Neyveli Lignite Corporation Limited

NEYVELI NEW THERMAL POWER STATION

VOLUME – IIB

TECHNICAL SPECIFICATION

FOR

220V DC BATTERY CHARGER

SPECIFICATION NO: ***PE-TS-402-508-E002***
REVISION: ***0***

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301

CONTENTS

TOTAL NO. OF SHEETS = (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

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. In line with clause no. 9.1 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-A: 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. A copy of next sheet ("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 charger description/ quantities, notes etc. from those given in Annexure-A to Section-C of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

DEVIATION SCHEDULE

SL. NO.	CLAUSE NO.	DEVIATION	REASONS FOR DEVIATION

It is certified that the offer is fully in conformance to the specification requirements except for the deviations, which are specifically brought out in the above prescribed Deviation Schedule.

Signature & seal of Bidder's authorized representative

PREAMBLE

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

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

This consists of four parts as below:-

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

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

Volume – IC This part contains Special Conditions of Contract.

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

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

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

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

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

Section – A This section outlines the Intent of Specification

Section – B This section provides “Project Information”.

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

Section – D This section comprises of 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)

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 Charger** as mentioned in different sections of this specification for **2X500 MW, NEYVELI NEW THERMAL POWER STATION.**

2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.

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

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

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

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

SECTION-B

PROJECT INFORMATION

SALIENT FEATURES OF THE SITE & GENERAL PROJECT INFORMATION

1.1 Introduction

The project site at Neyveli has distinct location advantages, being at pit-head distance from the source of lignite supply from Mines, making it convenient for transportation of lignite by belt conveyor. Water source is readily available from the nearby mines lake. Besides, other infrastructure such as access road, railway connection etc, already exist.

1.2 Power Plant Site

The power plant site is located at Neyveli, opposite to the now defunct Fertilizer and Briquetting & Carbonization Plant, near TPS-I Expansion and TPS-II.

1.3 Project & Site Information

(i).	Owner / Purchaser	:	Neyveli Lignite Corporation Limited (NLC Ltd), Neyveli, Cuddalore District, Tamil Nadu State, India
(ii).	Consultant	:	Lahmeyer International (India) Pvt. Ltd (LII), Gurgaon, NCR, India.
(iii).	Project Title	:	2x500 MW Neyveli New Thermal Power Project (NNTPP)
(iv).	Location	:	200 kms south of Chennai and 50 kms south-west of Cuddalore
(v).	Latitude	:	11° 34' 00" N to 11° 35' 00" N
(vi).	Longitude	:	79° 26' 00" E to 79° 27' 00" E
(vii).	Elevation above MSL	:	(+) 67 m
(viii).	Nearest Railway Station	:	Neyveli,
(ix).	Nearest Sea Port	:	Chennai, at a distance of 200 km
(x).	Nearest Airport	:	Chennai, at a distance of 200 km
(xi).	Road Access/Approach to Site	:	Connected by Chennai-Thanjavur NH 45C road and state highway connecting Cuddalore – Virudhachalam via Neyveli. Both NH and state high way roads are well connected to NLC township roads. The approach road is approximately 15 kms from Chennai–Thanjavur NH – 45C road
(xii).	**Site Meteorological Data**		
	• Max ambient temperature	:	42.8° C
	• Min Ambient Temperature	:	26.9° C

• Wet bulb temp	:	29° C
• Max. Relative Humidity	:	92 % in the month of September
• Min. Relative Humidity		23 % in the month of May
• Rainfall		About 1265.7 mm annually (average)
• Wind direction		South West to North East direction
• Wind Speed		97.2 km/hr (maximum recorded) 4.3 km/hr (average wind speed)
• Seismicity		As per IS: 1893 (part 4) (Zone-II) Importance factor: 1.75.

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SECTION - C

CONTENTS

1.0 INTRODUCTION

This specification covers the design, manufacture, assembly, testing, packing and dispatch of Battery charger (~~Float/Boost/~~Float cum Boost) complete in all respects with all components, fittings and accessories for efficient and trouble-free operation. The charger shall be connected Lead-acid type battery. In this specification though erection & commissioning is not included in vendor's scope, the vendor shall still not absolved of his responsibility of establishing the correctness of equipment at site.

2.0 CODES AND STANDARDS

The equipment shall generally conform to IS. Unless otherwise specified, the latest revisions of codes/ standards specified in Annexure-I enclosed are applicable.

3.0 OPERATIONAL REQUIREMENTS

3.1 Each battery bank is connected with two Float-Cum-Boost Chargers (FCBC). First float cum boost charger will be normally ON in float mode, supplying the D.C. load and the other FCBC trickle charging the battery and shall

(a) provide occasional equalizing charge

(b) boost charge the battery up to 2.75 Volts per cell as required.

Each FCBC can take over all the functions of the other FCBC in case of the failure of the later. The float-cum-boost charger will also have provision for float, equalizing, and boost charging the battery through manual selection.

3.2 The float charger shall withstand momentary supply failure due to changeover on AC supply feeding bus and continue to operate on float mode satisfactorily on restoration of AC supply to charger.

3.3 The DC system shall be ungrounded and shall float with respect to the ground potential when healthy. An earth fault relay of approved type and make shall be provided for detection and annunciation of earth fault.

3.4 After the batteries are boost charged and operation is changed to float mode, the voltage impressed on the loads shall not exceed float charge voltage.

3.5 The charger shall be designed to operate at an ambient air temperature of 50°C. It will be located indoor but in a hot, humid and tropical atmosphere.

3.6 The voltage at load terminal will not exceed the limits of +10% and -15% of nominal system voltage for DC system.

3.7 In case of failure of AC, battery will meet the DC load requirement. After restoration of power, one FCBC will continue to supply the loads and the second FCBC will trickle charge the battery. Under discharge condition, one battery will be put to boost charge at a time.

3.8 Provision of 84th Cell Tap (as shown in Annexure-B) assures that there is no need to isolate battery from loads while it is in boost mode.

3.9 Chargers will be static, natural air cooled with Degree Of Protection (DOP) IP-42, Self-regulating silicon-controlled full wave rectifier, auto and manual control type designed for single and parallel operation with battery and shall be provided with automatic voltage regulator for a close voltage stability even when AC supply voltage and DC load fluctuates. Effective current (load) limiting feature and filters on both input and output to minimise harmonics shall be provided. The charger will have following features:

- The charger output regulation shall be ± 1% from no load to full load with an input power supply voltage & frequency variation on feeding system.
- The charger will be provided with automatic digital voltage regulation in float mode and automatic constant current regulation in boost mode.
- Ripple content at rated continuous load will be limited to ±1% peak to peak.
- DC voltage setting adjustment of AVR for float charging will be ±10% of nominal voltage.
- DC current adjustment for boost charging will be 50% to 100% of maximum boost charging current.
- Minimum permissible power factor at rated continuous load will be 0.8
- Voltage stabilization for constant voltage regulation will be:
  ±1% of set DC voltage with ±10% variation in supply voltage, frequency variation of (+) 3 / (-5) % and combined voltage and frequency variation of 10% .
- One moving coil DC voltmeter and ammeter of size 96x96 mm of suitable range for float and boost charger with necessary shunts for local and remote metering.
- One moving coil centre zero ammeter, with shunt, size 96x96 mm to read discharge / charge current of the battery.

Each battery charger is provided with one (1) no. voltage transducer for monitoring DC output voltage, one(1) Voltage transducer for monitoring Battery voltage and one (1) no. current transducer for monitoring the DC output and as analog input to DCS.

3.91 All busbars and bus connections shall be of high conductivity aluminium/aluminium alloy and adequately sized to limit the maximum temperature rise to 40° C from ambient temp (50° C) under rated load condition. The maximum allowable temperature rise shall be 50° C from ambient temp (50° C) at joints. All bus connections shall be silver-plated joined with two bolt connection with plain and spring washers and locknuts.

4.0 BATTERY CHARGERS

4.1 The battery chargers shall be self-regulating, natural air cooled, static type/microprocessor based composed of silicon controlled rectifiers (SCRs)~~/IGBT~~ connected in three phase full wave full control bridge circuit.

4.2 Each charger circuit shall be provided with its own AC input voltmeter with voltmeter selector switch, AC ammeter with selector switch, DC voltmeter with selector switch & DC ammeter, battery DC output ammeter & voltmeter, battery charging current ammeter, control switches, rectifiers, Auto/ Manual voltage regulators, load limiting device, shunts for local and remote metering etc. as required for the successful operation of the DC system.

4.3 The charger shall have auto voltage regulators to enable stepless, smooth and continuous voltage control. The chargers shall have the effective current limiting feature and smoothing filters on both input and output to minimise harmonics, radio frequency transients, electromagnetic transients, etc.

4.4 The battery chargers as well as their automatic regulators shall be of static type/ microprocessor based,. The battery chargers shall be capable of continuous operation at the respective rated load in float charging mode i.e. trickle charging the associated DC batteries while supplying the DC loads.

