561055/2021/PS-PEM-EL

4x270 MW BHADRADRI TPS (FGD)

TECHNICAL SPECIFICATION
FOR
220V DC BATTERY CHARGER

SPECIFICATION NO. : PE–TS–440–508–E002

REVISION 00

VOLUME II B

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

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	SPECIFICATION NO. PE-TS-440-508-E002	
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TOTAL NO. OF SHEETS = 56 (INCLUDING COVER/ SEPARATOR SHEETS)

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COMPLIANCE CERTIFICATE

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

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

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

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

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

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

BIDDER'S STAMP & SIGNATURE

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SECTION I

SPECIFIC TECHNICAL REQUIREMENTS

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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, Supervision of E&C of 220V DC battery charger as described in the various sections of this specification. The equipment shall generally conform to IS. In this specification though erection and commissioning is not included in vendor's scope, the 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 equipment in accordance with the various sections of this specification. The bill of material is enclosed as Annexure-A.

3.0 SERVICES AND EQUIPMENT TO BE EXCLUDED

A) Civil works like foundation and cable cellar, flooring of the charger room etc.
B) Ventilation of charger room
C) DCDB
D) Battery
E) Erection & commissioning of the equipment
F) Power and control cables except internal wiring of charger

4.0 SYSTEM CONCEPT

4.1 220V DC system shall be one no ungrounded system, comprising of two sets of batteries with associated float cum-boost charger for each battery and one sectionalised DCDB. The 220V DC system is designed to cater the control, protection, interlocking, emergency lighting and emergency dc drives for FGD system. The load duty cycle and typical single line diagram for 220V battery and charger connections is enclosed as Annexure-V and Annexure-II respectively.

4.2 Each float cum boost charger will have a 'FLOAT/BOOST' selector switch for selection of battery charging mode. 'AUTO/MANUAL' selector switch for selection of battery charging control mode along with voltage/ current setter for FCB charger shall be provided. The float cum boost charger shall have provision for float equalising, and boost charging the battery through manual selection. The boost mode selection in the selector switch should give start command to the FC charger and stop command in case of float mode selection through suitable mechanism.

Under normal conditions, the 'FLOAT/BOOST' selector switch shall be in float mode. Float charging current of the battery shall be supplied by the FCB charger, which is continuously monitored. In case this current exceeds a certain value, the FCB charger can be switched over to 'BOOST' mode manually for charging at a higher rate only after load isolating breaker is open. Now the other FCB charger will cater the load by closing the bus coupler and battery is charged by FCB in boost mode. When the battery is fully charged, the FCB charger shall manually brought back to 'FLOAT' mode by closing the

isolating breaker manually and other Float charger can be isolated by opening the bus coupler.

4.3 Under normal conditions, FCB charger will cater continuous loads and trickle charging current to batteries. In case of failure of AC, battery will meet the DC load requirement. After restoration of power, the FCB charger will supply the loads as well as trickle charge the battery. Under discharge condition, battery will be put to boost charge by the associated FCB charger while the other FCB charger will continue to supply DC loads by closing the bus coupler. In boost mode, each of the chargers is suitable to charge the fully discharged battery (at end cell voltage of 1.85V) up to 2.75V/ cell in 10 hours.

4.4 Suitable electrical interlock will be provided in the charger to ensure that boost charging can commence only after the relevant load isolating breaker in the DCDB is open. This ensures availability of both redundant feeders to the loads when any charger is isolated from the system for boost charging. However, in case of failure of any FCB charger, the other FCB charger will take over and feed in both section of DCDB and provide trickle charging to associate battery. The operational philosophy/mechanism of DC SYSTEM shall be developed by vendor and decided during detailed engineering for approval of BHEL/TESGENCO without any commercial implication to BHEL.

4.5 Chargers designed for single and parallel operation with battery and shall be provided with 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 30% to 100% of maximum boost charging current.
- Current stabilization for constant current regulator for boost charging will be ±2%.
- Minimum permissible power factor at rated continuous load will be 0.8
- Voltage stabilization for constant voltage regulation will be:
  (a) ±1% of set DC voltage with ±10% variation in supply voltage.
  (b) ±5% during transient.

