, 6.6 kV & 415 V)

03.01.07 Ampere hour capacity for Lead acid battery shall be as specified designed for 10 hours discharge rate with final voltage per cell 1.85V.

For faster discharge rate, the permissible continuous load with final discharge voltage 1.85V / Cell shall be based on the following :

Discharge Time	AH capacity in % of rated 10 Hr. capacity
10 hrs.	100%
5 hrs.	67%
3 hrs.	60%
1 hr.	33%

03.01.08 While estimating battery capacities, an ageing factor of 1.0 may be kept as per IEEE -485 guidelines.

03.01.09 Additionally, 20% margin to be kept for future use.

03.01.10 For the purpose of estimating battery capacities, the maximum and minimum temperatures shall be considered as 50 Deg.C and 5 Deg.C respectively.

03.01.11 The procedure for estimating battery capacities shall be as per guidelines stipulated in IEEE-485.

03.01.12 The battery shall be sized such that the voltage at any time during the duty cycle shall not be less than 1.85 volt per cell.

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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- 03.01.15 The batteries [REDACTED] shall be so designed that the maximum fault level on DC DB is limited to 25KA (Indicative only; the actual value shall be decided by the bidder after substantiating the same by calculation.)

03.03.00 **System Concept for 220 V DC**

- 03.03.01 DC system shall be parallel redundant with load sharing type. Normally the chargers connected to the battery shall supply the DC loads and also keep the battery under float charge. On failure of supply from charger, the battery shall take over the DC loads without any interruption.
- 03.03.02 When the battery require boost charging, the first charger shall operate on boost charge mode while the second charger shall supply the DC load on float mode through automatic changeover arrangement.
- 03.03.03 Interlock shall be provided to ensure that the battery can be taken to boost mode only if the second charger is healthy and running. Interlock

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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defeat arrangement shall also be provided for initial charging of battery.

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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PART-B: LEAD –ACID PLANTE BATTERY

8.00.00 GENERAL TECHNICAL REQUIREMENTS

8.01.00 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:

The number of cells for the 220 Volts shall be 107.

Batteries should be suitable for continuous operation for the maximum ambient temperature as defined in technical parameters.

8.02.00 Construction Features

8.02.01 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.

8.02.02 Vent Plugs

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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Vent plugs shall be provided in each cells. They shall be antisplash 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 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.

8.02.03 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.

8.02.04 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.

8.02.05 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.

8.02.06 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.

8.02.07 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

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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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 bidder. 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. Bidder shall furnish necessary sizing calculations to prove compliance to the same.

8.02.08 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.

8.02.09 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

9.00.00 TESTS

9.01.00 GENERAL

The Bidder shall submit for Owner's approval the reports of all the type tests as per latest IS-1146 (for rubber & plastic containers for lead-acid storage batteries)/IS 1652 (for lead-acid plante batteries) carried out within last ten

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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years from the date of bid opening and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.

9.02.00 Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of battery.

9.03.00 Commissioning Checks:

All tests as listed below shall be carried out on sample cell selected at random by the owner 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 Bidder shall arrange for all necessary equipment, including the variable resistor, tools, tackles and instruments.

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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FITTINGS & ACCESSORIES

Each Lead-Acid battery bank shall be furnished complete with the following :

BATTERY

- a) First charge of electrolyte plus 10% extra
- b) Teakwood racks with 3 coats of anti-acid paint.
- c) Stand insulators plus 5% extra
- d) Cell insulators plus 5% extra
- e) Cell inter-connectors with 5% extra and end take-off with one no. extra
- f) Lead-coated connection hardware plus 5% extra
- g) Cell numbering tags with fixing arrangements
- h) Teakwood cable clamps with hardware.
- i) Six (6) extra cell with all accessories but without acid.

In addition to above, each Lead –Acid battery bank shall be furnished with a set of following accessories

- a) One (1) inter-connector bolt wrench
- b) One (1) hydrometer syringe
- c) One (1) thermometer with plug & cap and with specific gravity correction scale
- d) One (1) cell testing voltmeter with leads
- e) Pocket thermometer
- f) Acid resisting funnels

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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- g) Acid resisting jugs of adequate capacity
- h) Rubber aprons
- i) Rubber gloves
- j) Cell lifting straps
- k) PVC spill trays under the battery cells
- l) Bridging clamps
- m) Spanner for cells
- n) Float type level indicator
- o) First aid box

-----XXX-----

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 14.0 Battery & Battery Charger	
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Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

SECTION- 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections of tender documents and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

3.1 PROJECT DETAILS

Name of the Project: 220kV GIS - ROURKELA POWER
PROJECT (PP – III: 1X250 MW)

Name of the Customer: NTPC SAIL POWER COMPANY (P) LIMITED

Location & Land Availability:

The proposed unit of 1x250 MW will be installed on the western side of existing 2x60 MW units within the boundary of Rourkela Steel Plant in Sundergarh district of Orissa.

Approximately 80 acres of land is available for construction main plant and accessories. For ash dyke about 70 acres of land is available at a distance of approx 6 KM from plant towards southwest. Presently most of land is filled with blast furnace slag. The main power house building of proposed unit of 1x250 MW will be located on western side of existing 2x60 MW switchyard. The indicative latitude & longitude of the proposed site is as follows:

☐	Latitude	:	22°13'19"	N
☐	Longitude	:	84°53'51"	E

Availability of Infrastructure Facilities Road

The site is connected by road of NH-23 through a link road from a road junction at Panposh located approx. 10 KM from proposed site.

Railway siding

The nearest railway station Rourkela is situated about one km from the proposed plant site. A new railway siding will be developed for receiving coal from the source.

Airport/Air strip

The nearest airport is at Ranchi which is about 170 KM by rail and 225 KM by road from the proposed site.