4.5 The battery chargers shall have a selector switch for selecting the battery-charging mode i.e. float or boost charging.

4.6 The battery chargers shall be provided with facility for both automatic and manual control of output voltage and current. The selector switch will select the mode of output voltage/current control, whether automatic or manual. Necessary provisions shall be provided to avoid current/voltage surges of harmful magnitude/nature, which may arise during changeover from auto to manual mode or vice versa under normal operating condition.

4.7 Soft start feature shall be provided to build up the voltage to the set value slowly within 15 seconds. The chargers shall have load limiters, which shall cause, when the voltage control is in automatic mode, a gradual lowering of the output voltage when the DC load current exceeds the load limiter setting of the charger. The load limiter characteristic shall be such that any sustained overload or short circuit in DC system shall not damage the charger nor shall it cause blowing of any of the charger fuses. The charger shall not trip on overload or external short circuit. After clearance of fault, the charger voltage shall build-up automatically when working in automatic mode.

4.8 When on automatic control mode during float charging, the charger output voltage shall remain within ±1% of the set value for AC input voltage variation of ±10%, frequency variation of +3% to –5%, a combined voltage & frequency (absolute sum) variation of 10% and a continuous DC load variation from zero to full load. Uniform and stepless adjustment of voltage setting (in both auto/manual modes) shall be provided on the front of the charger panel covering the entire float charging output range specified. Stepless adjustment of the load limiter setting shall also be provided from 80% to 100% of the rated output current for float charging mode.

4.9 During boost charging, the battery chargers shall operate on constant current mode (when automatic regulator is in service). The boost charging current can be adjusted continuously over a range of 50% to 100% of the rated output current for boost charging mode. The charger output voltage shall automatically go on rising, when operating in boost mode, as the battery charges up. For limiting the output voltage of charger, a potentiometer shall be provided on the front of the panel, whereby it shall be possible to set the upper limit of this voltage anywhere in the output range specified for boost charging mode. All voltage and current setting potentiometers shall be vernier type/screw type.

4.10 Energising the charger with fully charged battery connected plus 10% load shall not result in output voltage greater than 110% of voltage setting. The time taken to stabilise within specified limits shall be less than 15 seconds.

4.11 Momentary output voltage of the Charger, without the Battery connected shall be within 94% to 106% of the voltage setting during sudden load Change from 100% to 20% of full load or vice-versa. Output voltage shall return to, and remain, within the limits specified as mentioned elsewhere in less than 2 seconds after the above mentioned change.

4.12 In case of float-cum-boost charger, manufacturer shall offer an arrangement in which the voltage setting device for float charging mode is also used as output voltage limit setting device for boost

charging mode, and the load limiter of the float charging mode is also used as boost charging current setting device.

4.13 Suitable filter circuits shall be provided in all the chargers to limit the ripple content (peak to peak) in the output voltage to 1%, irrespective of the DC load fluctuation even when they are not connected to a battery.

4.14 The charger shall have provision for termination of two sets of 415V AC incoming supply cables. Both the sets of terminals shall be paralleled at the input side of the AC Isolating switch. Changeover arrangement between the AC supplies shall be provided by the BHEL at the upstream end.

4.15 ~~Ni-Cd Batteries shall be Trickle charged at 1.4 to 1.42 Volts per cell. Chargers shall be capable of boost charging the associated D.C. Battery at 1.53 to 1.7 Volts per cell in 8-10 hours.~~
Lead Acid Batteries shall be Trickle charged at 2.25 Volts per cell. Chargers shall also be capable of boost charging the associated D.C. Battery at 2.3 to 2.75 Volts per cell in 8-10 hours. The Chargers shall be designed to operate, as mentioned above, at an ambient air temperature of 50°C.

4.16 Following protections are provided for batteries and chargers:

- Under voltage protection for DC system
- Over voltage protection for DC system
- Current limiting and AC under voltage protection for chargers
- Over current protection on DC side
- Fuse for short circuit protection of the battery
- Earth fault protection for DC system
- Fuse failure indication on DC side

5.0 DESCRIPTION OF EQUIPMENT

5.1 Rectifier assembly

Rectifier assembly shall be full wave bridge type and designed to meet the duty as required by the respective charger. The rectifier cells shall be provided with their own heat dissipation arrangement with natural air-cooling. The rectifier shall utilise diodes / thyristors/~~IGBT~~s and heat sinks to carry 200% of the load current continuously and the temperature of the heat sink shall not be permitted to exceed 85°C absolute, duly considering the maximum charger panel inside temperature. Adequate snubber circuit shall be provided for the safety of thyristors, etc. The successful bidder shall furnish calculations to show what maximum junction temperature will be and what the heat sink temperature will be when operating at 200% and 100% load current continuously duly considering the maximum surrounding air temperature for these devices inside the charger panel at air ambient temperature of 50°C outside the panel. Necessary surge protection devices and rectifier type fast acting HRC fuses shall be provided in each arm of the rectifier connections.

5.2 Rectifier transformer and Chokes

The rectifier transformer & chokes shall be dry and air cooled (AN) type. The rating of the rectifier transformers & chokes shall correspond to the rating of the associated rectifier assembly and shall be copper wound. The rectifier transformers & chokes shall have class-B insulation with temperature rise limited to class-A insulation value. The rectifier transformer sizing shall be done considering all the loads connected to it. And, also a 10% design margin shall be considered on transformer sizing. The successful bidder shall furnish calculations for rectifier transformer sizing.

5.3 Blocking Diode

Blocking Diode shall be provided in the output circuit of each charger to prevent current flow from the DC battery into the charger. The successful bidder shall furnish calculations to show what maximum heat sink temperature will be when operating at 200% & 100% load current continuously duly considering the maximum surrounding air temperature for these devices inside the charger panel at air ambient temperature of 50°C outside the panel.

5.4 Voltage regulators

5.4.1 The float charger shall have both auto and manual voltage regulation arrangements. The voltage regulator shall have auto/manual option and be of static type. A selector switch for selection of the mode of voltage regulation shall be provided. AVR time constant shall not exceed 0.5.

5.4.2 The boost charger shall have auto/manual voltage regulation arrangement. The voltage adjustment shall be uniform and step less throughout the voltage variation range. The regulator shall be of static type. The boost charger shall be designed to charge the fully discharged battery to fully charged condition in 10 hrs.

5.5 Printed Circuit Boards (PCB)

PCB shall be made of glass epoxy of 1.6 mm thick, fire resistant, bonded with 99.8% pure copper foil, free of wrinkles, blisters, scratches and pinholes. The contact surface of the edge connectors of PCBs shall be plated with hard gold to a minimum thickness of 5 microns. The component identification shall be printed on PCB by Silk screen method. All PCBs shall be tropicalised and masked.

5.6 Control and Selector Switches

The control and selector switches shall be of rotary stayput type with escutcheon plates showing functions and positions. The switches shall be of sturdy construction and suitable for mounting on panel front. The switches shall have shrouded live parts and sealed contacts against dust ingress. Auto/normal switch shall be of lockable type in either position. The contact ratings shall be at least the following:

- Make and carry continuously 10A
- Breaking current at 220V DC 0.5A (inductive)
- Breaking current at 240V AC 5.0A at 0.3 p.f.

5.7 Indicating Lamps

To indicate AC supply availability, three indicating lamps shall be provided. The indicating lamp shall be suitable for panel mounting, cluster type LED and capable of clear status indication under normal room illumination. The lamp covers shall be preferably screw type, unbreakable and moulded from heat resistant material.

5.8 Instruments

For all chargers, DC ammeter, DC voltmeter and AC voltmeter shall be provided in 96 x 96 mm2 size with 1.0 accuracy class conforming to IS-1248. The instruments shall be 240 scale, antiglare glass, flush mounted type, dust proof, moisture resistant and have easy accessible means for zero adjustment.

In addition to above, following metering provision shall be given for remote metering / recording at DCS.

- Battery Voltage
- DC voltage of float & Boost charger
- DC current of float & Boost charger
- DC load voltage
- DC load current
- DC Voltage and Current at FCBC
- Centre Zero Ammeter with Shunt to read Discharge/Charge current
- Ammeter for Battery Trickle Charge current
- DC Bus Voltmeter indicating - +ve to Earth, -ve to Earth and +ve to –ve with Selector switch.

Mandatory requirement for FCBC panel

- AC Supply – R,Y,B Healthy
- DC supply – Available
- Charger in Float Mode
- Charger in Equalising mode
- Charger in Boost mode
- Charger tripped on fault

Suitable soft link to be provided for interfacing with DCS.

5.9 Relays

The relays shall be enclosed in flush or semi flush dust tight cases finished with dull black enamel paint. Relays shall have self-contained test facilities and provisions for removing relay mechanism for inspection and maintenance.

