

THE SINGARENI COLLIERIES COMPANY LIMITED

**2 X 600 MW SCCL COAL BASED THERMAL
POWER PLANT**

VOLUME – II

***TECHNICAL SPECIFICATION FOR
220V DC BATTERY***

BHEL DOCUMENT NO. : PE-TS-381-508-E001, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA – 201301**



**TECHNICAL SPECIFICATION FOR
220V DC BATTERY**

**2 X 600MW TPP AT SINGARENI,
ADILABAD (A.P.)**

SPECIFICATION NO. PE-TS-381-508-E001

VOLUME II B

SECTION -

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***If bidders have any reference QAP of NTPC projects then same shall be applicable. QAP attached with specification is for reference only.**

TOTAL NO. OF SHEETS = 28 (INCLUDING COVER/ SEPARATOR SHEETS)

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

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS')



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INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 11.1 of Section-C, Volume-II-B of the specification, two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
 - a. Unpriced Price Schedule (Annexure-I: BOQ & price schedule, as enclosed with the specification) with bidder's signature and company stamp.
 - b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
 - c. A copy of previous sheet ("List of Contents"), with bidder's signature and company stamp.
 - d. ("Deviation Schedule"), with "NO DEVIATION" and bidder's signature and company stamp.
2. No technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.
3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the battery description/ quantities, notes etc. from those given in Annexure-I to Section-C of specification [BOQ-Cum-Price Schedule] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).
6. Refer provenness criteria and bidder must submit the document/proof in justification of the same.

BIDDER'S STAMP & SIGNATURE



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PROVENNESS CRITERIA

Bidder / sub-vendor should have manufactured and supplied at least two (2) numbers of minimum 220V, 1000AH rating high discharge type plant positive plate type battery (in case bidder offers Lead Acid plant type battery) or minimum 220V, 600AH rating high discharge type Nickel Cadmium battery (in case bidder offers Nickel Cadmium battery), at least one (1) each at two (2) different industrial installations, which should be in successful operation for at least two (2) years as on date of bid opening.



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PREAMBLE

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

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

This consists of four parts as below:-

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

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

Volume – IC This part contains Special Conditions of Contract.

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

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

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

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 **VOLUME – IIB**

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

Section – A This section outlines the Intent of Specification

Section – B This section provides “Project Information”.

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

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

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



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SECTION - A

SCOPE OF ENQUIRY

- 1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing and delivery to site of 220V DC Battery as mentioned in different sections of this specification for 2 X 600 MW TPP AT SINGARENI, ADILABAD (A.P.).
- 2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
- 3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.
- 4.0 The bidders shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Deviations, if any should be brought out very clearly on deviation sheet enclosed with specification only. Otherwise it will be presumed that the bidder's offer is in line with what has been stated/ asked for in this specification.
- 6.0 The offer should be complete with technical data, catalogue, brochures and drawings, as applicable.
- 7.0 **PROVENNESS CRITERIA: In order to be able to present to the client the provenness of the equipment offered, the bidder is required to furnish elaborate details of experience, capabilities, reference list etc. in the offer.**
- 8.0 The documents shall be in English language and MKS system of units.



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SECTION – ‘B’

PROJECT INFORMATION

CLAUSE NO.	PROJECT INFORMATION					
1.00.00	BACKGROUND					
	The Singarenis Collieries Company Limited is a government coal mining companies jointly owned by the Government of Andhra Pradesh and Government of India on a 51:49 equity basis					
	The present proposal is for setting up of a coal based Singareni Thermal Power Project (2x600 MW) to be owned by The Singareni Collieries Company Limited, which is A Government Company.					
1.01.00	LOCATION AND APPROACH					
	The Singareni TPP is located near Pegadapalli village, Jaipur Mandal, District Adilabad of Andhra Pradesh. The latitude and longitude of Site are 18° 48' 30" to 18° 50' 35" and 79° 34' 00" to 79° 35' 30" respectively. The Site is 14.6 Km from nearest town Mancherial and 4.6 Km from State Highway. Distance from NH-16 (Nirmal-Chinnur section) is 500M.					
	Nearest railway station is Mancherial railway station on Nagpur-Kazipet main rail line of South Central Railway, located at a distance of about 14.6 kms.					
	Nearest airport is Shamshabad Airport, Hyderabad at a distance of about 250KM.					
1.02.00	Vicinity Plan of the project is placed at Annexure-I					
	LAND REQUIREMENT					
	About 490 hectares of land has been identified for the plant, CHP, water reservoir, Staff colony, ash dump area, Coal conveyor corridors, water pipelines and Green belts.					
1.03.00	WATER					
	Water requirement has been assessed as 3700 cum/hr.					
	Irrigation & CAD Deptt., Govt. of Andhra Pradesh has allocated 1.0 TMC of water per annum from Pranahita Chevella Lift Irrigation Scheme vide Memo No. 17556/Maj.Irr.VIII(1)/08 dated 02.07.2008 (Annexure-2.1).					
	During the no-flow period in the river, Govt. of Andhra Pradesh, Ground Water Department vide their letter No. 157/T/2008 dated 07.08.2008 addressed to SCCL have accorded approval for drawal of 18 MGD (3409 cum/hr) water through infiltration galleries in River Godavari at Shetpally Village for the project.					
SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-A		SUB-SECTION-I PROJECT INFORMATION		PAGE 1 OF 12