4.6 The rectifier shall utilize diodes / thyristors and heat sinks rated to carry 200% of the load current continuously.

4.7 The voltage at load terminal will not exceed the limits of +10% and -15% of nominal system voltage for 220V DC system. The output voltage of float charger shall be adjustable between 230V to 240V.

4.8 Chargers will be suitable for continuous operation at AC voltage variation of ±10%, frequency variation of +3 to -5% and combined voltage and frequency variation of 10% (absolute).

4.9 The 220V DC power cable between battery to DCDB and charger to DCDB will be single core copper cable. The HRC fuse box shall be located near battery. The Main HRC fuse on battery and charger output shall also have alarm contact.

4.10 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.

4.11 Further 4-20mA signals to DDCMIS shall be provided for important parameters like charger O/P voltage, current and battery voltage, Charger panel shall be provided with charger input and output voltmeter & ammeter, battery voltmeter and ammeter.

4.12 The float-cum-boost charger panels will house load terminals, meters, annunciators and LED type indicating lamps.

4.13 Meters shall be provided with necessary shunts for local and remote metering shall also be provided. The instruments shall be flush mounted type, dust proof, moisture resistant and have easy accessible means for zero adjustment. Meters shall have 4 digit-7 segment LED/LCD display and RS 485 Serial Bus port.

4.14 For ungrounded DC system, suitable ground fault detection system shall be provided in the battery charger panel to detect the ground fault on either polarity for annunciation in the charger panel.

4.15 Suitable annunciation in DDCMIS shall be provided like charger trouble, battery on boost mode etc. through NO/NC contact.

5.0 ALARM AND PROTECTION

5.1 Fault indicating lamps for battery and chargers shall be provided on charger cubicle.

5.2 Each charger shall have minimum ten point alarm facia be provided with audio visual alarm annunciation arrangement, actuating devices, circuitry, legend and push buttons(accept, reject and test), and hooter for the following important alarms for various abnormal conditions. 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.

- AC supply failure
- DC voltage low
- DC voltage high
- DC system ground
- Charger overload
- SCR fuse blown
- Filter fuse blown

- Battery on boost charge
- Charger fail
- Float cum boost charger in float mode
- Battery earth fault
- DC output fuse blown
- Boost cum float charger bus over/under voltage

For all above alarms, a group alarm for each charger “Battery charger Trouble” shall be provided on the Electrical control panel (ECP).

Initiating contacts for all alarm points shall also have electrically separate spare set of contacts wired to the terminal block for future use. On occurrence of a fault, the corresponding window will light up and stay lighted until the fault is cleared and the reset button is pressed. In addition, any additional indication / alarms considered necessary during detailed engineering shall also be provided without any commercial implication. Each battery charger shall have two (2) nos. spare annunciation channels and window facia.

5.3 Each float-cum-boost charger panel shall be provided with the following meters:

- One (1) D.C. ammeter (for charger output).
- One (1) D. C. voltmeter with selector switch (for charger output/ battery voltage)
- One (1) D.C. ammeter for monitoring trickle charging current.
- Shunts for local and remote metering.
- Measurement for AC input voltage and current (through Voltmeter/Ammeter selector switch)
- Voltage selectors switch to measure DC bus voltage between positive to earth, negative to earth and positive to negative.

5.4 The charger panels shall be provided with lamp, heater and receptacle circuits shall have individual ON-OFF switch fuse units/MCCB:

- Internal illumination lamp with door switch
- Space heater with thermostat control.
- 5 pin 6A receptacle with plug.
- Individual switch fuse unit for lamp, heater and receptacle circuits
- Communication plug

5.5 The indications with cluster LEDs will be provided on float-cum boost charger panel shall include:

- Charger power supply ON
- Charger D.C. output healthy
- Control supply ON
- Annunciation DC healthy
- FCB in boost mode
- FCB in float mode

- FCB in Equalising mode

5.6 Following protections are provided for battery 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

6.0 1 no. discharge resistor suitable to conduct discharge test@ C10 of battery shall be provided by bidder for the plant.