5.10 Transducers

Transducers shall be panel-mounting type and suitable for operating temperatures from 0 to 55°C. Transducer output shall be used for remote display at DDCMIS. Transducers shall be provided in charger panel for DC battery voltage, charger output voltage and charger output current. The transducer shall have the following features:

- Input/ output with galvanic isolation
- Auxiliary voltage – 220V DC
- 4-20 mA independent dual output
- Accuracy class 0.5 or better
- Short circuit and over current protection

5.11 Contactors

All battery chargers shall have an AC contactor on the input side. It shall be of air break type and suitable for continuous duty. The operating coil shall be rated for 415 V. The DC contactors shall be ~~single/~~double pole air break type and suitable for continuous duty.

5.12 Thermal overload relay

A thermal overload relay with single phasing protection (using differential movement of bimetal strips) shall also be provided for the AC input, which will trip the contactor.

5.13 Air break switches / ~~MCCB~~

All chargers shall have AC input and DC output switches of air break, single throw, load break and fault make type or MCCB type. The contacts of the switches shall open and close with a snap action. The switches shall be rated for 120% of the maximum continuous load. The ‘ON’ and ‘OFF’

position of the switch shall be clearly indicated. The operating handle of the switches shall be fully insulated from circuit and shall be effectively earthed.

5.14 Fuses

Fuses shall be of HRC cartridge fuse link type. Fuses shall be mounted on fuse carriers, which are mounted on fuse base. Wherever, it is not possible to mount fuses on fuse carriers, fuses shall be directly mounted on plug-in type bases. In such cases one insulated fuse pulling handle shall be supplied for each charger. Kick-off fuses (trip fuses) with alarm contacts shall be provided for all DC fuses. The fuses shall be suitable for applicable fault level.

5.15 Variable Metallic Resistor (Discharge Resistor)

Variable metallic resistors and shunt suitable for carrying out discharge tests (10 hour discharge rate for Lead Acid battery) on the batteries shall be supplied. The Discharge resistor unit shall be of robust assembly consisting of Copper-Nickel Alloy wire grid elements. Discharge resistor shall have natural/ forced cooling. Incase of forced cooling the Discharge Resistor fan shall be designed to allow rapid, forced cooling of resistor bank.

5.16 Battery fuse box / ~~MCCB~~

Battery fuse /~~ MCCB~~ of adequate rating meeting the load duty cycle shall be supplied. Suppliers have to furnish DC fuse characteristics in support of the rating selected for the Battery Fuse Box. Battery fuse box /~~ MCCB~~ shall have suitable termination arrangement for terminating the incoming & outgoing cables informed during detailed engineering stage. Suitable cable lugs & glands have to be supplied with the equipment which shall be in Battery Charger Vendor scope.

5.17 Panel Construction

The charger panels housing all the equipment shall be indoor, floor mounting, air natural cooled, self-supporting sheet metal enclosed cubicle type. The charger panel and its frame shall be fabricated from 2.0 mm cold rolled sheet steel and have folded type construction. The bidder shall also supply necessary base frames, anchor bolts and hardware. Removable undrilled gland plates of at least 3.0 mm thick sheet steel and lugs for all cables shall be provided. The lugs for cables shall be made of electrolytic tinned copper. The gland plate shall be of adequate size for accommodating requisite number of cable glands for power and control cables. The charger shall be tropicalised and vermin proof. Ventilation louvers shall be backed with fine brass wire mesh. All door and covers shall be fitted with synthetic rubber/Neoprene gaskets. The panels shall have hinged double leaf doors provided on front and backside for adequate access of charger terminals. All the charger cubicle doors shall be properly earthed. The panels shall comply with at least degree of protection IP-42. Incoming and outgoing cables shall enter from bottom. Suitable cable terminal board with copper cable lugs and double compression brass nickel-plated cable glands shall be provided (which shall be in Battery Charger Vendor scope) in each panel for incoming and outgoing cables.

All indicating instruments, control and selector switches and indicating lamps shall be mounted on the front side of the charger. Design of panels shall be based on the following dimensions:

Overall height :	Maximum 2350 mm
Operating handles (highest and lowest positions reached by operator's hands) :	Maximum 1800 mm Minimum 350 mm
Doors and Panel handles and locks :	Maximum 1800 mm Minimum 300 mm

5.19 Electronic equipments shall be of modular design consisting of plug-in modules in standard 19 inches metallic racks with metallic card guides. The card should be provided with proper handles. Card to card wiring shall be through mother board. Unplanned jumpering and track modifications shall not be allowed. Mechanical interlocks to prevent wrong insertion of cards shall be provided. Each card shall have its junction and test points identified. Maintenance aids such as extension printed wiring boards and jumper leads shall be provided.

5.20 The layout of charger components shall be such that their heat losses do not give rise to excessive temperature within the charger panel surface. Location of the electronic modules will be such that temperature rise of the location, in no case, shall exceed 10°C over ambient air temperature outside the charger.

5.21 All the charger panels shall be provided with an illuminating lamp with door switch, communication plug, 3-pin 5A receptacle with plug and space heaters with thermostat control. Switch fuse units/MCB shall be provided separately for each of the above fittings. Space heaters “ON” indication shall be provided. Two separate grounding pads shall be provided for each panel.

5.22 Locking facility

Locking facility shall be provided as follows:

For locking float/boost selector switch in the float position only. This shall be used for having key mechanical interlock between float/boost selector switch and isolator in DCDB.

The charger enclosure door-locking requirement shall be met by the application of padlocks. Padlocking arrangement shall allow ready insertion of the padlock shackle but shall not permit excessive movement of the locked parts with the padlock in position.

5.23 Control wiring

Each panel shall be furnished completely factory wired upto power cable lugs and terminal blocks ready for external connections. The power wiring shall be carried out with 1.1kV grade, PVC insulated cables conforming to IS-1554 (Part-1). The control wiring shall be of 1.1kV grade, 1 core stranded copper wire with colour coded PVC insulation having identification ferrules at both terminal and device end for each wire. Wires shall conform to IS-694 and minimum size of the wire shall not be less than 1.5 mm2. The control wiring terminating at electronic card shall not be less than 1.0 mm2. The control terminal shall be suitable for connecting two wires with 1.5 mm2 stranded copper conductors. All terminals shall be numbered for ease of connections and identification. CT wiring shall be done with 2.5 sq mm control cable.

Power & control wiring within the panel shall be kept separate. Any terminal or metal work, which remains alive at greater than 415V, when panel door is opened, shall be fully protected by shrouding.

An air clearance of at least 10mm shall be maintained throughout all circuits, except low voltage electronic circuits, right upto the terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.

5.24 Terminal Blocks

Terminal blocks for all the chargers shall meet the following requirements:

a) Terminal block shall be 1.1kV grade, minimum 10A rated, one piece moulded complete with insulating barrier, clip on type terminals, washers, nuts and identification strip etc. It shall be similar to Klippon type RSF with insulating material of melamine or equivalent. Marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. Terminal blocks for CT & VT secondary leads shall be provided with links to facilitate testing, isolation, star/delta and earthing. Terminal blocks for CT secondary shall have the short-circuiting facility.

b) At least 20% spare terminals for external connections shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.

c) There shall be minimum clearance of 250mm between the terminal blocks and the cable gland plate and 150mm between two rows of terminal blocks.

5.25 Cable Lugs

Heavy duty bolt-on termination tinned copper lugs of compression type shall be used in the Charger for power cable termination. The supply of tinned copper cable lugs for power cables forms part of the supply of equipment. Cable lugs shall comply with IS-8309.

5.26 Cable Glands

The supply of cable glands forms part of the supply of equipment. Cable glands shall conform to BS-6121. Cable glands shall be of double compression type.

5.27 Panel Earthing

Charger panels shall have fully rated GI ground bus with two ground terminals, one at each end of the panel. Each ground terminal shall have two bolt drillings with GI bolts and nuts suitable for connection to purchaser's ground conductor.

6.0 ANNUNCIATION SYSTEM

6.1 Each charger shall have twenty point alarm facia provided with audio visual alarm annunciation arrangement (by the means of indicating lamps/LED or annunciation facia windows as per EEUA-45D, arranged on the top of the charger panels), actuating devices, circuitry, legend and push buttons (accept, reject and test), and hooter for the following important alarms for various abnormal conditions. At least 20% spare annunciation windows with accessories shall be provided. Also the initiating contacts shall be provided for remote alarm for each of the float cum boost chargers. The alarms shall be provided on the CRT in the control room. **RS-485 port shall be provided for interface with DDCMIS.**

a) AC supply failure
b) AC input fuse failure (separate for FCBC)
c) AC Undervoltage/Overvoltage
d) Rectifier fuse failure
e) Charger failure
f) Surge circuit fuse failure
g) Filter fuse failure
h) Blocking Diode failure
i) Load limiter operated
j) Charger trip/over loaded

k) Battery on boost
l) DC system earth fault
m) DC Voltage Low/High
n) Battery fuse blown
o) Boost Bus Overvoltage
p) DC system under voltage/over voltage
q) Battery Fully Discharged
r) DC output fuse failure
s) Battery on trickle
t) -VE Grounded
u) +VE Grounded
v) DC system Earth Fault

w) Charger trouble (this being a group alarm initiated by any of the faults of charger other than charger over load).