CLAUSE NO.	PROJECT INFORMATION			
	<p>SCCL has approached Govt. of Andhra Pradesh vide letter dated 29.08.09 to get allocation of 2 TMC of water from Sripada-Yellempalli Project including already allocated 1 TMC of water for the Power Project.</p> <p>Suitable intake system will be developed at a location as may be suggested by Ground Water Deptt., Govt. of Andhra Pradesh.</p>			
1.04.00	COAL AVAILABILITY AND TRANSPORTATION			
1.04.01	<p>Coal Availability</p> <p>Coal requirement for 1200 MW capacity has been assessed as 4.784 mtpa.</p> <p>Coal will be sourced mainly from Srirampur OCM of SCCL and nearby coalmines of SCCL.</p>			
1.04.02	<p>Coal Transportation</p> <p>Coal will be linked from Srirampur OCM & nearby coalmines of SCCL. (-) 200 mm size Coal will be transported by Rail / MGR system from mines to plant site</p> <p>As a standby arrangement coal shall also be transported by road and the arrangement shall be made in Plant CHP to receive the coal through trucks by designing suitable ground hopper.</p>			
1.04.03	<p>Coal Quality Parameters and Fuel Oil Characteristics</p> <p>The tentative Coal quality parameters and Fuel Oil Characteristics are enclosed as Annexures-II-1 and II-2 to this subsection.</p>			
1.05.00	CAPACITY & POWER EVACUATION			
	<p>Power generated is proposed to be stepped upto 400 kV by generator transformer and will be evacuated through the double circuit overhead transmission system.</p>			
1.06.00	METEOROLOGICAL DATA			
	<p>Important meteorological data from nearest observatory at Ramagundam is placed at Annexure - III.</p>			
1.07.00	PLANT WATER SCHEME			
	<p>The Plant water scheme is described below.</p>			
<p>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION - VI PART-A</p>	<p>SUB-SECTION-I PROJECT INFORMATION</p>	<p>PAGE 2 OF 12</p>

CLAUSE NO.	PROJECT INFORMATION			
1.07.01	<p>Condenser Cooling (CW) Water System</p> <p>It is proposed to adopt re-circulating type CW system with induced draft cooling towers for the project.</p>			
1.07.02	<p>Equipment Cooling Water (ECW) System (Unit Auxiliaries)</p> <p>The plant auxiliaries of Steam Generator shall be cooled by Demineralised water (DM) in a closed circuit. The primary circuit DM water shall be cooled through heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the induced draft cooling towers and shall be returned back to the system.</p>			
1.07.03	<p>Station Auxiliaries Cooling Water System</p> <p>The station auxiliaries such as Air compressors, compressors of ash handling plant, Cooling water circuit of Air Conditioning systems of Main Plant and Service Building, compressor of mill reject system etc. shall be cooled by separate cooling water system using separate set of pumps and cooling towers.</p>			
1.07.04	<p>Ash Water System</p> <p>(a) It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated. During re-circulation mode, the make up to the ash water system (to compensate for the ash water blow down and evaporation loss in ash dyke) shall be supplied from CW blow down.</p> <p>(b) During initial stage when decanted ash water is not available, the ash water system shall be operated in once through mode and make up water to ash water system shall be given from CW blowdown as well as raw water system.</p> <p>(c) Considering total ash handling plant water requirement of 1100 Cu.M/hr. (excluding the water required for cooling of air compressors and vacuum pumps but inclusive of seal water of ash slurry pumps during re-circulation mode operation, it is expected that about 930 M³/hr of decanted ash water shall return to the ash handling system after accounting for evaporation loss.</p>			
1.07.05	<p>Other Miscellaneous Water Systems</p> <p>(a) CW system blow down water shall be used for meeting the Fly ash and bottom ash system requirement. Clarified water shall be used for service water system. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc.</p>			
<p>SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION - VI PART-A</p>	<p>SUB-SECTION-I PROJECT INFORMATION</p>	<p>PAGE 3 OF 12</p>



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SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE OF ENQUIRY

This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing and despatch to site of 220V DC batteries as described in the various sections of this specification. The batteries shall generally conform to IS and IEEE. In this specification, as erection and commissioning is not included in vendor's scope, Vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.

2.0 EQUIPMENT AND SERVICES TO BE FURNISHED BY THE BIDDER

The bidder shall supply the following equipment in accordance with the various sections of this specification. The Unpriced Price Schedule is enclosed as Annexure-I.

3.0 SERVICES AND EQUIPMENT TO BE EXCLUDED

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

4.0 CODES AND STANDARDS

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

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

6.0 SYSTEM CONCEPT:

6.01 220V DC systems for 2 X 600MW SINGARENI TPP AT ADILABAD (A.P.), shall be an ungrounded system comprising of the following:

- i) 2 x 100% batteries each with 1 x 100% float cum boost charger.
- ii) 1 x 100% sectionalised DCDB to feed complete Unit & associated Station load.

Each battery is sized to cater to complete unit & associated station loads. Each battery & associated charger is connected on one section of DCDB and the other battery & associated charger is connected on another section of DCDB as



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indicated in one line diagram for 220V DC system in Annexure-IV. DC loads are distributed on each section to provide redundancy. Each battery will have to cater load duty cycle requirement enclosed as Annexure-III. **Bidder to furnish sizing calculations in support of the battery Capacity chosen by Bidder.**

- 6.02 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.
- 6.03 The 220V DC system is designed to cater to 220V DC power requirement of control, protection, interlock, emergency DC lighting and emergency DC drives for power station.
- 6.04 The 220V batteries are sized considering emergency load cycle requirement of **30 (Thirty) minutes** (as per Annexure-III) and design factors strictly to be followed.
- 6.05 The voltage at load terminal will not exceed the limits of +10% (242V) and -15% (187V) of nominal system voltage for 220V DC system.
- 6.06 DC batteries shall be suitable for continuous operation for the design ambient temperature as defined in Datasheet-A.
- 6.07 Batteries and Chargers shall be connected to DC distribution board through single cores cables for each pole. Battery terminals shall be made suitable for above cable. Battery shall be provided with fuse for short circuit protection.
- 6.08 The equipment will be located indoor in a clean but hot, humid and tropical atmosphere.
- 6.09 Necessary accessories required for maintenance and testing of batteries shall be supplied with each battery bank as per enclosed Annexure-I.
- 6.10 Batteries with cell weight more than 50 Kg shall be arranged in single tier arrangement. The bottom tier of the stand shall not be less than 150 mm above the floor. The batteries which are interconnected to serve as standby to each other shall be located in separate room.