6.1 The rating of 220V DC float-cum-boost charger shall be 50 A. The following items shall be provided with the charger.

i) Battery fuse of adequate rating enclosed (as per load duty cycle) in sheet steel enclosure along with supporting structure for 220V DC, min 200 AH lead-acid plante battery/ batteries connected in parallel.

ii) AC I/P HRC Fuse Link w/o holder, Glass Fuse w/o holder, Control HRC Fuse Link w/o holder, Rectifier Fuse Link w/o holder, Filter Capacitor Fuse Link w/o holder

6.2 All busbars and bus connections shall be adequately sized to limit the maximum temperature rise to 40°C under rated load condition. The maximum allowable temperature rise shall be 55°C at joints. All bus connections shall be shrouded.

7.0 Bidder to furnish list of sub-vendor(s) for bought out items. Make of equipment / components shall be subject to BHEL/TESGENCO approval after award of contract without any commercial implication.

8.0 **TESTS ON CHARGER**

8.1 Following routine tests will be conducted on charger:

- Visual checks for dimensions and general arrangement
- Wiring checks
- Functional checks
- Voltage regulation for rated input supply for loads from 0-100% with ±10% input voltage variation
- Load test to show the charger can deliver the rated duty without the current limiter device operating
- Ripple measurement by oscilloscope at different loads

- Demonstration of guaranteed efficiency and power factor
- Insulation test with 500V megger (Dielectric test)
- High voltage test, excluding electronic controller, at 2kV AC for one minute
- Routine test on components parts

8.2 Following type tests will be conducted on charger:

- Heat run test on current value
- Burning test on PCBS - Assembled PCBS shall be tested at 70° C for 72 hours in loaded condition
- Rapid temperature cycling test at 70° C and 0° C for 30 minutes at each temperature - 5 such cycles

8.3 Bidder has to submit test certificates for their bought out items.

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

10.0 **TECHNICAL AND QUALITY DOCUMENTATION TO BE SUBMITTED**

10.1 By All Bidders as technical offer:

(i) A copy of the sheet “Compliance certificate” with bidder’s signature and company stamp.

10.2 Documents to be submitted after award of contract shall be as per NIT.

10.3 No. of prints to be submitted by vendor after award of contract shall be as per NIT.

11.0 Supply and supervision of E&C schedule: As per NIT (Notice Inviting Tender).

4.03.00 **Battery Charger**

4.03.01 **General**

a) The charger shall be natural air cooled, solid-state type with full wave, fully controlled, bridge configurations.

b) The charger shall be provided with (but not limited to) microprocessor based automatic voltage control, current limiting circuitry, smoothing filter circuit and soft-start feature, under/ over voltage protection and earth fault detection.

c) Voltage/current control shall be stepless, smooth and continuous. Voltage control shall be possible either in “Auto“ mode or in “Manual” mode. An “Auto-Manual” selector switch shall be provided for this purpose.

d) The charger shall be self-protecting against all AC and DC transients and steady state abnormal currents and voltages.

e) Charger AC input and DC output shall be electrically isolated from each other and also from panel ground.

f) Isolation shall also be provided between power and control circuits.

g) Radio frequency suppressor/screening shall be provided with the charger to limit the noise level/interference to radio and other communication equipment to be installed in the same building.

h) The design of the equipment will be such that during the period both trickle charger unit and boost charger units are working independently, the tap connection from various taps of the battery cell to the load circuit should not involve any circulating current.