6.2 Suitable potential free contacts for remote indication of above abnormal conditions shall be provided. Multiplication relays, if required, shall be included in the panel.

7.0 NAME PLATE AND MARKING

The name plates shall be made of non-rusting metal / 3 ply Lamicoid and shall have black back ground with white engraved letters and secured by screws. These shall be provided near top edge on the front as well as on rear side of charger. Name plates with full and clear inscriptions shall also be provided on and inside the panels for identification of the various equipments.

8.0 PAINTING

All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust. After fabrication, all surfaces shall be cleaned and pre-treated as per IS:6005. After cleaning, the surfaces shall be given a phosphate coating followed by 2 coats of high quality lead oxide primer and stoved after each coat. The equipment shall be finished in Siemens Gray RAL: 9002 color with two coats of epoxy based powder coated paint except end covers and RAL 5012 for end covers. Thickness of paint shall be min. 40-50 microns .The coating shall be done electro statically followed by stoving. Protecting peelable compound shall be provided on outside finished surface to protect the painted surface during transportation and site handling.Sufficient quantity of touch-up paint shall be furnished for application at site.

9.0 PERFORMANCE GUARANTEE

The bidder shall guarantee that chargers offered shall meet the ratings and performance requirements stipulated for various equipments covered in this specification. If the equipment fails to meet the requirement, the supplier shall replace it with appropriate equipment free of cost without affecting the schedule.

10.0 INSPECTION & TESTING

10.1 The bidder shall confirm compliance to Quality plan enclosed with Section-C of specification. The Quality plan shall be subject to BHEL/ customer approval after award of contract without any commercial or delivery implication. Inspection shall be carried out as per BHEL/ customer approved Quality plan.

10.2 All equipments to be supplied shall be of type-tested quality. The bidder shall furnish all type test reports for BHEL/ customer approval. The Type tests should have been carried out within last five years 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/ government agency. In absence of such type tests reports or in case such reports are not found to be meeting the specification/ standards requirements, vendor shall conduct all such type tests without any commercial/ delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval. (Type test charges as per clause 10.10 shall not be applicable in such cases).

10.3 The details of Type Tests to be conducted shall be as per Data Sheet-A enclosed with Section-C of specification.

10.4 The bidder shall furnish following Type Tests reports for each type & rating of battery charger:

i) Temperature rise test at full load

ii) Temperature rise test for rectifier assembly at current specified in Data Sheet-A Section-C.

iii) Insulation resistance test

iv) High voltage (power frequency) test on power & control circuits except low voltage electronic circuit

v) Ripple content test at no load, half and full load

vi) Automatic voltage regulation operation test at specified AC supply variations at no load, half and full load

vii) Load limiter operation test.

viii) Efficiency and power factor measurement.

ix) Input and output surge withstand capacity test. Surge voltage as per ANSI-C37.90a shall be applied for a period of not less than 2 seconds at the following points of the charger operating at 50°C at full load:

a) Across each AC input phases
b) Across AC input line to ground
c) Across DC output terminals
d) Across each DC output terminal to ground

The charger shall not exhibit any component damage and there shall be no deterioration in performance of the charger.

x) Environmental Tests: Steady state performance tests (temperature rise test at full load & load limiter operation test) shall be carried out before & after the following tests.

a) Soak test: The electronic modules shall be subject to continuous operation for a minimum period of 72 hours. During last 48 hours, the ambient temperature shall be maintained at 50°C. The 48

hour test period shall be divided into 4 equal 12 hour segments. The input voltage during each 12 hours shall be nominal voltage for 11 hours followed by 110% of nominal voltage for 30 minutes, followed by 90% of nominal voltage for 30 minutes.

b) Degree of protection test

xi) Complete physical examination

xii) Dynamic response test
Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.

10.5 Rectifier transformers shall be subjected to following routine test as per IS: 11171:

a)Voltage Ratio Test
b) DC resistance Test
c) No Load Test Measurement of iron losses
d) Measurement of Tap Voltages
e) Measurement of Cu. Losses
f) High voltage test
g) Induced high voltage test
h) Heat run Test

10.6 Following routine tests are to be performed on all battery chargers:

i) Complete physical examination, visual checks, wiring checks, functional checks,

ii) Temperature rise test on complete charger at full load (Heat run test on current limiting value)

iii) Insulation resistance test.

iv) High voltage (power frequency) test.

v) Ripple content test at no load, half and full load.

vi) AVR operation test at specified AC supply variation at no load, half and full load.

vii) Load limiter operation test.

viii) Checking of proper operation of annunciation system.

ix) Dynamic response test
Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.

x) Burn in test shall be carried out on all electronic modules or panels with modules. During the test the panel / module shall be subjected to ambient temperature of 50°C for 48 hours in energised condition. The temperature rise inside the cubicle shall not exceed 10°C during the test.

xi) Degree of protection test
The charger shall be checked for gasket arrangement as per the drawings.

xii) Efficiency and power factor measurement.

xiii) Dielectric tests

xiv) Voltage regulation check from 0 to 100% loads with ± 10% input voltage variation.

xv) D.C short circuit test to prove ability of current limit.

xvi) Routine test on component / parts.

10.7 Following routine tests shall be carried out on annunciation system:

i) Annunciation assembly and module shall be functionally tested as per EEUA-45D.

ii) Burn in test as specified above in cl. No. 10.5 (x) above.

10.8 All material used for the construction of the equipment / items shall be new and shall be in accordance with the requirements of this specification. Materials utilised shall be those, which have established themselves for use in such applications.

10.9 All acceptance and routine tests as per relevant standards and specification, 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.

11.0 DOCUMENTATION

11.1 Documents to be submitted by the Bidder along with the bid:

1) Clause wise deviation if any in the enclosed format.
2) ~~Out line drawings of charger, battery fuse box.~~
3) Unpriced Price Schedule (Annexure-A as enclosed with the specification) with bidder's signature and company stamp.
4) A copy of the sheet "Instructions to Bidders for Preparing Technical Offer" with bidder's signature and company stamp.
5) A copy of sheet "List Of Contents" with bidder's signature and company stamp.

11.2 Over and above the documents mentioned in 11.1, the following documents are to be submitted after the award of the contract for purchaser's approval:

1) Brief write-up on the working of the system offered along with Installation, operation and maintenance manual for the battery charger, battery fuse and variable metallic resistor and shunt.
2) Data sheet-C
3) General arrangement drawing showing the battery charger ~~and associated components~~, Fuse Box & discharge resistor.
4) Wiring diagram.
5) Quality plan.
6) Transformers KVA and voltage rating calculation.
7) ~~Fault current calculation.~~
8) Thyristor rating, heat sink and fuse co-ordination calculation.
9) Blocking Diode rating & heat sink calculation.
10) Filter circuit calculation.
11) AC power consumption in float mode & boost mode.
12) List of make of major components.
13) Test certificates as required/ type test procedures
14) ~~Installation, operation and maintenance manual for the battery charger, battery fuse and variable metallic resistor and shunt.~~
~~15) Descriptive pamphlets, giving all information regarding the various components/equipments.~~
16) ~~Other relevant documents and data necessary for approval of drawings under this clause and for satisfactory operation and maintenance.~~

17) Field quality plan. 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.

18) LIST OF E&C SPARES

19) LIST OF MANDATORY SPARES

11.3 Instruction Manuals

Instruction manuals for the installation, operation and maintenance of battery charger, battery fuse and variable metallic resistor and shunt to be supplied at least two months before the date of despatch of equipment.

The installation and maintenance manual of battery charger, battery fuse and variable metallic resistor and shunt shall contain the following.

A) General description giving type and rating of equipment.
B) Technical data.
C) Salient constructional details.
D) Instruction to be followed on receipt at site.
E) Erection procedures and checks (handling at site, erection, pre-commissioning).
F) Commissioning procedures and site tests.
G) Routine, periodic and preventive inspection and maintenance procedures.
H) Safety rules.
J) Possible faults, their causes and remedies.
K) Catalogues, literature and drawings.

L) Outline dimension drawings showing constructional features, relevant cross sectional views and earthing details, operator oriented description of equipment and accessories.

M) Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

12.0 SPARES

12.1 Bidder to furnish the E & C spares as per attachment-III Data Sheet-A enclosed with Section-C of specification.

12.2 ~~Bidder to quote O&M spares for 3 years of normal operation as optional items.~~

13.0 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.

14.0 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.