Seaport

The nearest seaport is at Paradip (Orissa) which is around 400 Kms from the proposed site.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

3.1.1 SITE CONDITIONS

1.	Average elevation above mean sea level	194m
2.	Barometric pressure	983 mb
3.	Ambient temperature	
	a. Absolute maximum	48 °C
	b. Absolute minimum	6 °C
4.	Relative humidity (Maximum)	65 %
5.	Annual Average Rainfall	2656.6 mm
6.	Heaviest in 24 Hrs.	257.8 mm
7.	Seismic Zone	Zone-II (As per latest Revision of IS 1893 /2002) Part-I
8.	Pollution Level	Very Heavily Polluted

3.1.2 SYSTEM PARAMETERS

3.1.2.1	Continuous current carrying capacity (rms) at 50° C ambient temperature.	2500A (min)
3.1.2.2	Short time current carrying Capacity	40kA for 3 sec (220 kV)
3.1.2.3	Maximum temperature rise over ambient of 50° C	28 ° C
3.1.2.4	Voltage	220/245kV (Nom/Max)
3.1.2.5	Frequency	50Hz
3.1.2.6	System neutral earthing	Effectively earthed

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

3.1.2.7	Insulation Level	
3.1.2.8	One minute Dry Power frequency Withstand Voltage (kV rms)	460
3.1.2.9	One minute Wet power frequency Withstand Voltage	460
3.1.2.10	Impulse withstand (kV)	1050
3.1.2.11	Creepage distance	31 (mm/kV)

3.1.3 AUXILIARY POWER SUPPLY

Supply	Description	Consumer
H.T. Supply	6600 V, 3ph, 3W, 50 Hz non-effectively earthed, Fault level 40 KA symm.	Transformers(6.6KV/415V)
L.T. Supply	415V, 3 phase , 4W, 50 Hz, effectively earthed, Fault level 50 KA symm	Motors and loads up to 160 KW for CHP and 200KW for remaining areas and lighting transformers (1:1)
	240V, 1ph, 2W, 50 Hz, effectively earthed	Motors up to 200W, Lighting, space heaters, A.C. control & protective devices.
	240V AC, 1 ph, 50 Hz. UPS system	DCS/PLC, control & instrumentation
	110V, 1ph, 50 Hz	Control, protection & metering
	24V AC	Maintenance Lighting
D.C. Supply	220V, 2W, unearthed, Fault level 25 KA*	D.C. alarm, control & protective devices, DC motors, Emergency lighting.
	24V DC	Control & Instrumentation

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

RANGE OF VARIATION**A.C. Supply**Voltage: $\pm 10\%$ Frequency: $\pm 5\%$ Combined Volt: $10\% + \text{frequency}$ (absolute sum)

During starting of largest motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment, while running, shall successfully ride over such period without affecting system performance.

D.C. Supply Voltage:
198 to 240 Volt

System Earthing

220KV, 33KV & 415V systems are effectively earthed. High resistance type non-effective earthing shall be used for 6.6 kV systems to limit earth fault current. Resistors shall be connected to the Star point of the concerned transformers.

Fault Levels

1	220 KV System	40KA for 3 secs.
2	6.6 KV System	40KA for 3 secs.
3	415 V system	50KA for 1 secs.
4	220V DC	20KA for 1 secs.

3.1.4 **The various minimum heights of the switchyard shall be as given below from plinth level:**

Voltage	Equipment /1st Level
220kV	6000mm

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550mm.

3.2 SPECIAL INSTRUCTIONS TO BIDDERS

General

The Bidder shall base the equipment design on the information given in this specification. The equipment shall be complete in all respects. Any item which is not specifically mentioned herein but found essential for safe and efficient operation and maintenance and satisfactory performance of the system shall be deemed to have been included in the scope of the Bidder. It shall be presumed that the Bidder has studied the site, all the drawings, tender documents and is fully aware of the scope of work involved and the site conditions prevailing.

The Bidder shall include one set of new and unused Tools & Tackles as specified in relevant sections of the specification.

The Bidder shall include in his scope, the requirement of chemicals, resins, lubricants, lube oils, and all other consumables required for testing, commissioning upto the completion of trial operation of unit.

A stainless steel name plate with letters engraved in English language shall be provided for the equipment. The name plate shall indicate make, identification, number, capacity, rating and weight of the equipment. The name plate shall be fitted at a prominent place on the body of each equipment with the help of S.S. screws.

All the instruments shall be calibrated only in metric units. English shall be the language of all communications.

Any additional work / equipment and materials which may not have been specially mentioned in this specification but are required to make the equipment complete in every respect in accordance with technical specification and are necessary for safe & efficient operation & maintenance and guaranteed performance of the equipment shall be deemed to have been included under the scope of this specification and shall be provided by the bidder within the quoted price.

The Bidder shall furnish all the drawings, documents, load data and other information / data like fault diagnosis, operation, maintenance, erection manuals etc, general details and layout drawings, design calculations and equipment specification of equipment, together with "as built drawings" for the equipment.

3.3 Codes and Standards

- a. All equipment, systems and works covered under this specification shall comply, in all respect, with requirements of applicable latest statutes and that of latest editions of codes and standards. Latest regulations and safety & environmental requirements as applicable in India / state of installation shall also be complied with.
- b. All codes and standards mentioned shall mean as relevant and applicable to a particular equipment / system.
- c. All other codes/standards not covered in Section 1 / Section 2 but required for the plant and system offered shall also be referred / followed by the Bidder. The Bidder, along with the bid, shall submit a comprehensive list of codes and standards to be followed for various equipment / system.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

- d. In all cases where IBR does not govern, German, American, British, ISO or other international standards established to be equivalent or superior to the codes specified are also acceptable. In the event of any conflict between the requirements of equivalent codes and standards and the requirements of Indian standards / regulations, the latter will govern unless specified otherwise in the specifications.
- e. The Bidder shall be responsible to be in possession of all the specified Codes / Standards and ensure reference to the same before submitting the offer/ bid.
- f. Mandatory codes / local regulations to be followed for safety, design, fabrication and operation of the switchyard shall be, followed:
- g. If the equipment supplied does not conform to the codes and standards mentioned in this specification, but is manufactured to the Bidder's own standard, developed as a result of his experience, is also acceptable provided the same is found to be superior to the above mentioned codes and standards. The Bidder shall identify such equipment and shall also present sufficient data to the Owner / Consultant to support his design and to establish the superiority. The design may be accepted by Owner/ his Consultants only if the Purchase / his consultant is satisfied that sufficient experience exists with the design proposed.
- h. Design not meeting the stipulations of the codes and standards will not be acceptable.
- i. Apart from various codes and standards mentioned in Section 1/2, the Manufacturer shall comply with other requirements of codes and standards mentioned in this Specification for detailed design, manufacture, testing, erection, construction etc.