7.0 OTHER TECHNICAL REQUIREMENTS

7.1 Lead-Acid Batteries

Batteries shall be stationery storage Lead-Acid Plante high discharge type conforming to IS-1652/IEEE485. The batteries shall meet the 'Load Duty Cycle' requirements under all site-operating conditions as specified. For the purpose of design an ambient temperature of 50 degree centigrade and relative humidity of 85% shall be considered.



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The batteries shall be boost charged at about 2.7V per cell (maximum) and float charged at about 2.25V per cell.

a) Containers:

Containers shall be made of transparent glass, hard rubber, suitable robust, heat resistant, leak proof, non-absorbent, acid resistant, non-bulging type and free from flaws such as wrinkles, cracks, blisters, pinholes etc. Electrolyte level lines shall be marked on containers in case of translucent containers. Float type level indicator shall be provided in case of opaque containers. The stem portion of the float shall 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 shall be for upper & lower limits. The material for 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 shall be such that no acid particle gets entrapped due to acid creep as a result of capillary action and it shall be possible to remove and refix the sealing to carry out maintenance.

b) Vent Plugs:

Vent plugs shall be provided in each cell. They shall be anti-splash 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 from topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte sample.

c) Plates:

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

The separators shall maintain the electrical insulation between the plates and shall permit free flow of electrolyte. Proper arrangement to keep end plates in position shall be furnished. Separators shall be suitable for continuous immersion in the electrolyte without distortion. The positive and negative terminal posts shall be clearly marked.

d) 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.



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e) Electrolyte:

The electrolyte shall be prepared from battery grade Sulphuric Acid conforming to IS-266 and distilled water conforming to IS-1069. The cells shall be shipped in dry uncharged condition and electrolyte shall be supplied separately in non-returnable containers. 10% extra electrolyte shall be furnished as accessory to cover spillage in transit or during erection.

f) Connectors and Fasteners:

Lead or lead coated copper connectors shall be used for connecting up adjacent cells and rows. Bolts, nuts, clamps and washers shall be lead coated with minimum thickness 0.025 mm to prevent corrosion. The thickness of lead coating shall be measured as per appendix-F of IS-6848 (latest edition). All the terminals and inter-cell connectors shall be fully insulated or shrouded. End take of connections from positive and negative poles of batteries shall be done through single core cable having stranded copper conductor and PVC insulation. The bidder shall supply lead coated bent copper plate, tubular copper lugs, teak wood clamp, bolts, nuts, washers, etc. for termination of these cables on batteries. Suitable numbers of inter rack connectors shall be supplied by the bidder to suit the battery room layout during detailed engineering. Calculation for sizing of connectors and fasteners shall be furnished during detail engineering.

All connectors and lugs shall be capable of continuously carrying the 30 minutes discharge current of respective batteries and through fault short circuit current, which the battery can produce and withstand for the period of one minute. The successful bidder shall furnish necessary sizing calculations to prove the compliance for the same at contract stage.

g) Battery Racks:

The batteries shall be supported on best quality first class seasoned teakwood racks in line with CPWD specification. The racks shall be free standing type mounted on porcelain/hard rubber/ PVC pads insulators/high impact plastic insulators. The batteries racks and supports for cable termination shall be coated with three coats of anti-acid paint of approved shade. The nameplates, resistant to acid, for each cell shall be attached on the necessary racks.

Wherever racks are transported in dismantled conditions, match makings shall be provided to facilitate easy assembly.

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

- Manufacturer's name and trade marks
- Country and year of manufacturer
- Manufacturer type designation



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- AH capacity at 10 hour discharge rate
- Serial number

- i) Positive and negative terminal posts shall be clearly and indelibly marked for easy identification.
- j) Following minimum information shall be given on the instruction cards:
- Manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate
 - Maintenance instructions
 - Designation of cell in accordance with IS-1652
 - Storing conditions of electrolyte

8.0 Nickel Cadmium Batteries

DC batteries shall be Stationary, high discharge vented type Nickel-Cadmium batteries with pocket plates (KPH) conforming to IS 10918. The batteries 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. The plates will be designed for the maximum durability under all service conditions including high rate of discharge and rapid fluctuation of loads. 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 to 1.7V per cell (maximum) and float charged at about 1.42V per cell.

8.1 Containers:

Containers shall be made of polypropylene plastic material. Containers shall be robust, heat resistant, leak proof, non-absorbent, alkali resistant, non-bulging type and free from flaws such as wrinkles, cracks, blisters, pinholes etc. Electrolyte level lines shall be marked on containers in case of translucent containers.

8.2 Vent Plugs:

Vent plugs shall be provided in each cell. They shall be anti-splash type, having more than one exit hole and shall allow the gases to escape freely but prevent alkali from coming out. The design shall be such that the water loss due to evaporation is kept to minimum. In addition the ventilator shall be easily removed for topping up the cells and of such dimensions that the syringe type hydrometer can be inserted into the vent to take electrolyte sample.

8.3 Plates:

The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load. The construction of plate



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shall conform to latest revision of IS 10918. The separators shall maintain the electrical insulation between the plates and shall permit free flow of electrolyte. Separators shall be suitable for continuous immersion in the electrolyte without distortion. The positive and negative terminal posts shall be clearly marked.

8.4 Cell insulators:

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 the adjacent cells shall be more than the bulge allowed for two cells in accordance with IS 1146.