15.0 STATUTORY AND REGULATORY REQUIREMENTS

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

ANNEXURE-I

LIST OF APPLICABLE STANDARDS

1.	GUIDE FOR SURGE WITHSTAND CAPABILITY TESTS	ANSI-C 37.90a
2.	COLOURS FOR READY MIX PAINTS	IS-5
3.	PVC INSULATED CABLE FOR WORKING VOLTAGE 1100V	IS-694
4.	INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS	IS-1248
5.	DOP FOR LV SWITCHGEAR AND CONTROL GEAR	IS-13947 PART-1
6.	SPECIFICATION FOR LV SWITCHGEAR AND CONTROL GEAR	IS-13947
7.	ELECTRICAL RELAYS FOR POWER SYSTEM PROTECTION	IS-3231
8.	APPLICATION GUIDE FOR ELECTRICAL RELAYS FOR AC SYSTEM	IS-3842
9.	MONO CRYSTALLINE SEMICONDUCTOR RECTIFIER CELLS & STACKS	IS-3895
10.	MONO CRYSTALLINE SEMICONDUCTOR RECTIFIER ASSEMBLIES & EQUIPMENT	IS-4540
11.	CODE OF PRACTICE FOR PHOSPHATING OF IRON & STEEL	IS-6005
12.	SAFETY CODE FOR SEMICONDUCTOR RECTIFIER EQUIPMENT	IS-6619
13.	CONTROL SWITCHES (SWITCHING DEVICES FOR CONTROL AND AUXILIARY CIRCUITS INCLUDING CONTACTOR RELAYS) FOR VOLTAGE UPTO 1000V AC OR 1200V DC	IS-6875
14.	ENVIRONMENTAL TESTING FOR ELECTRONIC & ELECTRICAL ITEMS	IS-9000
15.	LV FUSE FOR VOLTAGES BELOW 1000V AC OR 1500V DC	IS-13703
16.	PERFORMANCE REQUIREMENT FOR ALARM ANNUNCIATION SYSTEM	EEUA-45D
17.	POWER TRANSFORMERS	IS-2026
18.	INDIAN ELECTRICITY RULES & INDIAN ELECTRICITY ACTS	

NOTE: Equipment complying to other internationally accepted standards such as IEC, BS, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the bidder shall clearly indicate the standards adopted, furnish a copy in English of the latest revision of the standards alongwith copy of all official amendments and revisions and shall clearly bring out the salient features for comparison.

	QUALITY PLAN		CUSTOMER: NNTPS, NEYVELI			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ : VENDOR			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER			
	SHEET 1 OF 6		SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**RAW MATERIAL**											
1.1	M.S Sheet (CRCA)	1. Grade	Major	Visual	100%	MFR's drg	MFR's drg	IR	3	-	1	IR=INSPECTION RECORD
		2. Thickness & Finish	Major	Physical	Sample/lot	BHEL appd drg/data sheet	BHEL appd drg/data sheet	-do-	3	-	1	
1.2	Powder Paint	Shade	Major	Visual	Sample/lot	IS-5(1994) SHADE CARD	BHEL appd drg/data sheet	-do-	3	-	1	
2.0	**Major bought out items**											
2.1	Power Switches,MCCB, Timer, Contactor & Relay	1) Type, Rating	Major	Physical	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	**
		2) Mechanical Operation/functional check	Major	Visual	100%	MFR's std.	MFR's std.	-do-	3	-	-	
2.2	MCB,Push Buttons,HRC fuse,terminal blocks,control & selector switches,Semiconductor Fuses,Heaters,Thermostat,Lamps, Plug in socket	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	COC	3	-	2,1	
		2)Continuity test	Major	Electrical	100%	MFR's std.	MFR's std.	-do-	3	-	2,1	
2.3	Rectifier bridge Element	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	**
2.4	Digfital Multi Function Meters	1) Type, Rating	Major	Visual	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	
		2) Calibration Certificate	Major	Visual	100%	-do-	-do-	MFT TC	-	-	3,2,1	
		3) Routine TC	Major	Electrical	100%	-do-	-do-	-do-	-	-	3,2,1	
2.5	PVC Insulated Electric Cable	1) Type, size	Major	Visual	100%	BHEL appd data sheet	BHEL appd data sheet	COC	3	-	2,1	**, All power cables to conform to IS 1554;Control wires to conform to IS 694
		2) I.R Test	Major	Electrical	Sample/lot	-do-	-do-	COC	3	-	2,1	
		3) H.V Test	Major	Electrical	Sample/lot	-do-	-do-	COC	3	-	2,1	
2.6	Transducer	1) Routine TC & calibration report	Major	Electrical	100%	IS 12784	IS 12784	Mfr TC	3	-	2,1	
		2) Type, Rating	Major	Visual	100%	-do-	-do-	-do-	3	-	2,1	
2.7	Current Transformer,Voltage Transformer, Dimmerstat Control Transformer	1) Routine Tests	Major	Electrical	100%	BHEL appd drg/Data sheet/ IS 2705	BHEL appd drg/Data sheet/ IS 2705	Mfr TC	3	-	2,1	
		1) Type, Rating	Major	Visual	100%	-do-	-do-	IR	3	-	2,1	**

BHEL	**PARTICULARS**	**BIDDER/VENDOR**
	NAME	
	SIGNATURE	
	DATE	BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN		CUSTOMER: NNTPS, NEYVELI			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION			
	SHEET 2 OF 6		SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.8	Busbar	1) Dimensional checkup	Major	Physical	100%	BHEL appd drg/data sheet	BHEL appd drg/data sheet	IR	3	-	2,1	
		2) Conductivity test	Major	Electrical	Sample/lot	-do-	-do-	IR	3	-	2,1	
		3)Surface Finish	Major	Visual	100%	-do-	-do-	IR	2	-	1	
		4)Material Grade	Major	Verif. of TC	1/Lot	-do-	-do-	Mfr TC	2	-	1	
2.9	Annunciation facia (if applicable)	All routine test as per EEUA-45D	Major	Electrical	100%	BHEL appd GA drg	BHEL appd GA drg	Mfr TC	3	-	2,1	
2.10	Visual Indications for charger status using LED/indicating lamps (if annunciation facia is not used)	Electronic card used for indication (refer Electronic card assembly & location at cl. No.3.4,for checks				BHEL appd GA drg	BHEL appd GA drg		2	-	1	
2.11	Rectifier Transformer	1) Rating	Major	Visual	100%	BHEL appd Data sheet	BHEL appd Data sheet	IR	3	-	2,1	
		2) Dimensional check	Major	Physical	100%	MFR's drg.	MFR's drg.	-do-	3	-	2,1	
		a) Overall size	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		b) Mounting Details	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		3) Terminal Board	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		4) Polarity Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		5) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		6) Routine Tests										
		a)Voltage Ratio Test	Major	Electrical	100%	IEC 146	IEC 146	IR/ Mfr Tc	3	-	2,1	
		b) DC resistance Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		c) No Load Test Measurement of iron losses	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		d) Measurement of Tap Voltages	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		e) Measurement of Cu. Losses	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		f) High voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		g) Induced high voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		h) Heat run Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	Temp. rise limited to class A insulation value
2.12	Choke	1) Rating	Major	Physical	100%	BHEL appd Data sheet	BHEL appd Data sheet	IR				
		2) Dimensional check	Major	Physical	100%	MFR's drg.	MFR's drg.	-do-				
		a) Overall size			100%	-do-	-do-	-do-				
		b) Mounting Details			100%	-do-	-do-	-do-				

BHEL	PARTICULARS	BIDDER/VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN		CUSTOMER: NNTPS, NEYVELI			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION			
	SHEET 3 OF 6		SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
		3) Terminal Board/Bakelite plate or busbar	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		4) Terminal rating	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		5) Air gap Measurement	Major	Physical	100%	-do-	-do-	-do-	3	-	2,1	
		6) Contuinity test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		7) Insulation Resistance	Major	Electrical	100%	IEC 146	IEC 146	IR/ Mfr TC	3	-	2,1	
		8) High voltage test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		9) DC resistance Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	
		10) Heat run Test	Major	Electrical	100%	-do-	-do-	-do-	3	-	2,1	Temp. rise limited to class A insulation value
2.13	Printed Circuit Boards											
	Insulating Materials (FRP,SMC,DMC,ETC.)	1. Electrical	CR	Elect. Test	Sample	Relevant IS, MFR's Std.	Relevant IS, MFR's Std.	Test Certificate	2	-	1	
		2. Mech Props.	MA	Mech Test	Sample	-do-	-do-	-do-	2	-	1	
		3. Tracking Index	MA	Elect. Test	Sample	-do-	-do-	-do-	3/2	-	1	
	Paints	Shelf Life	MA	Visual	100%	……..as per Paints Manuf's. Spec…….		IR	2	-	-	
	Gaskets(Syn. Rubber only)	1. Dimension	MA	Measurement	Sample	MFR's DRGS.	MFR's DRGS.	IR	2	-	-	
		2. Shore Hardness	MA	Test	-do-	MFR's DRGS.	MFR's DRGS.	IR	2	-	-	
		3. Ageing	MA	Test	-do-	IS-3400/BS-2752	IS-3400/BS-2752	INSPN Report	2	-	-	
3.0	**In process Inspection**											
3.1	Enclosure fabrication	1) Dimensional checks	Major	Physical	100%	MFR's Fabrication drg	MFR's Fabrication drg	IPIR	2	-	1	IPIR= In process Inspection Report
		2) Diagonal (Skewness)	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		3) Straightness	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		4) Welded joints	Major	Visual	-do-	-do-	-do-	-do-	2	-	1	
		5) Deburring & Finishing of welded joints	Major	Visual	-do-	-do-	-do-	-do-	2	-	1	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