Control System	IEEE – 122 , 1992
Metering / Dosing pumps	API 675 – 1987 (Positive displacement pumps – controlled volume) API 676 – 1987 (Positive displacement pumps – Rotary).
Centrifugal pumps	API 610 – 1990, ASME PTC 8.2 – 1965
Gear Box	API 613 – 1993 & AGMA 420 & 421
Coupling	API 671 – 1993
Structural	IS 1893 – 1991, IS 875-1992 & IS 800 – 1991
Pressure Vessel	ASME Sec. VIII, Div. 1 – 1995
Piping	ANSI B 31.1-1995 / 31.3 – 1993, IBR
Valve	API
Instrument	ISA, API
Electrical	As per specification attached & relevant
	IS/IEC
Tanks	API 650- 1993
Electrodes	AWS, IS
Painting	IS Standards

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Performances Tests	
Overload test of crane and hoists	IS 3177

3.4 Deviations and Assumptions

Bidders requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specifications. The Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. In the event of conflict between the Technical Specifications and the condition of contract, the requirements as indicated in the technical specification shall govern, unless confirmed otherwise by the Owner in writing before the award of contract, based on written request from the bidder for such a clarification.

In the event of conflict between requirements of any two clauses of the specification documents, the more stringent requirements shall apply, unless otherwise confirmed by the Owner in writing before the award of this contract, based on a written request from the Bidder for such clarification.

The Bidders are advised that while making their Bid Proposals and quoting prices, all terms and conditions of bidding documents may appropriately be taken into consideration. Bidders are required to furnish a certificate indicating their full compliance to the terms and conditions of the bidding documents.

3.5 Limit of Contract

Equipment furnished shall be complete in all respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions. All similar standard components/ parts of similar standard equipment provided shall be interchangeable with one another.

During execution of the contract, successful Bidder (Bidder) shall furnish the engineering data / drawings / calculations, etc. in accordance with the schedule of information agreed between Owner and the Bidder. Review of these data by the Owner's Engineer / Consultant will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under specifications, external connections and of the dimensions which might affect plant layout.

This review by the Owner's Engineer / Consultant may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicative of the accuracy of the information submitted. This review and/ or approval by the Engineer shall not be construed by the Bidder, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements specified under these specifications and documents.

3.6 Latent Defects

Notwithstanding the issue of the Take Over Certificate, the Contractor shall be responsible for making good with all possible speed any Latent Defect in any Works /equipment of the plant which appears at any time before the expiry of defect liability period. And shall remedy such defect at its own cost and expense. The latent defect liability period shall be a minimum of 5 years from the end of defect liability period. The defects to which this applies are defects in design, materials or workmanship or defects arising from any act or omission of the Contractor done or omitted prior to Take-over of the portion of the Plant affected by the defects or during the Warranty Period which a reasonable examination at the end of the Warranty Period would not have disclosed.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

3.7 Completion Schedule

The Bidder shall submit Time Bar chart indicating completion date of major activities such as submission of design data / calculations and drawings for approval, manufacturing of components / units, supply, inspection etc. without which the Tender shall not be considered. Time Bar Chart furnished shall afterwards form part of the contract and cannot be altered arbitrarily except Force Majeure conditions as may be agreed with the Owner.

3.8 Drawings & Documents for Owner's use and Archives

The Bidder shall submit all final drawings, documents, manuals for Owner's use and for reference / record required during course of operation and maintenance of the plant. Numbers of copies and their form (hard copy, electronic form, reproducible) to be submitted and the details of the documents, drawings, manual etc. to be furnished by the Bidder are described elsewhere in the specification.

Drawings, documents, calculation, data & Information to be submitted by the Bidder along with the offer:

Technical Data to be submitted with the Tender

- 1) List of performance tests proposed by the Bidder to demonstrate the guaranteed parameters for generator and other electrical equipment.
- 2) Specific energy consumption.
- 3) Type test certificates for major categories of equipment, issued by independent testing authority.
- 4) Guaranteed Technical Parameters.
- 5) Technical catalogues.
- 6) Manufacturing Quality Plan

3.9 DRAWINGS & DOCUMENTS TO BE SUBMITTED BY THE SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT

One set of soft copies of all the approved drawings, documents including as built drawings shall be furnished by the Bidder to the Owner / Consultant in compact discs.

White prints or other non-reproducible drawings can be mailed folded. Blue prints shall generally not be used.

All drawings, prepared by the Bidder shall be as per IS: 696. Supplier's standard drawings are exempted from the above size limitation, unless his "standard" includes drawings of very large size or length. There shall be sufficient reference notes on the drawings to permit identification of all the drawings which are required for a proper understanding.

Bills of material and drawings shall be cross-referenced for easy identification.

All drawings shall be dimensioned in the metric system. Where drawings are usually made in the British (or other) system, they shall also have metric system dimensions in parentheses or below dimension line. Titles and written notations shall be in English. If the original is in another language it shall carry English translation. The translations will appear immediately on the drawings. Attached lists of translated words shall not be accepted.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Drawings and bills of material shall be identified by a numbering system to be mutually agreed later on. Any additional identification numbers or symbols that the Bidder selects to use for his own purposes are permissible so long as Owner's number is the prime means of identification.

The scale of the drawing shall be shown clearly in the title block of the drawing. Wherever possible, scales of drawings shall be:-

1 : 1	1 : 2.5	1 : 5	1 : 10	1 : 20	1 : 25
1 : 50	1 : 100	1 : 200	1 : 300	1 : 500	
1 : 1000	1 : 2000	1 : 5000			

All reproducible must be made from original drawings.

All revised drawing shall clearly indicate the number, date and subject to each revision. All the revisions carried out in the drawings shall be clearly identified and marked.

Drawing list shall be kept up-to-date, incorporating all new additions, cancellations and changes, and will be reissued periodically with Progress Report.

General arrangement drawings shall be submitted for approval to the Owner/ Consultant prior to the commencement of detail engineering by the Bidder. These drawings shall show to scale all major equipment including electrical equipment and building outlines and overall dimensions as well as tie-in dimensions and clearances shall be clearly indicated. Approved arrangement drawings shall be used as basis for design and preparation of detail drawing to be prepared by the Bidder. The Bidder shall furnish all the necessary drawings, data etc., of the plant/equipment with appropriate "Status" stamp in adequate no. of copies as indicated below:

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	6	6	-
2	Drawings "As Built "	-	-	6	-
3	Type Test Reports	1	6	6	02
4	Erection Manuals	-	6	6	-
5	Operation and Maintenance Manuals	-	6	6	-
6	Manufacturing Quality Plan	1	6	6	-
7	Field Quality Plan	1	6	6	-
8	Inspection Test Reports	-	-	6	-

All instruction manuals / O&M Manual/"as built drawing" : 6 copies each

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Operation & Maintenance Manuals

Instruction manuals, presenting the basic categories of information for the operating and/or maintenance personnel, as detailed herein below shall be furnished by Bidder.