8.5 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.

8.6 Electrolyte:

The electrolyte shall be prepared from battery grade Potassium Hydroxide conforming to relevant BS 1069. Depending upon installation schedule, whether batteries to be despatched charged or uncharged shall be decided by purchaser and informed to supplier during detailed engineering. Necessary electrolyte for makeup shall be supplied separately. However, there shall not be any commercial implication on account of this. In case batteries are shipped un-charged, the electrolyte shall be supplied in non-returnable containers.

8.7 Connectors and Fasteners:

Nickel coated copper connector shall be used for connecting up adjacent cells and rows. Bolts, nuts, clamps and washers shall be Nickel coated with minimum thickness of 0.02 mm to prevent corrosion. All the terminals and inter-cell connectors shall be fully insulated or shrouded. End take of connections from positive and negative poles of batteries shall be done through single core cable having stranded Aluminium conductor and XLPE insulation. The bidder shall supply necessary supports and lugs for termination of these cables on batteries. Suitable numbers of inter rack connectors shall be supplied by the bidder to suit the battery room layout during detailed engineering.

All connectors and lugs shall be capable of continuously carrying the 30 minutes discharge current of respective batteries and through fault short circuit current which the battery can produce and withstand for the period declared. The successful bidder shall furnish necessary sizing calculations to prove the compliance for the same at contract stage. The same shall be subject to customer's approval.



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8.8 Battery Racks:

The batteries shall be supported on Mild Steel racks. The racks shall be free standing type mounted on porcelain/hard rubber/PVC pads insulators/high impact plastic insulators. The batteries racks and supports for cable termination shall be coated with anti-corrosive paint of approved shade. The nameplates, resistant to alkali, for each cell shall be attached on the necessary racks.

Wherever racks are transported in dismantled conditions, matchmakings shall be provided to facilitate easy assembly.

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

- Nominal voltage
- Manufacturer's name/ model reference
- Rated capacity in ampere hours (Ah) with End Cell Voltage
- Voltage for float operation at 27°C with tolerance of +/-1%.
- Month and year of manufacture
- Polarity marking

8.10 Following minimum information shall be given on the instruction cards:

- Manufacturer's instructions for filling and initial charging of the battery together with starting and finishing charging rate
- Maintenance instructions
- Designation of cell in accordance with IS standards
- Storing conditions of electrolyte

9.0 PERFORMANCE GUARANTEE

9.1 Bidders shall guarantee that battery offered shall meet the 'Load Duty Cycle' requirements as stipulated in this specification and as confirmed by them in technical data sheets. In case the performance of battery at site is not as per the performance guarantee, the bidder will have to replace the battery at site free of cost.

9.2 Make of components shall be subject to BHEL/customer approval.

10.0 INSPECTIONS & TESTING

10.1 Equipments offered shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years. 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 the contractor is not able to submit report of the type test(s) conducted within last ten years from the date



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of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client /owners representative and submit the reports for approval. The bidder shall confirm compliance to quality plan enclosed with the specification, which is subject to customer/ BHEL approval(without any price implication) and the inspection shall be carried out based on this approved Quality Plan (QP no. PE-QP-999-508-E002, rev.01 (Lead Acid) / PE-QP-999-508-E003, rev.00 (Ni Cd)).

- 10.2 All acceptance and routine tests as per IS-1146 (for rubber & plastic containers for lead-acid storage batteries) / IS 1652 (for lead-acid plante batteries)/ IS 10918 (for Ni Cd) shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.
- 10.3 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 & Ni-Cd storage batteries), IS1652 (for lead-acid plante batteries) & IS 10918 (for Ni-Cd batteries). The complete type test reports shall be for any rating of battery in a particular group, based on plate dimensions being manufactured by supplier.
- 10.4 However, if bidder is not able to submit reports of type tests conducted within last ten years from the date of bid opening or in case of type test reports are not found to be meeting the specification requirement s, the bidder shall conduct all such tests at no additional cost to BHEL either at third party lab or in presence of BHEL/ owner.
- 10.5 All material used for the construction of the equipment / items shall be new and shall be in accordance with the requirements of this specification. Materials utilised shall be those, which have established themselves for use in such applications.

11.0 DOCUMENTATION

11.1 By all Bidders along with technical offer:

- (i) Unpriced Price Schedule (Annexure-I as enclosed with the specification) with bidder's signature and company stamp.
- (ii) A copy of the sheet "Instructions to Bidders for Preparing Technical Offer" with bidder's signature and company stamp.
- (iii) A copy of sheet "List of Contents" with bidder's signature and company stamp.



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- (iv) A copy of sheet "Deviation schedule" with NO DEVIATION and bidder's signature and company stamp.
- (v) A copy of sheet "Data Sheet-A" with required information and bidder's signature and company stamp.
- (vi) Battery capacity calculations along with battery performance curves, Capacity calculation curves, derating factors for ambient temperature and float charging factor

11.2 Final documents to be submitted after award of contract shall be decided during kick-off meeting and bidder to agree the same without any commercial/ delivery implications. However, tentative list of documents is given below (also refer Annexure-V):

- a) Data sheet 'C' duly filled up
- b) Fault current calculation for battery
- c) Sizing calculation for connectors
- d) Dimensional drawings of the battery and space requirement for the battery room
- e) GA drawing and foundation details of battery stand including ventilation requirements.
- f) List of make of major components
- g) Pole sealing arrangement
- h) Test Certificates as required
- i) Type test procedures
- j) Quality Plan & Field quality plan
- k) Installation, operation and maintenance manual for the battery

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

11.4 Instruction Manuals

Instruction manuals for the installation, operation and maintenance of battery to be supplied shall be furnished at least two months before the date of despatch of equipment.