4.03.02 **Construction**

a) The charger shall comprise a continuous line up of free-standing, floor mounted sheet steel panels, with access from both from front as well as from rear.

b) In between float and float-cum-boost charger panels, a central panel shall be provided. This panel shall house the battery terminals, load terminals, battery blocking diodes, meters, annunciator and indicating lamps.

c) The panel shall conform to the degree of protection IP 42. Minimum thickness of sheet metal used shall be 2 mm

d) Access doors shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh. Door over 600 mm width shall be of double-leaf design.

e) All equipment within the panels shall be arranged in modular units and laid out with sufficient space for easy maintenance.

f) All indicating instruments, control switches etc. shall be flush mounted on the front face of the panels. However potentiometer shall be provided inside the panel. Nameplates of approved size and type shall be provided for all circuits and devices both at front & inside of the panel.

g) All bus bar and bus connections shall be of high conductivity copper and adequately sized to limit the maximum temperature within the permitted value. All bus connection shall be silver plated.

h) Heat –shrinkable insulating sleeves shall be provided for bus bars. All bus connections shall be color coded for easy identification.

i) Bus bars shall be supported and braced to withstand the stress due to maximum short circuit current and also to take care of any thermal expansion.

4.03.03 **Charger Equipment**

a) All power diode and control rectifiers shall be silicon type. Rectifier transformer shall be resin impregnated in vacuum, dry type, double wound with copper conductor and class-F insulated with temperature rise limited to class-B having off-circuit tap +(-)2x2.5% on primary side. LC filter suppressor shall be provided in the output to minimize ripple content and to keep the value within the specified limit.

b) The diode & bridge elements shall be liberally sized for forward current, minimum momentary overloads & voltage spikes. The current & peak inverse voltage (PIV) should be chosen accordingly. Wherever necessary power semiconductor device shall be provided with over current and over temperature protection by using special fuses.

Blocking diodes shall be fully rated and shall have redundancy so that failure of a single diode shall not incapacitate the system in any way.

c) Isolating switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON & OFF position.

d) AC Changeover switch shall be 3 position, 4 pole, load break type with 2 NO + 2 NC auxiliary contacts. The switch shall be installed in such a manner that the operating handle shall be accessible only after opening the front door.

e) Double pole, double throw DC switch shall be load break type with 2 NO + 2 NC auxiliary contacts.

f) Control switches shall be dust protected, heavy duty, switchboard type complete with escutcheon plates. Contacts shall be silver plated, rated 10A at operating voltage.

Selector switch shall be maintained contact, lockable stay-put type with knob handle. Meter selector switch shall be four-position type.

Ground fault detection switch shall be three-position type spring return to neutral.

g) Push button shall be heavy duty, shrouded, push to actuate type with colored button and inscription plate. Each push button shall have 2 NO + 2 NC contacts, rated 10A at 240V AC and 5.0A at 220V DC.

h) Contactor shall be air-break type with hand reset type thermal overload relays having in built temperature compensator and single phase preventor. Contactor duty class shall be AC-3.

i) Fuses shall be HRC type, mounted on insulated fuse carriers, which are mounted on fuse bases. Wherever it is not possible to mount fuses on carriers, fuses shall be directly mounted on plug-in type of base. In such cases, one set of insulated fuse pulling handles shall be supplied with each board. Kick-off fuses (trip fuses) with alarm contacts shall be provided for all DC fuses. Semi conducting device fuses shall be fast-acting. All upstream fuses shall be properly coordinated with corresponding down stream fuses.

j) Indicating lamps shall be clustered of LEDs suitable for the duty involved. The body shall be made of polycarbonate Unbreakable lens. LEDs shall be protected by inbuilt fuse with surge suppressor or leakage voltage glow protection. Both lamps and lens shall be replaceable from front.

k) Each battery charger shall be provided with one (1) no. voltage transducer and one (1) no. current transducer for monitoring the DC output. These transducers shall have twin-channel output of 4-20mA and will be used for analog inputs to central DDCMIS/ EDMS.

l) Ground fault relay shall be provided to detect DC system ground leakage current.

m) Switch fuse shall be provided to receive incoming AC supply.

n) Charger shall be equipped with LCD display, so the system or particular module operation parameters can be locally or remotely viewed / monitored. Following parameters to be displayed:

- Input AC voltage
- Input AC current
- Charging voltage

- Charging current
- Load voltage
- Load current
- Battery voltage
- Battery current

4.03.04 **Alarms**

a) Solid–state, audio visual annunciation system shall be provided for battery chargers. Annunciation system shall operate on 220V DC.