The instruction manuals shall present the following basic categories of information in particular complete and comprehensive manner and prepared for the use by operating and/or maintenance personnel.

- i. Instructions for initial commissioning, short duration and long duration shut down.
- ii. Instruction for operation, routine inspection and maintenance including preventive maintenance.
- iii. Recommendation for inspection points, method of inspection and period of inspection.
- iv. Information on detection, cause and rectification of troubles and faults.
- v. Instructions on normal repairs and overhaul.
- vi. Complete parts list with proper and complete identification (Tag nos./Serial nos. as shown in the respective approved drawings) and ordering information for all replaceable parts. The identification details of equivalent and alternative makes for these spare parts which are not manufacturer's own product shall also be listed.
- vii. List of all special tools and tackle & spares and instructions for use of such tools and tackle & spares.
- viii. One complete set of as built drawings of the entire systems.
- ix. The information shall be organized in a logical and orderly sequence. A general description of equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment. Such description and technical characteristics shall not differ from the approved data.
- x. Necessary drawings, curves and other illustrations shall be included or copies of appropriate approved drawings shall be bound in the manuals. Tests, adjustment and calibration information, as appropriate, shall be included. Safety and other warning notices and installation, maintenance and operating cautions shall be emphasized.
- xi. Write-up, figures, part list etc., shall be clearly legible. The manuals shall be prepared on good quality paper securely bound in durable folders.
- xii. The instruction manuals shall be subject to Consultant's approval in the same fashion as that for drawings.
- xiii. Instruction manual shall give step by step procedure for Erection, testing and commissioning
- xiv. Operation, Maintenance and Repair Instruction manual shall also contain:
- xv. List of spare parts with ordering specifications and manufacturer's catalogues
- xvi. List of consumables, lubricants, chemicals with specifications, brand names and annual consumption figures.
- xvii. Drawings relevant for erection, operation, maintenance and repair of the equipment.
- xviii. Procedure for ordering spares.
- xix. Maintenance Manual shall also include:
- xx. Diagnostic trouble shooting / fault location charts
- xxi. Tests for checking of proper functioning.

Drawings / documents for approval

List of drawings with schedule of submission five (05) days from the date of placement of order.

Quality Control & Quality Assurance plan.

G.A. and Cross Sectional drawings of all equipment indicating weights, material of construction, bill of material, dimension, specification etc.

Final design calculations and assumptions.

Actual performance data and characteristic curves based on the testing at site.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Technical specification of all equipment, motors, for all system and all other accessories.
Final list of drawings.
As built drawings.

Technical document for Reference / Information

Civil foundation drawings with static & dynamic load data of all equipment indicating cable trench, pipe trench, conduits, inserts, cable entries to motor, field devices etc.

Technical literature and catalogue of bought out items.

Drive list to be furnished within fifteen (15) days from the date of placement of order.

List of special tools & tackles to be supplied

Test certificates.

Part number and description of all spare parts.

Reproducible of all final drawings.

Total list of all equipment with dispatch schedule.

All other relevant drawings / documents / certificates not specifically mentioned above but deemed essential for successful functioning of the equipment.

Methodology of drawing Approval

Bidder shall submit all drawings / documents / data sheets / calculations etc. which require approval clearly indicating the category (Approval / Information) to BHEL in hard copies/ soft copies in adequate number. BHEL shall compile the observation/ comments along with MECON/NSPCL's comments and shall send stamped copies of the drawing / document to Bidder for further action at their end.

Bidder shall send the Approved working drawings to BHEL for their record, reference and use.

Electrical wiring diagram for all interlock in lubrication system etc., including wiring inside local panel.

Foundation drawing with loading data.

Miscellaneous

- i. General arrangement and cross sectional drawings of all major components with bill of material.
- ii. Foundation drawings, load data & design calculation for all equipment.
- iii. Erection drawings for all equipment and structures showing complete erection details.
- iv. Engineering and design calculations of installations and units.
- v. QAPs
- vi. Detailed procedures of shop testing of all the items applicable shall be submitted to the Owner/ Consultant for approval before conducting tests.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

vii. Following shop test certificates/test curves/data, shall be furnished.

- Materials and components test certificates.
- Performance test results and characteristic curves of all fans, pumps, and electric drive motors etc.
- Non-destructive test results as applicable.
- Reports and test certificates of shop tests.
- Type test & routine test certificates.

viii. Detailed quality assurance program along with quality plan shall be submitted.

Following data shall be furnished:-

- a. Technical data of all the plant, equipment, drive motors, instruments, panels, etc. shall be furnished.
- b. Following lists/tables / write ups shall be furnished, complete with tag nos. and brief specification. Proper numbering system as approved by Consultant/Owner shall be adopted.
 - i. Instrument schedule (with service, range, make of instrument).
 - ii. Flow element schedule.
 - iii. Valve schedule.
 - iv. Pipe schedule.
 - v. Cable schedule (Power & Control).
 - vi. Schedule of actuators (electric/pneumatic)

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalized at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	Approval/comments/by employer on Initial submission	Within 2 weeks of receipt
ii.	Resubmission	Within 2 (two) weeks (whenever from date of comments required) Including both ways postal time.
iii.	Approval or comments	Within 2 weeks of receipt of resubmission
iv.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

3.10 Workmanship and Quality Control

All moving parts of equipment, which can conceivably cause injury to the operator and otherwise authorized personnel within the vicinity of working area shall be suitably guarded and warning displays shall be put at prominent places.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

The Bidder shall clearly indicate and identify the plans and procedures, which shall be followed in the design, manufacture and installation of plant and equipment to control and assure to the Owner of the desired quality.

3.11 Provision for exposure to hot and humid climate

a. ENCLOSURE

Enclosure protection class shall be as detailed in the respective chapters.

Equipment enclosure, intended for outdoor service, shall be of weather-proof construction, generally conforming to degree of protection IP-55.

For equipment located in hazardous areas like lub oil handling, hydrogen handling areas, FOPH etc. increased safety type enclosure, such as flame/explosion proof type, shall be provided. Such enclosures shall be certified by recognized authority as suitable for use in that particular environment.

b. TROPICAL PROTECTION

All electrical equipment, accessories and wiring shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

Fine mesh screen of corrosion resistant material shall be furnished on all ventilating openings to prevent entry of insects.

c. SPACE HEATERS

The heaters shall be suitable for continuous operation at 230 V as supply voltage. On –off switch and fuse shall be provided.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centered in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conducting and electrical insulation properties or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in vitreous glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the compartments.

d. FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistance varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

e. VENTILATION OPENING

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds.