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The installation and maintenance manual of battery shall contain the following:

- A) General description giving type and rating of various batteries.
- B) Technical data.
- C) Salient constructional details.
- D) Instruction to be followed on receipt at site.
- E) Instructions for foundations, if any.
- F) Erection procedures and checks (handling at site, erection, pre-commissioning).
- G) Procedure for filling of electrolyte.
- H) Commissioning procedures and site tests.
- I) Routine, periodic and preventive inspection and maintenance procedures.
- J) Safety rules.
- K) Possible faults, their causes and remedies.
- L) Copies of the type, acceptance and routine test certificates in bound volume.
- M) Catalogues, literature and drawings.
- N) Outline dimension drawings showing constructional features, relevant cross sectional views and earthing details, operator oriented description of equipment and accessories.
- P) Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

11.5 Bidder shall furnish field quality plan detailing out the specific quality control procedure covering receipt of material/equipment and handling at site, storage, erection, commissioning, post commissioning etc.

12.0 TOOLS AND TACKLE

Tools & tackle which are essential to facilitate assembly, adjustments, maintenance & dismantling of equipment shall be provided as part of equipment supplied. The above tools shall be supplied along with the initial consignment of equipment so as to be available prior to erection but may not be used for erection purposes.

13.0 AS-BUILT DRAWINGS

Though only supply of equipment is under bidder's scope, bidder may note that all as-built correction (as given by purchaser to vendor) shall have to be incorporated in the originals by the vendor and copies of the as-built corrected drawings / documents as per requirement shall be submitted by the vendor.

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

2X600 MW SINGARENI TPP AT ADILABAD (A.P.)
BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY (NI-CD Battery)
ANNEXURE -I

Sr. No.	Item code	Item Description	Unit	Quantity	UNIT PRICE	TOTAL PRICE
(A)	MAIN ITEMS					
1.0	508-13013-A	NI-CD POCKET PLATE 220V BATTERY (170 CELLS, 220V Ni-Cd, HIGH discharge battery 1.14 ECV suitable as per Load Duty Cycle(Annexure-III) with all accessories & MS racks with 3 coats of anti acid paints.(For each battery))	Sets	4		
		Break up detail				
		220V , Ni-Cd battery suitable as per Load Duty Cycle (Annexure-III) (1 set comprises 170 nos. cell)	Sets	4		
		MS racks with 3 coats of anti acid paints for 220V DC Battery	Sets	4		
		Inter-cell connectors	Sets	4		
		Electrolyte (sulphuric acid for first filling plus 10% extra)	Sets	4		
1.1		LIST OF ACCESSORIES (for each set of battery)				
a		Hydrometer	Nos	2		
b		Set of hydrometer syringes (suitable for the vent holes in different cells)	Nos	2		
c		Thermometer with specific gravity correction scale (for measuring electrolyte temperature)	Nos	5		
d		Specific gravity correction chart	Nos	2		
e		Wall mounting type holder made of teak wood for hydrometer and thermometer	Nos	2		
f		Cell testing digital voltmeter (3-0-3V) with testing leads	Nos	2		
g		Acid/alkali mixing jar	Nos	2		
h		Rubber apron	Nos	2		
i		Pair of rubber hand gloves	Nos	2		
j		Set of spanners	Nos	2		
k		“No smoking” notice	Nos	2		
l		Goggles (industrial)	Nos	2		
m		Instruction card	Nos	10		
n		Minimum and maximum temperature indicator for Battery Room	Nos	1		
o		Interconnector bolt wrenches	Nos	1		
p		Stand insulators	lot	1		
q		Battery log book	Nos	1		
r		Funnel	Nos	2		
s		Multimeter	Nos	2		
t		Cell interconnectors with 5% extra and end take-off with one no. extra	lot	1		
u		Lead coated connection hardware plus 5% extra	lot	1		
v		Teakwood Cable clamps with hardware	lot	1		
2.0	508-13007-A	E & C SPARES				
a		INTER CELL CONNECTOR	NOS	4		
b		GLOVES	SET	4		
c		VENT PLUGS	NOS	4		
3.0	508-13023-A	MANDATORY SPARES				
		COMPLETELY ASSEMBLED CELL (DRY)	NOS.	14		
		Inter-cell connectors with hardware	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Vent plug	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Acid level indicating float (for opaque containers only)	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Stand insulator	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Cell insulator	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
(B)	OPTIONAL ITEMS					
1.0	508-13022-A	O & M SPARES FOR 220V BATTERY(BIDDER TO FURNISH THE LIST)	LOT	1		
2.0	508-13024-A	SUPERVISION CHARGES OF COMMISSIONING OF 220V DC BATTERY)	LOT	1		
3.0		SUPERVISION CHARGES OF ERECTION & COMMISSIONING OF 220V DC BATTERY)	SET	1		
4.0		SUPV. OF E & C- MANDAY RATE	SET	1		
5.0		SUPV. OF E & C- TRAVEL CHARGE	SET	1		
6.0	508-13028-A	TYPE TEST				
a		DISCHARGE PERFORMANCE AT LOW TEMPERATURE	LOT	1		
b		LIFE CYCLE TEST	LOT	1		
c		AIR PRESSURE TEST	LOT	1		
d		VARIFICATION OF CONSTRUCTIONAL REQUIREMENT	LOT	1		
e		ENVIRONMENTAL TEST	LOT	1		
f		INSULATION RESISTANCE TEST	LOT	1		

Note: Cable Lugs at Battery terminals shall be in bidders Scope & Same shall be informed during detailed engineering.