	QUALITY PLAN		CUSTOMER: NNTPS, NEYVELI 0			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION			
	SHEET 4 OF 6		SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
3.2	Pre treatment of enclosure	1) Dimensional checks	Major	Physical	100%	IS 6005 / MFR's Std practice	IS 6005 / MFR's Std practice	IPIR	2	-	1	
		2) Water rinsing	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		3) Derusting	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		4) Water rinsing			-do-				2	-	1	
		5) Phosphating	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		6) Water rinsing	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		7) Hot- Chromating	Major	Physical	-do-	-do-	-do-	-do-	2	-	1	
		8) Sealing (If used)							2	-	1	
3.3	Powder Coating	1) Shade, Thickness & Finish	Major	Cross Hatch	Random	IS 6005 / MFR's Std practice	IS 6005 / MFR's Std practice	-do-	2	-	1	
		2) Adhesion check by cross hatch mathod	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
3.4	Electronic card assembly & location	1) Electronic cards fittings	Major	Cross Hatch	Random	Electronic cards shall be modular fitted in standard 19" metal racks with guides	Electronic cards shall be modular fitted in standard 19" metal racks with guides	-do-	2	-	1	
		2) Mechanical interlock	Major	Visual	100%	To avoid wrong insertion of cards	No wrong insertion of cards possible	-do-	2	-	1	
		3) Correctness of electronic components	Major	Visual	100%	MFR's drg	MFR's drg	-do-	2	-	1	
		4) Jumpers/ track modification	Major	Visual	100%	No unplanned jumpers / track modification	No unplanned jumpers / track modification	-do-	2	-	1	
		5) Finish of electronic cards	Major	Visual	100%	MFR's drg	No dry soldering	-do-	2	-	1	
		6) Environmental check on cards to remove cards with infant mortal components	Major	Visual	100%	MFR's std	MFR's std	-do-	2	-	1	
3.5	Assembly of components & modules	1) Transformer & choke	Major	Visual	100%	MFR's drg	MFR's drg	-do-	2	-	1	
		2) Mounting of components such as switches, rectifiers,stack fuses, meter & contactor	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		3) Minimum clearance between busbar	Major	Physical	100%	Relevant IS	Relevant IS	-do-	2	-	1	
		4) Electronic cards location inside the panels	Major	Visual	100%	Approved drg.	Temp. rise of the location should not exceed 10°C over ambient during heat run test	-do-	2	-	1	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

		QUALITY PLAN	CUSTOMER: NNTPS, NEYVELI 0			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER			
		SHEET 5 OF 6	SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
3.6	Wiring	1. Bunching	Major	Visual	100%	MFR's drg	MFR's drg	IPIR	2	-	1	
		2.Marking	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		3. Ferruling	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		4. Lugs crimping	Major	Physical	100%	-do-	-do-	-do-	2	-	1	
		5. Contuinity	Major	Electrical	100%	-do-	-do-	-do-	2	-	1	
		6. Identification labels	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
3.7	Finishing of Equipment	1. Proper pasting of gasket	Major	Visual	100%	-do-	-do-	-do-	2	-	1	
		2. Earthing busbar	Major	Physical	100%	-do-	-do-	-do-	2	-	1	
4.0	**Final Inspection**											
4.1	**Overall**	1.Dimensional & sheet thickness	Major	Physical	100%	BHEL appd drawing & Data sheet	BHEL appd drawing & Data sheet	IR	2	1	-	
		2. Gen arr. & B.O.M	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		3. Aesthetic Look, Straightness,skewness,Door alignment,Labels etc.	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		4. Provision of lifting arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		5. Proper earthing	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		6. Gasketing (Check with 1mm wire)	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		7. Gland plate arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		8. Mounting arrangement	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		9. Wiring quality	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		10. Paint shade, Adhesion & thickness check	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		11.Door Functioning	Major	Operation	100%	-do-	-do-	-do-	2	1	-	
		12. Mounting & Proper Fixing of all components	Major	Visual	100%	-do-	-do-	-do-	2	1	-	
		13 Smooth operation of all Switches PUSH Buttons etc.	Major	Operation	100%		-do-	-do-	2	1	-	
		14 Alarm & Protection	CR	Elect	100%	BHEL appd drawing & Data sheet & other Relv IS	BHEL appd drawing & Data sheet & other Relv IS	Test Report	2	1	-	

BHEL	**PARTICULARS**	**BIDDER/VENDOR**
	NAME	
	SIGNATURE	
	DATE	BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

		QUALITY PLAN	CUSTOMER: NNTPS, NEYVELI 0			PROJECT TITLE : 2x500MW NNTPS UNITS 1&2, NEYVELI			SPECIFICATION NO. : PE-TS-402-508-E002			
			BIDDER/ VENDOR :			STANDARD QP NO. : PE-QP-999-508-E003, REV. 0			SPECIFICATION TITLE:TECHNICAL SPECIFICATION			
		SHEET 6 OF 6	SYSTEM 220V DC SYSTEM			ITEM : BATTERY CHARGER			DOC. NO. :			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
4.2	**Electrical Testing**	1) Burn in check at 50°C for 48 hrs in energized condition	Major	Electrical	100%	BHEL Spec	BHEL Spec	IR	2	-	1	Burn in test to be performed before offering for BHELInspection
		2) AVR operation test with input voltage variation of +/- 10%, frequency variation and combined voltage-frequency variation.	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) No Load				-do-	-do-	-do-	2	1	-	
		b) Half Load				-do-	-do-	-do-	2	1	-	
		c) Full Load				-do-	-do-	-do-	2	1	-	
		3) Ripple test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) No Load				-do-	-do-	-do-	2	1	-	
		b) Half Load				-do-	-do-	-do-	2	1	-	
		c) Full Load				-do-	-do-	-do-	2	1	-	
		4)Logic simulation/interlocks/ General Operation Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		a) Trickle / boost mode selector switch operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		b) Auto/ manual selector switch operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		c) Soft start feature check	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		d) Uniform step-less trickle mode voltage adjustment in auto / manual operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		e) Boost charge mode current adjustment from 50% to 100 % continuously	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		5) Control circuit & charger status indication test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		6) Load Limiter Operation	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		7) Heat Run Test	Major	Electrical	1 sample	-do-	-do-	-do-	2	1	-	
		8) Dynamic response test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		9) Input AC current measurement test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		10) Degree of protection Check for IP 42	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		11) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		12) H.V Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		13) Efficiency and power factor measurement	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		Complete Physical Examinatin, visual checks, wiring checks, functional checks.	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		Checking of proper operation of annunciation system	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		Di-electric Tests	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		Voltage Regulation check from 0 to 100% loads with +/- 10% input voltage variation.	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		DC short circuit test to prove ability of current limit.	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
		Routine test on component/ parts	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
5	**Battery Fuse Box**	1) Dimensional check	Major	Physical	100%	BHEL appd G.A drg.	BHEL appd G.A drg.	-do-	2	1	-	
		2) Fuse Rating	Major	Visual	100%	BHEL appd Data sheet	BHEL appd Data sheet	-do-	2	1	-	
		3) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
6	**Discharge Resistor**	1) Dimensional check	Major	Physical	100%	BHEL appd G.A drg.	BHEL appd G.A drg.	-do-	2	1	-	
		2) Resistance rating	Major	Electrical	100%	BHEL appd Data sheet	BHEL appd Data sheet	-do-	2	1	-	
		3) I.R Test	Major	Electrical	100%	-do-	-do-	-do-	2	1	-	
5.0	**CABLE LUGS & GLANDS**	Visual	MA	-	100%	BHEL approved GA drg, data sheet	BHEL approved GA drg, data sheet	-do-	2	1	-	

**** : IF THESE ITEMS ARE PURCHASED FROM BHEL APPROVED SUB VENDOR THEN IR NOT REQUIRED, HOWEVER CERTIFICATE OF CONFORMANCE TO BE SUBMITTED TO BHEL FOR ACCEPTANCE.**

BHEL			**PARTICULARS**	**BIDDER/VENDOR**	
			NAME		
			SIGNATURE		
			DATE		BIDDER'S/VENDOR'S COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