3.12 NAME PLATE

Nameplate of approved design shall be furnished on each panel and for each instrument or device mounted on panel.

The material for nameplate shall be 3 mm thick lamicoid or approved equal, with white letters on black background.

3.13 GALVANISING

i. The galvanised surface shall consist of a continuous film adhering to the steel. The finished surface shall be clean and smooth, and shall be free from defects like dissolved patches, base, spot, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off, etc. The presence of any of these defects shall render the material liable to rejection.

ii. All exposed ferrous parts shall be hot dip galvanised as per IS:2629 & IS:2633, Galvanising shall be uniform, smooth continuous and free from acid spots. Should the galvanising of the sample be found defective, the entire batch of steel shall have to be re-galvanised at Contractor's cost. The amount of zinc deposit shall be not less than 610 gms. per sq.m. of surface area and in addition, the thickness of zinc at any spot shall not be less than 85 microns. The Employer reserves the right to measure the thickness of zinc deposit by Elcometer or any other instrument acceptable to Employer and reject any component which shows thickness of zinc at any location less than 85 microns. The testing on the galvanised materials shall be carried out as per IS: 2633.

iii. The amount of zinc deposit over threaded portion of the bolts, nuts and screws shall not be less than 300 gms. per sq. meter of surface area. The amount of zinc deposit on washers shall not be less than 340 gms. per sq. meter of surface area. The threads having extra deposit of zinc shall be removed by die cutting after the completion of galvanising. The removal of extra zinc shall be carefully done so that threads shall have minimum deposits of zinc on them as specified.

3.14 Surface Preparation and Painting

The surface of plant & equipment shall be suitably cleaned and coated with anti-rust primer to protect against corrosion and damage during transit and transportation to the site.

Painting shall be done as per details indicated in the relevant Sections of this specification.

Unless explicitly stated in relevant chapters of the specification, the painting of all electrical equipment shall be as follows:

Epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat. Paint shade shall be as per technical specification.

All sheet steel work shall be pretreated, in tanks, in accordance with IS: 6005. Degreasing shall be done by alkaline cleaning. Rust and scales shall be removed by pickling with acid. After pickling, the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The phosphate coating shall be "Class-C" as specified in IS: 6005. The phosphated surfaces shall be rinsed and

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

passivated. After passivation, Electrostatic Powder Coating shall be used. Powder should meet requirements of IS 13871 (Powder costing specification). Finishing paint shade for complete panels excluding end covers shall be RAL9002 & RAL5012 for extreme end covers of all boards, unless required otherwise by the Owner. The paint thickness shall not be less than 50 microns. Finished parts shall be suitably packed and wrapped with protective covering to protect the finished surfaces from scratches, grease, dirt and oil spots during testing, transportation, handling and erection.

3.15 QUALITY ASSURANCE

- i. The Contractor shall follow his standard procedures for quality assurance and control. A copy of the said standard procedures shall be submitted to the Owner / Purchaser for his reference. However, Owner / Purchaser reserves the right to review the same and give his observations, if any, for compliance.
- ii. The procedures shall be in such a form as to clearly delineate the manufacturing sequence, inspection points, tests and test procedures, acceptable ranges / values, reference drawings etc.
- iii. The Owner / Purchaser shall inform the Contractor as to which of the inspection points and tests shall be witnessed. As a minimum, inspection and testing of the finished equipment shall be made prior to shipment, unless specifically waived by the Owner / Purchaser. The contractor shall give at least fifteen (15) days advance notice regarding readiness of the equipment.
- iv. Manufacturing and quality control procedures shall be available for audit to the Owner / Purchaser and/or its representative at the place of manufacture.
- v. The Owner / Purchaser reserves the right to inspect the equipment at the point of manufacture and witness factory and other such tests as may be necessary to ensure conformance to the specification.
- vi. The Owner / Purchaser may inspect the Contractor's facilities prior to award of contract.
- vii. The Owner / Purchaser may witness any or all of the tests stipulated in the relevant standards and this specification.
- viii. The Owner / Purchaser may conduct surveillance of the Contractor's facilities for compliance to his standard procedures of Quality Assurance and Quality Control while work on the specified equipment is in progress.

QUALITY ASSURANCE REQUIREMENTS

3.15.1.1 QUALITY ASSURANCE PROGRAMME

- a. To ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Contractor's works or at his Sub-contractor's premises or at the Owner's site or at any other place or work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Owner/Authorized representative after discussions before the award of contract. A quality assurance programme of the Contractor shall generally cover the following:
- b. His organization structure for the management and implementation of the proposed quality assurance programme.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

- c. Documentation control system.
- d. Qualification data for Bidder's key personnel.
- e. The procedure for purchase of materials, parts, components and selection of Sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
- f. System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.
- g. Control of non-conforming items and system for corrective actions.
- h. Inspection and test procedure both for manufacture and all site related works.
- i. Control of calibration and testing of measuring and testing equipments.
- j. System for quality audit.
- k. System for indication and appraisal of inspection status.
- l. System for authorizing release of manufactured product to the Owner.
- m. System for handling storage and delivery.
- n. System for maintenance of records.
- o. Furnishing of quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed at Annexure-I to this section.

3.15.1.2 GENERAL REQUIREMENTS - QUALITY ASSURANCE

- i) All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the Contractor for some of the major items is given in the respective technical specification. This is however, not intended to form a comprehensive programme as it is the Contractor's responsibility to draw up and implement such programme duly approved by the Owner/Consultant. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder, separately in the format attached at Annexure-I and will be submitted to Owner/Authorized representative for approval. Schedule of finalization of such quality plans will be finalized before award.
- ii) Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's Quality Control organization, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing.
- iii) Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control organization, during various stages of site activities from receipt of materials/equipment at site.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