2X600 MW SINGARENI TPP AT ADILABAD (A.P.)
BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY (LEAD -ACID PLANTE)
ANNEXURE -I

Sr. No.	Item code	Item Description	Unit	Quantity	UNT PRICE	TOTAL PRICE
(A)	MAIN ITEMS					
1.0	508-11013-A	LEAD -ACID BATTERY PLANTE, 220V BATTERY (107 CELLS, 220V LEAD ACID, 1.85 ECV suitable as per Load Duty Cycle(Annexure-III) with all accessories & Teakwood racks with 3 coats of anti acid paints.(For each battery set)	Sets	4		
		Break up detail				
		220V , Lead acid plante battery suitable as per Annexure-III (Load duty cycle) (1 set comprises 107 nos cell)	Sets	4		
		Teakwood racks with 3 coats of anti acid paints for 220V DC Battery	Sets	4		
		Intercell connectors	Sets	4		
		Electrolyte (sulphuric acid for first filling plus10% extra)	Sets	4		
1.1		LIST OF ACCESSORIES (for each set of battery)				
a		Hydrometer	Nos	2		
b		Set of hydrometer syringes (suitable for the vent holes in different cells)	Nos	2		
c		Thermometer with specific gravity correction scale (for measuring electrolyte temperature)	Nos	5		
d		Specific gravity correction chart	Nos	2		
e		Wall mounting type holder made of teak wood for hydrometer and thermometer	Nos	2		
f		Cell testing digital voltmeter (3-0-3V) with testing leads	Nos	2		
g		Acid/alkali mixing jar	Nos	2		
h		Rubber apron	Nos	2		
i		Pair of rubber hand gloves	Nos	2		
j		Set of spanners	Nos	2		
k		'No smoking' notice	Nos	2		
l		Goggles (industrial)	Nos	2		
m		Instruction card	Nos	10		
n		Minimum and maximum temperature indicator for Battery Room	Nos	1		
o		Interconnector bolt wrenches	Nos	1		
p		Stand insulators	lot	1		
q		Battery log book	Nos	1		
r		Funnel	Nos	2		
s		Multimeter	Nos	2		
t		Cell interconnectors with 5% extra and end take-off with one no. extra	lot	1		
u		Lead coated connection hardware plus 5% extra	lot	1		
v		Teakwood Cable clamps with hardware	lot	1		
2.0	508-11007-A	E & C SPARES				
a		INTER CELL CONNECTOR	NOS	4		
b		GLOVES	SET	4		
c		VENT PLUGS	NOS	4		
3.0	508-11022-A	MANDATORY SPARES				
		COMPLETELY ASSEMBLED CELL (DRY)	NOS.	9		
		Intercell connectors with hardware	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Vent plug	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Acid level indicating float (for opaque containers only)	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Stand insulator	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
		Cell insulator	NOS./%	10% or 5 nos. whichever is more of total population of 4 sets of battery		
(B)	OPTIONAL ITEMS					
1.0	508-11023-A	O & M SPARES FOR 220V BATTERY(BIDDER TO FURNISH THE LIST)	LOT	1		
2.0	508-11024-A	SUPERVISION CHARGES OF COMMISSIONING OF 220V DC BATTERY)	LOT	1		
3.0		SUPERVISION CHARGES OF ERECTION & COMMISSIONING OF 220V DC BATTERY)	SET	1		
4.0		SUPV. OF E & C- MANDAY RATE	SET	1		
5.0		SUPV. OF E & C- TRAVEL CHARGE	SET	1		
6.0	508-11029-A	TYPE TEST				
a		TEST FOR CAPACITY- TEST FOR VOLTAGE DURING DISCHARGE	LOT	1		
d		TEST FOR CHARGE RETENTION/ LOSS OF CAPACITY	LOT	1		
c		AMPERE HOUR AND WATT-HOUR EFFICIENCY TEST	LOT	1		
d		ENDURANCE TEST.	LOT	1		

Note: Cable Lugs at Battery terminals shall be in bidders Scope & Same shall be informed during detailed engineering.



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ANNEXURE-II

LIST OF APPLICABLE STANDARDS (LATEST)

- | | |
|---|----------|
| 1. STATIONERY LEAD ACID PLANTE BATTERY | IS 1652 |
| 2. STATIONARY NI-CD BATTERY | IS 10918 |
| 3. RECOMMENDED PRACTICE FOR SIZING LEAD ACID BATTERIES | IEEE 485 |
| 4. SPECIFICATION FOR WATER FOR STORAGE BATTERIES | IS 1069 |
| 5. SPECIFICATION FOR SULPHURIC ACID FOR LEAD ACID BATTERIES | IS 266 |
| 6. RUBBER & PLASTIC CONTAINERS FOR LEAD ACID BATTERIES | IS 1146 |
| 7. SYNTHETIC SEPARATORS FOR LEAD ACID BATTERIES | IS 6071 |
| 8. SEALING COMPOUND FOR LEAD ACID BATTERIES | IS 3116 |
| 9. METHODS OF TESTS FOR LEAD ACID BATTERIES | IS 8320 |
| 10. SPECIFICATION FOR HIGH PERFORMANCE PLANTE'S CELLS | BS-6290 |
| 11. ELECTRICAL VOCABULAR, PRIMARY CELLS AND BATTERIES. | IS:1885 |
| 12. INDIAN ELECTRICITY RULES & INDIAN ELECTRICITY ACTS | |