Sr. No.	PARAMETER	UNIT	VALUE
1.0	**Power Supply & fault level details**		
1.1	Rated AC voltage & variation	V, %	415 V, 3P-4W, ± 10%
1.2	Rated DC voltage & variation (Float Mode)	V, %	220 V, -15% to +10%
1.3	Rated DC voltage & variation (Boost Mode)	V, %	245-302.5V
1.4	Fault current of LV system (415 V)	kA	50 kA for **1** sec.
1.5	Fault current of DC system limited upto (max)	kA	20 KA, 1sec
1.6	Battery Type	-	Lead Acid Plante type
BATTERY CHARGER			
2.0	**Charger current rating**		
2.1	**No of Float Cum Boost Charger**	Nos.	2 x 100% FCBCs (Total 8 FCBCs)
2.2	Float-cum-boost charger	A	350Amps
3.0	**Ripple content of charger**		
3.1	Peak to peak	%	± 1% The output voltage of charger will be regulated within ±1% of the set value for any load variation 0 to 100 % Input AC voltage variation (±10%) and input frequency variation of +3 to -5%) and combined voltage and frequency variation of 10%. The ripple content in charger D.C output will be limited to ±1% (peak to peak) of the D.C. output voltage, at nominal A.C voltage.
4.0	**Degree of Protection (DOP)**		
4.1	Rectifier transformer cubicle		IP-42
4.2	Control cubicle		IP-42
4.3	Discharge Resistor		IP-32
4.4	Battery Fuse Box		IP-42
5.0	**Constructional features**		
5.1	Panel sheet thickness/ material	mm	2.0, Sheet steel
5.2 a	Paint shade (outside)		RAL : 9002 Except end cover
5.2 b	Paint shade (outside) – End Cover		End Cover RAL 5012

5.3	Paint shade (inside)		Glossy White
5.4	Cable gland plate thickness/ material	mm	3 mm / Removable undrilled gland plates of at least 3.0 mm sheet steel
5.5	Gasket thickness/ material	mm	3 mm / Synthetic Rubber
5.6	Battery Charger (350A)		
	a) Cable size from charger to DCDB		1R-1CX630Sqmm (Cu)/ Pole
	b) Cable size from battery to Charger through Battery Fuse Box		1R-1CX630Sqmm (Cu)/ Pole
6.0	Dropper diode for feeding loads while Charger is on Boost mode (Battery Intermediate cell tapping)	Yes/No	YES Please refer schematic in Annexure-C
BATTERY FUSE BOX			
7.0	Battery Fuse Box current rating	A	Minimum 1000A, fuse shall be suitable for Load duty cycle (Annexure-B of Tech spec)
7.1	Fault current of DC system limited upto (max)	KA	20 KA
7.2	Panel sheet thickness/ material	mm	2
7.3	Paint shade (outside)		Same as that of Charger.
7.4	Paint shade (inside)		
7.5	Cable gland plate thickness/ material	mm	3 mm / Removable undrilled gland plates of at least 3.0 mm sheet steel
7.6	Gasket thickness/ material	mm	3 mm / Synthetic Rubber
DISCHARGE RESISTOR			
8.0	Discharge Resistor current rating	A	Suitable for battery size of 1850AH with 10Hour discharge rate (For Unit Battery Charger)
8.1	Duration of discharge	Hrs	**10**
8.2	Cooling of Discharge resistor		Air / fan cooled

8.3	Cable gland plate thickness/ material	mm	3 mm / Removable undrilled gland plates of at least 3.0 mm sheet steel
8.4	Gasket thickness/ material	mm	3 mm / Synthetic Rubber
RECTIFIER TRANSFORMER			
9.0	Type		Double wound, Dry type, copper conductor, class –B insulation
9.1	Rated KVA &% impedance		As per calculations, to be provided by bidder. * *The rating of rectifier transformer shall be greater than 150kVA under all circumstances. The Max temp rise shall be limited to class-A insulation.
9.2	Standard applicable		IS 11171 / 2026
9.3	Power factor at nominal input & output voltage & current.		0.8
METERS			
10.0	Accuracy		Accuracy class 1.0 as per IS 1248
10.1	Size	mm^2	96X96
EARTHING			
11.0	Grounding terminal size/ no. for each charger		50X6 MM./ 2 nos.
11.1	Grounding terminal size/ no. for each fuse box		50X6 MM./ 2 nos.
11.2	Grounding terminal size/ no. for each discharge resistor		50X6 MM./ 2 nos.
12.0	**Type Tests**		
12.1	Validity period of type test reports		Within last five years
12.2	Type tests to be conducted for this contract, despite availability of valid & acceptable test certificates	Yes/ No	YES
12.3	Test to be conducted		As mentioned in the technical

			specification.
13.0	**Mandatory Spares**		
13.1	Mandatory Spares to be quoted for this contract	Yes/ No	YES
13.2	If yes, list of mandatory spares		ATTACHED WITH ANNEXURE-A
14.0	**E & C Spares**		
14.1	E & C Spares to be quoted for this contract	Yes/ No	Yes
14.2	If yes, list of E & C Spares		Enclosed in annexure-A
15.0	**Special tools & tackles**		
15.1	Special tools & tackles to be quoted for this contract	Yes/ No	Yes
15.2	If yes, list of Special tools & tackles		List to be furnished by Bidder for their system
16.0	O & M SPARES		
16.1	O & M SPARES applicable for 3 years to be quoted for this contract	Yes/ No	No
16.2	If yes, list of O & M Spares		-

2x500MW NEW NEYVELI TPS UNITS 1&2, NEYVELI **'ANNEXURE-A'**

'BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY CHARGER ***'SPECIFICATION NO. PE-TS-402-508-E002***

Sr. No.	Item code	Item Description	Unit	Quantity	Remarks
(A)	**MAIN ITEMS**				
1.0	508-12010-A	FLOAT CUM BOOST CHARGERS	NOS	8	350A, 220V DC Float-cum-boost charger (Suitable for 110 Cells of 1850 AH battery)
2.0	508-12001-A	BATTERY FUSE WITH SH STEEL ENCL SUPP STR	NOS	8	Minimum 1000A, Battery fuse box of adequate rating enclosed (as per load duty cycle) in sheet steel enclosure painted with antiacid/ antialkali paint, front sheet of fibre glass along with supporting structure for 220V DC, 1850 AH lead-acid plante battery
3.0	508-12005-A	DISCHARGE RESISTOR	NOS	1	Discharge resistor with shunt suitable for 10 hour discharge rate for 1850 AH lead acid plante battery
4.0	508-12006-A	E & C SPARES	SET		
4.1		FUSE LINK WITHOUT HOLDER			
a		AC I/P HRC FUSE LINK	NOS	16	
b		CONTROL HRC FUSE LINK	NOS	16	
c		RECTIFIER FUSE LINK	NOS	16	
d		FILTER CAPACITOR FUSE LINK	NOS	16	
e		DC O/P FUSE LINK	NOS	16	
4.2		INDICATING LAMP			
a		AC I/P LAMP RED COLOR	NOS	16	
b		AC I/P LAMP YELLOW COLOR	NOS	16	
c		AC I/P LAMP BLUE COLOR	NOS	16	
d		DC O/P LAMP	NOS	16	
5.0	508-12023-A	TOOLS & TACKLES	SET	1	LUMP sum price to be quoted by bidder and List to be furnished separately by bidder for their system
6.0	508-12020-A	SUPV.OF E&C	MAN DAY CHARGES	12	Free shared Accomodation, Food facilities, Local conveyance at site, storage space for tools shall be provided F.O.C to vendor.

NOTE:- 1) All Cable Gland and Lugs at Charger, fuse box & discharge resistor end are in Bidder's Scope.
2) Detailed list of Tools and Tackles (for battery charger) shall be submitted by vendor after award of contract. This list shall be subjected to approval of BHEL/ Customer without any price implication to BHEL.
2) Amount payable for supervision of E&C = [daily charges as per sl. no. 6.0 above X no. of days at site]. (To be certified by BHEL site).

2x500MW NEW NEYVELI TPS UNITS 1&2, NEYVELI **'ANNEXURE-A'**

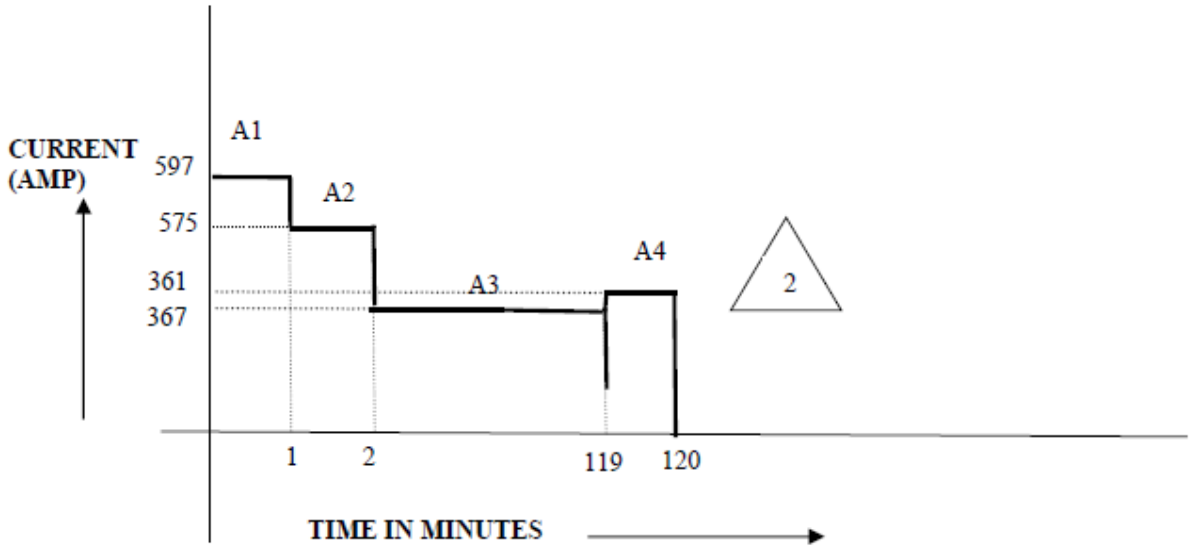
'BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY CHARGER ***'SPECIFICATION NO. PE-TS-402-508-E002***