- iv) The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality plans and reference documents/standards etc. will be subject to Owner's approval without which manufacture shall not proceed. These approved documents shall form a part of the contract. In these approved quality plans, Owner/Authorized representative shall identify customer hold points (CHP), test/checks which shall be carried out in presence of the Owners Engineer or his authorized representative and beyond which the work will not proceed without consent of Owner/Authorized representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Owner/Authorized representative for approval and dispositioning.
- v) No material shall be dispatched from the manufacturer's works before the same is accepted subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by Owner's Engineer/Authorized representative, and duly authorized for dispatch issuance of Material Dispatch Clearance Certificate (MDCC).
- vi) Materials used or supplied shall be accompanied by valid and approved materials certificates and tests and inspection report as per Owner's approved QAP. These certificates and reports shall indicate the sheet numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it.
- vii) Castings and forgings used for construction shall be of tested quality. Details of results of chemical analysis, heat treatment record, mechanical property test results shall be furnished.
- viii) All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section-IX/BS-4870 or other International equivalent standard acceptable to the Owner.
- ix) All brazers, welders etc. employed on any part of the contract at Contractor's/Sub-Contractor's works or at site shall be qualified as per ASME Section-IX or BS-4871 or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in presence of Owner/his authorized representative.
- x) For welding of pressure parts and high pressure piping the requirements of IBR shall also be complied with.
- xi) All non-destructive examination (NDT) shall be carried out in accordance with approved international standard. The NDT operator shall be qualified as per SNT-TC-IA (of American Society of non-destructive examination). Results of NDT shall be properly recorded and submitted for approval.
- xii) All the sub-vendors proposed by the Contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment list of which shall be drawn up by the Contractor and finalized with the Owner shall be subject to Owner's approval. Quality Plans of the successful vendors shall be discussed, finalized and approved by the Owner/Authorized representative and form part of the Purchase Order between the Contractor and the Vendor.
- xiii) All the purchase specifications for the major bought-out items, list of which shall be drawn up by the Contractor and finalized with the Owner shall be furnished to the Owner for comments and subsequent approval before orders are placed. Owner reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-vendor's quality management and control activities. The Contractor shall provide all necessary assistance to enable the Owner carry out such audit and surveillance. Quality audit/approval of the results of tests and inspection will not prejudice the right of the Owner to reject an equipment not giving the desired

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

performance after erection and shall not in no way limit the liabilities and responsibilities of the Contractor in earning satisfactory performance of equipment as per specification.

- xiv) Quality requirements for main equipment shall equally apply for spares and replacement items.
- xv) Repair/rectification procedures to be adopted to make any job acceptable shall be subject to the approval of the Owner.
- xvi) For quality assurance of all civil works refer to the specifications for civil works.

3.15.1.3 QUALITY ASSURANCE DOCUMENTS

- i) The Contractor shall be required to submit two (2) copies and two (2) sets of microfilms of the following Quality Assurance documents within three (3) weeks after dispatch of the equipment:
- ii) Material mill test reports on components as specified by the specification.
- iii) The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.
- iv) Non-destructive examination results /reports including radiography interpretation reports.
- v) Factory tests results for testing required as per applicable codes and standards referred in the specification.
- vi) Welder identification list listing welder's and welding operator's qualification procedure and welding identification symbols.
- vii) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- viii) Stress relief time temperature charts.
- ix) Inspection reports duly signed by QA personnel of the Owner and Contractor for the agreed inspection hold points. During the course of inspection, the following will also be recorded :
- x) When some important repair work is involved to make the job acceptable.
- xi) The repair work remains part of the accepted product quality.
- xii) Letter of conformity certifying that the requirement is in compliance with finalized specification requirements.

3.16 Inspection and Testing

The plant and equipment shall be subjected to inspection and witnessing of shop tests by the Owner / Consultant or the agency mutually agreed between Owner and the Bidder / Supplier. The supplier shall inform the Owner/ his Consultants at least fifteen days in advance of the date when the plant and equipment shall be made available for inspection and testing. The Owner and / or his Consultant shall be given full access to the tests and testing premises and can inspect the factories and offices of the supplier or sub-vendor, if so required. After inspection and testing, all certificates /documents as required by the Owner /

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Consultant shall be submitted for approval to the Owner before clearance for dispatch of equipment can be given.

For plant and equipment for which tests at works may not have been witnessed by Owner / Consultant, the tests and quality certificates duly signed by appropriate authority acceptable to Owner / Consultant shall be submitted to the Owner / Consultant for approval within 6 weeks in advance of the dispatch.

Inspection by the Owner or his representative shall not relieve the Bidder of his liability for rectifying any defects which may subsequently appear or be detected during or after erection and during guarantee test. After rectification, the testing of equipment shall be repeated to the satisfaction of the Owner / Consultant.

Drawings / Data to be submitted with the Tender

In order to enable the Owner / Consultant to properly evaluate the tenders, the drawings / documents / technical particulars.

3.17 Packing, Dispatch, Handling & Transportation

All equipment, shall be suitably packed for protection against mechanical damages and climatic conditions during transit and storage. Packing and weather proofing shall be subject to approval of the Owner / his Consultant. This approval shall be general and may not be required every time for an article to be dispatched. However, the Owner reserves the right to examine the packing for any particular consignment at supplier's/ manufacturer's works before dispatch.

The supplier shall be entirely responsible for the insurance, shipment, handling and transportation.

The equipment shall not be dispatched by the Bidder from the place of manufacture to the site until the dispatch instructions are issued by the Owner.

3.18 ELECTRICAL SWITCH BOARDS

General

Switchboards shall be dead-front, free-standing, vertical, cubicle/panel type, completely wired, having access doors with concealed hinges and locking type latches.

Panels shall be fabricated from minimum 2 mm. thick CRCA (cold rolled continuously annealed) sheet steel, free from any surface imperfections and suitably reinforced to provide a sturdy and rigid assembly. Gland plate thickness shall be min 3.0 mm of non-magnetic material.

Panels shall be adequately sized for installation of field cables and access for maintenance. The working zone shall be limited between 450 mm and 1800 mm from floor level.

Each panel shall be provided with internal illumination lamp operated by door switch, space heater with switch fuse unit, and plug socket with switch for hand lamp.

Removable eye bolt/lifting lugs shall be furnished on all panels.

Module selection chart is included in this specification for guidance purpose. Bidder to note that this is only for guidance of the bidder. Actual size, rating etc. shall be as per detailed engineering by the bidder.

3.18.1 Equipment Mounting

All instruments, switches etc. mounted on the front face of the panels shall be of flush type.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

All equipment shall be so mounted that removal and replacement may be accomplished individually without interruption of service to others.

All equipment inside the panel shall be so located that their terminals and adjustments are readily accessible for inspection and maintenance. Adequate ventilation shall be provided in enclosed panel.

Each of the LV switchboards shall be designed for 1.1 times the required rating as a spare capacity. Further all LV Switchboard shall be provided with 20 % spare modules of each rating and type of module.

3.18.2 Panel Wiring

All panels shall be fully wired at the factory to ensure proper functioning of all control, protection and interlock schemes. All wiring for external connections shall be brought to terminal blocks and numbered.