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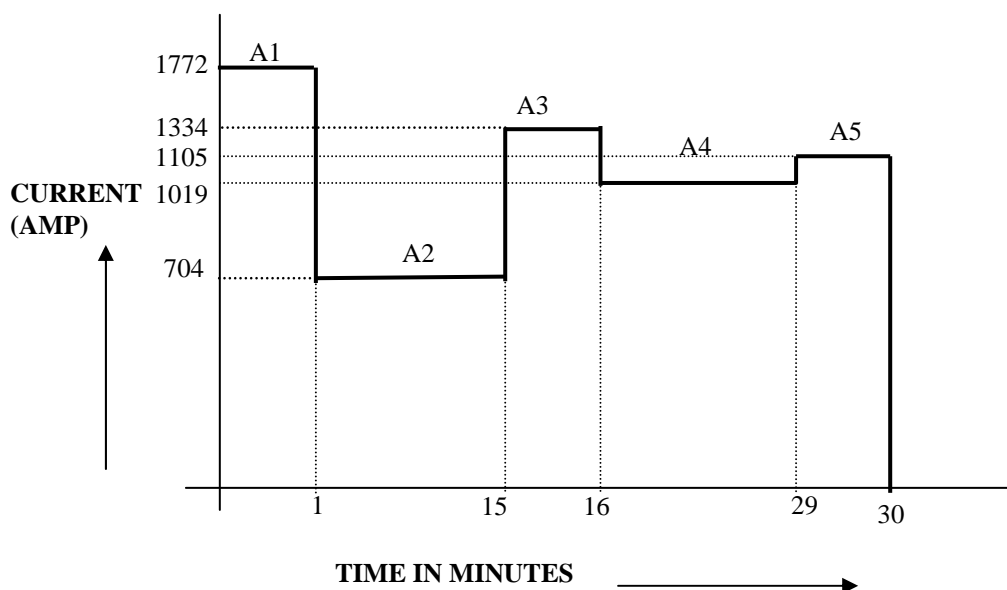
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ANNEXURE-III

LOAD DUTY CYCLE - 220V DC SYSTEM



FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

1. AGEING FACTOR : 1.25 (for Lead-Acid Plante) & 1.25 (for Ni-Cd)
2. MIN.ELECTROLYTIC TEMP. : 15 °C
3. END CELL VOLTAGE : 1.85V (for Lead-Acid Plante) & 1.14V (for Ni-Cd) PER CELL
4. DESIGN MARGIN : 10%

NOTE: BIDDER HAS TO TAKE AGEING FACTOR (MARGIN) IN THEIR SIZING AND SELECTION OF BOTH LEAD-ACID AND NI-CD BATTERY. NO DEVIATION IS ACCEPTABLE ON AGEING AND DESIGN MARGIN.



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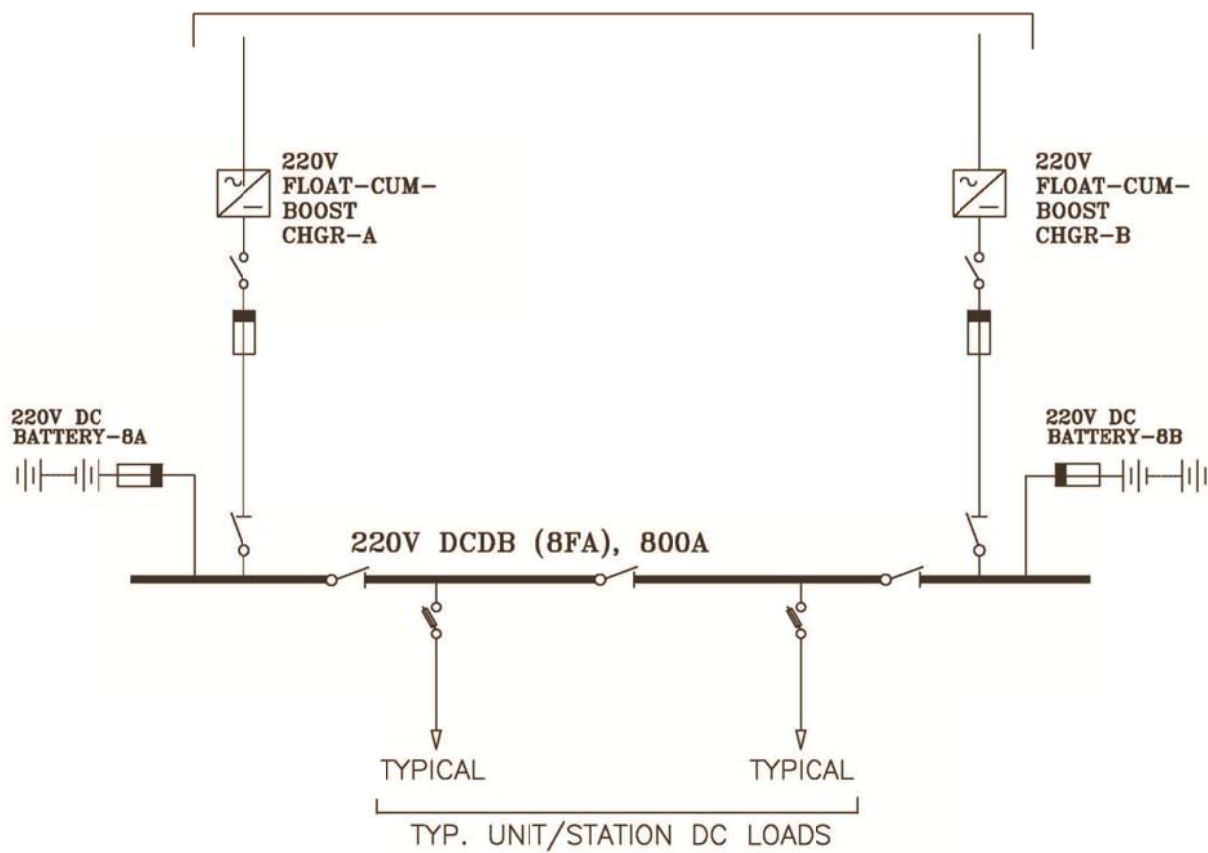
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ANNEXURE-IV

ONE LINE DIAGRAM FOR 220 V DC SYSTEMS (TENTATIVE)