b) One (1) minimum twelve-points alarm facia shall be provided on float-cum-boost charger panel, complete with proper actuating devices, circuitry, legends, push buttons (Accept, Reset and Test) and hooter.

c) Each central panel shall be provided with one (1) minimum ten point alarm facia complete with proper actuating devices, circuitry, legends, push- buttons (Accept, Reset and Test) and hooter.

d) The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button is pressed.

e) Each time a window lights up, a master relay will get energized to provide group alarm signals for Owner/Purchaser's remote panel.

f) The requirements of indication/metering/alarms are given in the annexure.

g) The alarm shall be compatible with central DCS/SCADA

4.03.05 **Meters**

Meters shall be 96 x 96 mm switchboard type, 90 deg scale, antiglare glass, accuracy class 2.0, with zero adjuster on the front.

4.03.06 **Transducers**

Each battery charger shall be provided with one (1) no. voltage transducer and one (1) no. current transducer for monitoring the DC output. Transducer shall have 4-20mA dual output.

Charger panel shall be provided with the following transducers:

a) DC voltage transducer at each charger output.

b) DC current transducer at each charger output.

c) DC voltage transducer at battery output.

4.03.07 **Controls**

The following (but not limited to) manual controls shall be provided on the front of each charger panel :

a) Charger ON/OFF push button.

b) Selection of float or boost charge in case of float-cum-boost charger.

c) Voltage setters for setting the output of float/ equalizing / boost charge. Setting shall be independent of each other so that setting of one voltage shall not require resetting other.

d) Ground fault detection switch with indicating lamps.

e) Current limit setter/ charging rate.

f) Under/Over voltage relay including battery earth fault monitoring relay.

g) Acknowledge-Reset-Test push buttons for annunciation system. The color of reset buttons shall be BLACK.

4.03.08 **Lamp/Space heaters/receptacles**

DELETED

4.03.09 **Wiring/Cabling**

a) The panels shall be completely wired-up. All wiring shall be routed through wiring troughs.

b) Wiring shall be done with flexible, 1100V grade, fire resistance PVC insulated switchboard wires with stranded copper conductors of 2.5 mm^2 for control and current circuits and 2.5 mm^2 for voltage circuits.

c) Each wire shall be identified, at both ends, with interlocking type permanent markers bearing wire numbers as per Bidder's Wiring Diagrams. AC / DC wiring shall have separate color-coding.

d) Wire termination shall be made with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

e) All spare contacts of relays, timers, auxiliary switches and other devices shall be wired up to the terminal block.

f) Gland plate shall be of 4 mm thick, non-magnetic material and suitable for single-phase cable entry from bottom. Cable terminal board with cable lugs and double compression cable glands shall be provided in each panel for termination of incoming and outgoing cable.

4.03.10 **Terminal Block**

a) 1100V grade, multi way terminal block complete with mounting channel, binding screws and washers for wire connections and marking strip for circuit identification shall be provided for terminating the panel wiring. Terminals shall be stud type, suitable for terminating 2 nos. 2.5 mm2 stranded copper conductor and provided with acrylic insulating cover.

b) Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished. Separate terminal blocks shall be used for AC/ DC wiring termination.

c) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

d) Terminal blocks used for interface with DDCMIS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.

4.03.11 **Grounding**

a) The charger panels shall have fully rated ground bus with two ground terminals, one at each end.

b) Each terminal shall comprise two-bolt drilling with G.I. bolts, nuts and bimetallic washers for connecting to 50x6 mm G.I. flat. Ground bus shall be bolted to the panel structures, effectively grounding the entire assembly. The cases of meters, relays and switching devices shall be grounded through sheet steel structure.

c) Wherever, the schematic diagrams indicate a definite ground at the panel, a single wire for each circuit thus grounded shall be run independently to the ground bus and connected thereto.

4.03.12 **Tropical protection**

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

b) Screens of corrosion resistant material shall be furnished on all ventilating louvres to prevent the entrance of insects.