All auxiliary wiring shall be carried out with 650V grade, single core stranded copper conductor, color coded, PVC insulated wires. Conductor size shall be 1.5 mm² (min.) for control circuit wiring and 2.5 mm² (min) for CT, PT and space heater circuits.

Solderless compression/clamp type connection shall be used for wire terminals. Wiring shall be continuous between terminals without splicing. Each wire shall be identified at both ends with permanent markers having wire numbers as per approved wiring drawings.

3.18.3 Terminal block

Terminal blocks shall be 650V grade, 10Amps rated, made up of unbreakable polyamide 6.6 grade. The terminals shall be either screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design.

Terminal blocks for CT and VT secondary leads shall be of stud type, made up of unbreakable polyamide 6.6 grade. They shall be provided with links to facilitate testing, isolation star / delta formation and earthing. Terminal blocks for CT secondary shall have the short circuiting facility. The terminals for remote ammeter connection etc. shall also be disconnecting type only. All metal parts shall be of nonferrous material. Screws shall be captive.

All panel wiring for external connections shall terminate on separate terminal blocks which shall be suitable for connecting two (2) stranded copper conductors of 2.5 sq. mm on each side, or alternatively, the terminal blocks shall have the possibility of double shorting space to facilitate looping.

Not more than two wires shall be connected to one terminal. Spare terminal equal in number to 20% of active terminals shall be furnished.

Terminal housing Material should be a) Fire resistant/retardant, b) Of high aging stability and c) Unbreakable.

Cable terminals Material should a) be of copper alloy b) Be able to rigidly hold the cable with adequate pressure, c) have low contact resistance and d) have sufficient contact surface.

3.18.4 Grounding

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

A copper ground bus, sized to carry maximum short circuit current, shall run along the entire length of panel structure and shall have terminal connector at each end for connection to station ground grid (50 X 6 mm G.I. flat).

Tests

Each panel shall be completely assembled, wired, adjusted and tested at the factory prior to shipment. The test shall include wiring continuity tests, insulation tests and functional tests to ensure satisfactory operation and control of individual equipment.

Special Cables

Special cables for specific purpose, as required, shall be supplied and installed by the Bidder.

3.18.5 CONDUITS

Conduits shall be of heavy gauge rigid steel, hot-dip galvanized, cut square reamed, threaded and screwed tight at all joints.

Conduit entrances to pull boxes and switches shall have double lock nuts & insulating bushings. No running thread shall be used.

Flexible metallic conduit shall be used for connection to equipment, which are subject to vibration, and also for connection to level/limit/pressure switches.

3.19 Performance Guarantee and Penalties

All the plant and equipment supplied shall be guaranteed for quality workmanship and compliance with the specified requirements for integrated performance to deliver rated outputs. Non-compliance and non-performance shall be subjected to correction.

3.20 TYPE, ROUTINE & ACCEPTANCE TESTS:

All equipments to be supplied shall be of type tested design. During contract stage, bidder shall submit for Owner's approval the reports of all the type tests listed in this specification and carried out within last ten years from the date **02/04/2015**. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the tests should have been either conducted at an independent laboratory or should have been witnessed by a client.

However if contractor is not able to submit report of the type tests conducted within ten years from the date **02/04/2015** or in the case of type test reports are not found to be meeting the specification requirements, the bidder 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.

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.

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

3.21 Title Block :

		NTPC-SAIL POWER COMPANY (P) LIMITED			
Project		ROURKELA PP-II EXPANSION PROJECT (1X250 MW)			
		Consultant (मेकॉन लिमिटेड) MECON LIMITED			
BHARAT HEAVY ELECTRICALS LTD  TRANSMISSION BUSINESS GROUP		DRN			
		DESN			
		CHD			
		APPD			
DEPT : TBG	SCALE NTS		DRAWING NUMBER		
TITLE :					Pg.No 1/--

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Bharat Heavy Electricals Limited	Doc No. TB-390-316-025 Rev 0
Project: NSPCL-Rourkela PP-II Expansion (1x250 MW) Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY	

SECTION-4

Guaranteed Technical Particulars

<u>(A) BATTERY</u>	<u>220V DC</u>	
<u>1 GENERAL</u>		
1.1 Make		
1.2 Catalogue No.		
1.3 Type		
1.4 Reference Standard		
<u>2 RATING</u>		
2.1 Rated Voltage	V	
2.2 Overall dimensions of battery (L x B x H)	mm3	
2.3 10-hour rating at 27°C to end cell voltage	AH	
2.4 2-hour discharge rate to end cell voltage	A	
2.5 1 –hour discharge rate to end cell voltage	A	
2.6 1 –minute discharge rate to end cell voltage	A	
<u>3 PERFORMANCE</u>		
3.1 Battery duty cycle curve furnished	Yes /No	
3.2 Cell voltage characteristics during duty cycle furnished	Yes /No	
3.3 Minimum cell voltage during duty cycle	V	
3.4 AH efficiency at 10-hour discharge rate	%	
3.5 Expected life of Battery	Year	
<u>4 BATTERY CHARACTERISTICS</u>		
4.1 Recommended charging rate for		
4.1.1 Float charging	A	
4.1.2 Equalising Charge	A	
4.1.3 Boost charging in 10 hrs.	A	
4.2 Start	A	
4.3 Finish	A	
4.4 Recommend specific gravity at 27°C		
4.4.1 For first filling		
4.4.2 At full charge		
4.4.3 At end of 10 -hour discharge		
4.5 Battery sizing calculations furnished in line with IEEE	Yes/No	
4.6 Batter backup time min.		