Sr. No.	Item code	Item Description	Unit	Quantity	Remarks
(B)	**MANDATORY SPARES**				
1.0	508-12016-A	MANDATORY SPARES for FLOAT CUM BOOST CHARGER			
a)		Contactors of Each Type	Nos.	10	
b)		Coils for Each Type of Contactor	Nos.	10	
c)		Main and Aux Contact sets	Nos.	10	
d)		DC Ammeter of Each Type	Nos.	2	
e)		DC Voltmeter of Each Type	Nos.	2	
f)		AC Ammeter of Each Type	Nos.	2	
g)		AC Voltmeter of Each Type	Nos.	2	
h)		Control Switch of Each Type	SET	1	
i)		Current Regulators of Each Type	SET	1	
j)		Fuses/ MCBs of Each Type and rating	Nos.	2	
k)		Overload Relays of Each Type	Nos.	1	
l)		Filter Condensor & Filter Fuses	SET	2	
m)		MCCBs of Each rating	Nos.	2	
n)		LED Lamps	SET	2	
o)		PCBs of Each Type	Nos.	1	
p)		Control Unit Relay	Nos.	10	
q)		SCR Module of Each Type	Nos.	5	
r)		Blocking Diode for battery Charger per board	Nos.	5	
s)		Push Buttons	Nos.	5	
t)		Cooling Fan	Nos.	1	

Note: Detailed list of Mandatory spares (for meeting the above requirement) shall be submitted by vendor after award of contract. This list shall be subjected to approval of BHEL / Customer without any price implication to BHEL.

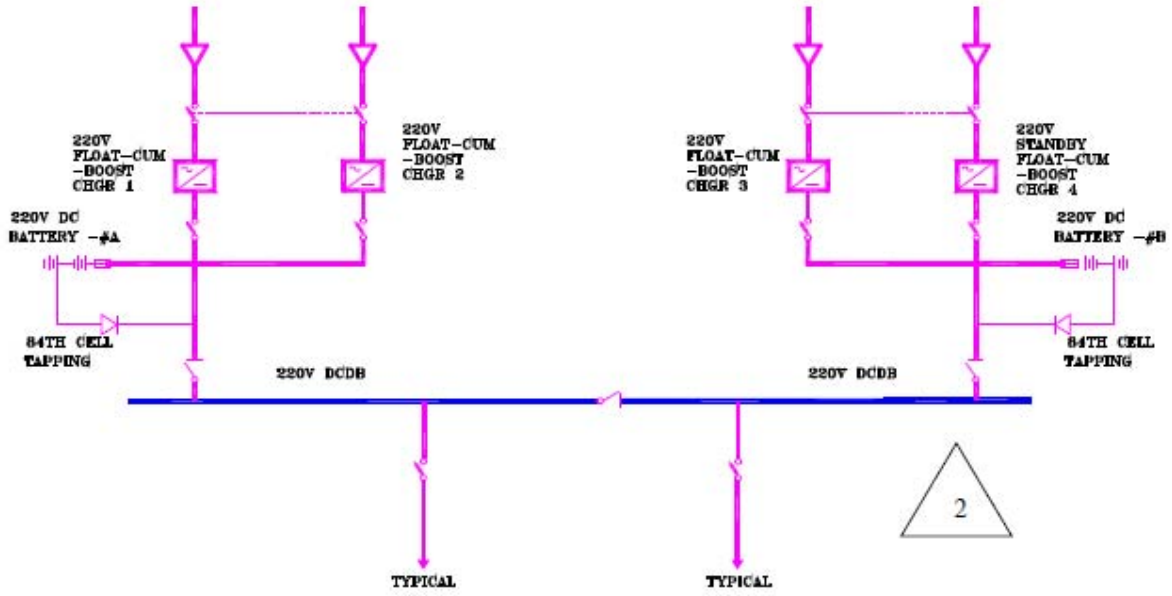
ANNEXURE-B

LOAD DUTY CYCLE - 220V DC SYSTEM



ANNEXURE-C

ONE LINE DIAGRAM FOR 220 V DC SYSTEM



ANNEXURE-D

DOCUMENT / DRG. DISTRIBUTION SCHEDULE

DRAWING/DOCUMENT DISTRIBUTION LIST

All documents & drawings shall be in English and in metric units

SI		LII	NLC (HQ)	NLC-SITE	BHEL SITE	PMG BHEL	PEM/ UNITS/ PSSR	REMARKS
1	Master list of drawings / document (duly indicating schedule of submission)	Soft copy	Soft copy	Soft copy		Soft copy	Soft copy (S)	
2	Drawings / document for Approval/Information (First Submission)	Soft copy + 2 prints	Soft copy + 3 prints	Soft copy + 1 print		Soft copy	Soft copy (S)	
3	Return with comments/approval	Soft copy (S)	Soft copy	Soft copy		Soft copy	Soft copy	
4	Drawings / Documents for approval (second & subsequent submissions till approval)	Soft copy	Soft copy	Soft copy		Soft copy	Soft copy (S)	
5	Drawings / documents for distribution (Approved by NLC, in cat. 1 or Received for Information)	Soft copy + 2 print (HQ+ Site)	Soft copy + 3 prints	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
6	Erection Drawings / documents	-	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
7	As built Drawings / documents	Soft copy + 1 print	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
8	Operation & Maintenance Manual	-	Soft copy + 1 print	Soft copy + 10 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	
9	Type Test Certificate	Soft copy	Soft copy + 1 print	Soft copy + 3 prints	Soft copy + 5 prints	Soft copy	Soft copy (S)	

NOTES:

1. The above schedule of submission does not include Docs/Drgs. of quality assurance/inspection and delivery/dispatches. QAP documents to be submitted as per distribution schedule.
2. Date of submitting soft copy is to be taken as date of submission.
3. S – Source for generation of document.

ANNEXURE-E

LIST OF STANDARD DELIVERABLES FOR DC BATTERY CHARGER

SL. No.	DOCUMENT TITLE	DWG. / DOCUMENT No.	Submission Schedule
1	Data Sheet for Battery Charger	PE-VO-402-508-E101	Within two weeks of award of contract
2	General Arrangement drawing for Battery Charger	PE-VO-402-508-E102	Within two weeks of award of contract
3	Schematic/ Power Circuit diagram for Battery Charger	PE-VO-402-508-E103	Within two weeks of award of contract
4	Internal Layout drawing for Battery Charger	PE-VO-402-508-E104	Within two weeks of award of contract
5	Bill of Material for Battery Charger with list of makes	PE-VO-402-508-E105	Within two weeks of award of contract
6	Operation Write up for Battery charger	PE-VO-402-508-E106	Within two weeks of award of contract
7	Fault level Calculation for Battery Charger	PE-VO-402-508-E107	Within two weeks of award of contract
8	Calculation of Transformer kVA and Rectifier for Battery Charger	PE-VO-402-508-E108	Within two weeks of award of contract
9	Thyristor rating and fuse co-ordination calculation	PE-VO-402-508-E109	Within two weeks of award of contract
10	Filter Circuit Calculation for Battery charger	PE-VO-402-508-E110	Within two weeks of award of contract
11	AC Power consumption in float mode & boost mode	PE-VO-402-508-E111	Within two weeks of award of contract
12	List of E & C Spares for Battery Charger	PE-VO-402-508-E112	Within two weeks of award of contract
13	List of Mandatory Spares for Battery Charger	PE-VO-402-508-E113	Within two weeks of award of contract
14	O&M Manual for Battery Charger	PE-VO-402-508-E114	After despatch of Charger
15	Field Quality plan for Battery Charger	PE-VO-402-508-E115	Within two weeks of award of contract
16	Type test reports for the Battery Charger	PE-VO-402-508-E116	Within two weeks of award of contract
17	Circuit diagram and GA of battery discharge panel	PE-VO-402-508-E117	Within two weeks of award of contract
18	Circuit diagram and GA of battery fuse box	PE-VO-402-508-E118	Within two weeks of award of contract
19	Quality Plan for Battery Charger	PED-508-0-Q-001,	Within two weeks of award of contract