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ANNEXURE-V

LIST OF STANDARD DELIVERABLES FOR DC BATTERY

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.
1	Data Sheet for battery	PE-VO-381-508-E001
2	Battery sizing calculation	PE-VO-381-508-E002
3	OGA Drawing for battery bank	PE-VO-381-508-E003
4	Bill of Material for the battery	PE-VO-381-508-E004
5	List of E & C Spares for battery	PE-VO-381-508-E005
6	List of Mandatory Spares for battery	PE-VO-381-508-E006
7	List of O&M Spares for battery	PE-VO-381-508-E007
8	O & M manual for battery	PE-VO-381-508-E008
9	Field Quality Plan for battery	PE-VO-381-508-E009
10	Type test reports for the battery	PE-VO-381-508-E010
11	Quality Plan for battery	PE-QP-999-508-E002
12	Battery Catalogues, Performance Curves, Capacity Calculation curves, Dearing factor for ambient temperature	



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ANNEXURE-VI

No. OF DRAWINGS / DOCUMENTS REQUIRED FROM VENDOR

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



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DATASHEET -A

LEAD ACID PLANTE BATTERY

- | | | | |
|------|--|---|---|
| 1. | Rated voltage (V) | : | 220V DC |
| 2. | Type of Battery | : | Lead Acid Plante
high discharge/ Ni Cd
Pocket Plate High
Discharge |
| 3. | Conforming to | : | IEEE/ IS standards |
| 4. | No. of cells & End cell voltage | : | 107 Nos (Lead Acid)/170 Nos.
(Ni Cd); 1.85V (Lead Acid) /
1.14V (Ni Cd) |
| 5. | Nominal Float voltage (V) | : | 2.25 V/cell (Lead Acid) / 1.42
V/cell (Ni Cd) |
| 6. | Boost voltage (Maximum)
(V) | : | 2.7 V/cell (Lead Acid) / 1.7
V/cell (Ni Cd) |
| 7. | Equallising Charge (V) | : | 2.33 V/cell (Lead Acid) |
| 8 A) | Capacity at 5/10 hour rate
at 27°C (Minimum rating) | : | Bidder to furnish quoted AH
capacity along with offer |
| B) | Capacity at 10 hour rate at
27°C offered by the bidder | : | Bidder to furnish quoted AH
capacity along with offer |
| 9. | Intermediate Tapping | : | No |
| 10. | Minimum temp for which
battery capacity to be
selected | : | 15°C as minimum
electrolyte temp. |
| 11. | Arrangement of batteries
on racks | : | Single tier |
| 12. | Connection from battery
to DCDB | : | Single Core Cables (Size
shall be informed DDE) |



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DATA SHEET -C

Sr. No.	PARAMETER	UNIT	VALUE
1.0	Make and Type		
2.0	AH capacity at 27° C and end voltage		
2.1	At 10 Hr discharge rate	AH	
2.2	At 1 Hr discharge rate	AH	
3.0	Battery Discharge current		
3.1	At one minute rate	Amp	
3.2	At 30 minutes rate	Amp	
3.3	At 30 minutes rate at end voltage	Amp	
3.4	At 60 minutes rate	Amp	
3.5	At 60 minutes rate at end voltage	Amp	
4.0	Types of plates		
4.1	Negative plates		
4.2	Positive plates		
5.0	Method of connection between cells		
6.0	Voltage per cell at the end of charge at the finishing rate	V	
7.0	Recommended Trickle charge current	Amp	
8.0	Type and material of separators		
9.0	Material of container		
10.0	Type of container		
11.0	Internal resistance of cells	Ohms	
12.0	Total resistance of connectors	Ohms	
13.0	Insulator Material for		
13.1	Cells		
13.2	Racks		
14.0	Average life	Years	
15.0	Recommended boost charger rating for		
15.1	Charging in 8 hours	Amp	
15.2	Charging in 10 hours	Amp	



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Sr. No.	PARAMETER	UNIT	VALUE
16.0	Allowable ripple content acceptable to battery (r.m.s)	%	
17.0	Hydrogen evaluation		
18.0	Cell designation in accordance with IS: 1651/1652		
19.0	Applicable standard		
20.0	Whether battery performance curve and calculation for capacities enclosed		
21.0	Recommended Maximum period of storage of Electrolyte before first charge		
22.0	Amount and specific gravity of electrolyte per cell required for first filling at 27° C		
23.0	Recommended specific gravity of electrolyte at 27° C		
23.1	When fully charged		
23.2	When fully discharged		
24.0	Container dimensions	(L X B X H)mm	
25.0	Distance between centres of cells when erected	Mm	
26.0	Terminal connectors		
26.1	Type		
26.2	Material		
27.0	Battery Racks		
27.1	Type & Material		
27.2	Outline dimensions	(L X B X H) mm	
27.3	Net weight	Kg	
28.0	Weight per cell	Kg	
28.1	Net dry weight	Kg	
28.2	Net weight with electrolyte	Kg	
29.0	Total shipping weight of one battery unit (without electrolyte)	Kg	
30.0	Taps provided at cell no.		
31.0	Connection from battery to charger (busbar/ cable)		
32.0	Recommended size of (busbar/ cable)		
33.0	Whether backup calculation furnished		



QUALITY PLAN

CUSTOMER : SCCL

PROJECT TITLE: 2X600 MW
SINGARENI, TPP

T/S NO. : PE-1S-381-508-E001

BIDDER /
VENDOR

SPECIFICATION
TITLE

SHEET 1 OF 1

SYSTEM

ITEM N/C D BATTERY (DC SYSTEM)

SECTION VOLUME III

S. NO.

COMPONENT / OPERATION

CHARACTERISTIC CHECK

CAT.

TYPE / METHOD OF CHECK

EXTENT OF CHECK

REFERENCE DOCUMENT

ACCEPTANCE NORM

FORMAT OF RECORD

P

W

V

11

REMARKS

10

11

12

13

14

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