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

4.7 Cell voltage characteristics during charging furnished	Yes /No	
<u>5 CELLS</u>		
5.1 Nominal Cell voltage	V	
5.2 Cell voltage at the end of duty cycle	V	
5.3 Cell voltage at the end of full discharge at 10-hour rate	V	
5.4 Type of the cell		
5.5 Cell designation as per relevant Standard		
5.6 Material of the container		
<u>6 INTERCELL CONNECTOR</u>		
6.1 Intercell connector furnished	Yes /No	
6.2 Type of Intercell connector bolted/ burned		
6.3 Material of Intercell connector		
<u>7 PLATES</u>		
7.1 Type of positive plate		
7.2 Type of negative plate		
<u>8 SEPARATOR</u>		
8.1 Type		
8.2 Material		
8.3 Thickness mm		
<u>9 ELECTROLYTE</u>		
9.1 Electrolyte conforms to		
<u>10 RACKS</u>		
10.1 Type of racks Rows /Tiers		
10.2 Material of rack		
10.3 Racks provided with		
10.3.1 Numbering tags for cells		
10.3.2 Clamps for cables		
10.4 Insulator furnished for		
10.4.1 Cell	Yes /No	
10.4.2 Stand	Yes /No	
10.5 Inter-row, mite r-tier connectors and end take-off furnished	Yes /No	
10.6 Connector hardware's furnished	Yes /No	
10.7 Ventilation requirement furnished	Yes /No	
10.8 List of accessories furnished	Yes /No	
10.9 Technical leaflets furnished	Yes /No	

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)**Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY****SECTION-5****CHECKLIST FOR LEAD ACID BATTERY BANK**

Put a tick mark on 'YES' if the specified requirement is met, or put a tick mark on 'NO' if the specified requirement is not met and give comments in the remark column

1. TECHNICAL REQUIREMENTS

Sl. No.	Parameters	Required Value 220V BATTERY (BOQ S.No 1)	Bidder's Confirmation	Reasons for Non Compliance
1.	Manufacturer's Identification System	As per Specification	YES	
2.	Battery Type	Lead Acid plante	YES	
3.	Battery Voltage	220V	YES	
4.	Design Ambient Temperature	50deg. C	YES	
5.	Max. Battery Bank Voltage	242V	YES	
6.	Min Battery Bank Voltage	198V	YES	
7.	Nominal Discharge Voltage per cell		YES	
8.	Nominal voltage per cell	2.0V	YES/NO	
9.	Cell container	As per Section-2 , 08.02.01	YES/NO	
10.	Vent Plugs	As per Section-2, 08.02.02	YES	
11.	Plates , Sediment Space , Cell insulator	As per Section -02	YES/NO	
12.	Electrolyte	As per Section-2 , 08.02.06	YES/NO	
13.	Connectors and Fasteners	As per Section-2 , 08.02.07	YES/NO	
14.	Battery Racks	As per Section-2 ,08.02.08	YES/NO	

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

18.	Arrangement for connection for cell tapping provided for continuity during boost charging?		YES/NO	
20.	Accessories required for complete installation of the Battery Bank included in the scope of supplies.	YES	YES/NO	
21.	Mandatory spares quoted in line with clause 1.3.2 of section 1	YES	YES/NO	
22.	Supply of electrolyte for first filling plus 10% extra with the battery bank	YES	YES/NO	
23.	All routine & acceptance tests to be conducted	As per relevant IS/IEC/IEEE	YES/NO	
24.	Supervision of Erection at Site for each type and rating	Included	YES/NO	
25.	Supervision of Testing and Commissioning at Site for each type and rating.	Included	YES/NO	

24. Sizing Calculation for deciding Ampere hour rating of battery as per specified duty cycle (Section 1) has been submitted along with offer for review. **YES/NO**

2. TYPE TESTS

- Whether the offered equipment has been type tested within Ten years from the date of bid opening (**Date of bid opening is 02.04.2015**) and valid reports are available. **YES / NO**
- If yes, furnish the report number.
- If case, the reports are not found complete / valid at contract stage, such type tests shall be carried out without any cost / delivery implication to BHEL . **Yes / No**
- Documents submitted to prove meeting of the Pre-Qualifying Requirements as per Clause 1.5 (Details provided) **Yes / No**

Bharat Heavy Electricals Limited

Doc No. TB-390-316-025

Rev 0

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

SECTION-6

Quality Plan

LEAD ACID BATTERY								
ATTRIBUTES / CHARACTERISTICS								
ITEMS, COMPONENTS, SUB SYSTEM ASSEMBLY	Dimensions & Finish	Conformance to relevant part drg. & Manufacturer's standards	Chemical composition	Lead Coating Thickness (min. 25 microns, IS: 6848 App.F) & Adhesion Check	Conformance to CPWD Spec. for Teak Wood	Paint Process checks, Paint Shade, Thickness, Adhesion & Finish	Constructional requirements as per NSPCL Spec.	Routine & acceptance tests as per relevant standard
Container & Lids (IS : 1146)	Y	Y						
Vent Plugs	Y	Y						
Sealing Compound (IS : 3116)		Y	Y					
Positive & Negative Plates		Y	Y					
Separators (IS : 6071)	Y	Y						
Electrolyte (Water / Sulphuric Acid) (IS : 1069 / 266)		Y	Y					
Inter-cell Connectors & Fasteners	Y	Y		Y				
Battery Stand	Y	Y			Y	Y		
Cell Insulators	Y	Y						
Stack Assembly	Y	Y						
Lead Acid Battery (IS : 1652)	Y						Y	Y

Note: This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.

QUALITY ASSURANCE

DC HEALTH MONITORING												
SYSTEM	Attributes / Characteristics →	Items / Components / Sub- assembly ↓	Make, Model, Type, Rating & Finish	Verification of Routine test reports as per relevant IS	Sheet Steel Pretreatment & Painting process	Conform to relevant Standard & NSPCL spec	Dimensional check and Paint shade, thickness, adhesion & Finish checks	Complete physical examination for constructional features as per NSPCL approved drgs &	Operational & Functional Checks	HV & IR Test	Burn-In Test at 50°C for 48 hrs in energized condition	Degree of Protection Test as per NTCP Spec.
Enclosure	Y		Y		Y	Y	Y					Y
Synthetic Rubber Gaskets	Y		Y			Y						
Control & Selector Switches ,Indicating Meters, Indicating Lamps	Y					Y			Y			
Control Terminal Blocks ,Push Buttons, MCB	Y		Y			Y			Y			
MCB	Y		Y			Y			Y			
PVC insulated Copper control / signal cables	Y	Y	Y			Y						
Transducers / detectors	Y	Y	Y			Y			Y			
PCB & racks for electronic cards	Y		Y									
Electronic Cards	Y		Y						Y		Y	
Microprocessor Based Controller	Y		Y						Y		Y	
SCADA	Y		Y						Y			
Software	Y		Y						Y			
DC Health Monitoring System	Y		Y			Y	Y	Y	Y	Y	Y	Y
Notes:												
1. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.												
2. Makes of all major Bought Out Items will be subject to NSPCL approval.												

Bharat Heavy Electricals Limited

Project: NSPCL-Rourkela PP-II Expansion (1x250 MW)

Technical Specification for 220V DC LEAD ACID PLANTE TYPE BATTERY

Doc No. TB-390-316-025

Rev 0

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specification:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification
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Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date:

Tenderer's Stamp & Signature