4.03.13 **Painting**

a) The sheet metal of the panels shall be thoroughly cleaned by chemical agents (7-tank process) as required to produce a smooth clean surface free of scales, grease and rust.

b) Both interior and exterior surfaces of the panels shall be powder coated and finished with two (2) coats of paints of approved shades.

c) The paint shall be carefully selected to withstand tropical heat, rain etc. The paint shall not scale off or crinkle or removed by abrasion due to normal handling.

d) Sufficient quantity of touch up paint shall be furnished for application after installation at site.

4.03.14 **Nameplate**

a) Name plate shall be provided for each panel and for each equipment/device mounted on it.

b) The material shall be anodized aluminum/ lamicoid, 3mm thick, with white letter on black background.

c) Name plate shall be held by self-tapping screws. The size of name plates shall be approximately 20mm x 75mm for equipment and 40mm x 150mm for panels.

d) Name plates for panels shall be provided both on the front, rear and also inside the panels.

e) Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices both inside and outside the panel.

f) Instrument and devices mounted on the face of the panels shall also be identified on the rear with the instrument / device number. The number may be painted on or adjacent to the instrument or device case.

g) Caution notice of suitable metal plate shall be affixed at the back of each panel.

h) Bus bar clamp-on sensor, maximum DC current: 50A

4.04.00 **Battery Discharge Resistor Unit / Portable Single Cell Charger**

4.04.01 It shall be designed to perform periodic discharge tests. The Resistor Unit shall be made specially to check initial battery performance, guarantee smooth operation of back up system during emergencies and improve overall health and life of Battery system.

4.04.02 Resistor Unit shall be an assembly consisting of copper-nickel alloy wire grid elements supported by stainless steel tie rods. The resistor bank shall have adequate trimming facility (coarse and fine) to maintain a constant current against falling voltage during discharge operation. An ammeter shall be provided on the unit to monitor discharge current of battery.

4.04.03 Portable single cell charger shall be supplied with all accessories like input & output cables, ammeter, etc. It will be used for charging a cell while operating as part of a battery bank, even if another charger is connected, without removing it from service

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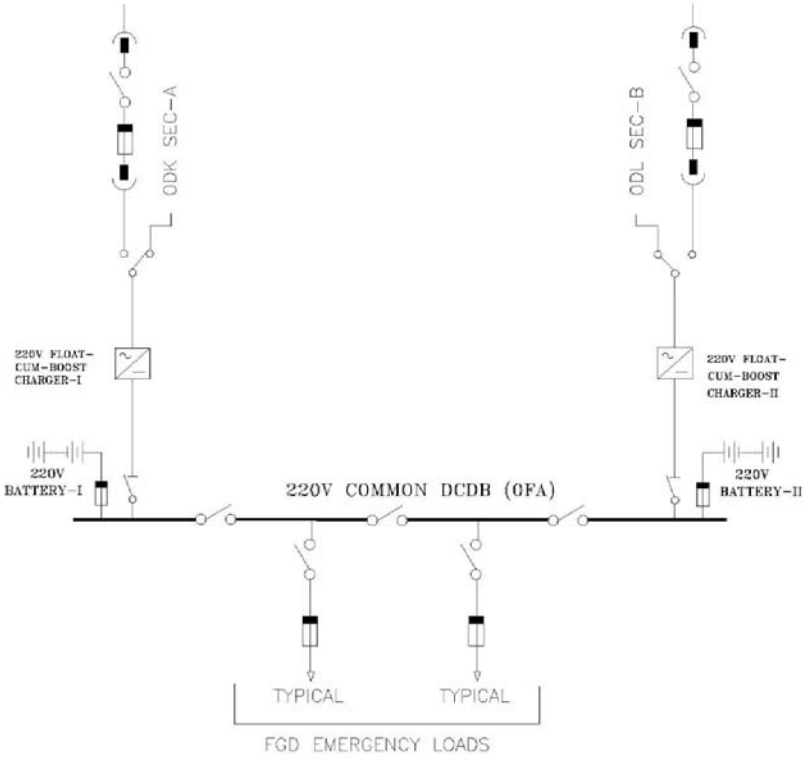
ANNEXURE-II

ONE LINE DIAGRAM FOR 220 V UNIT DC SYSTEM



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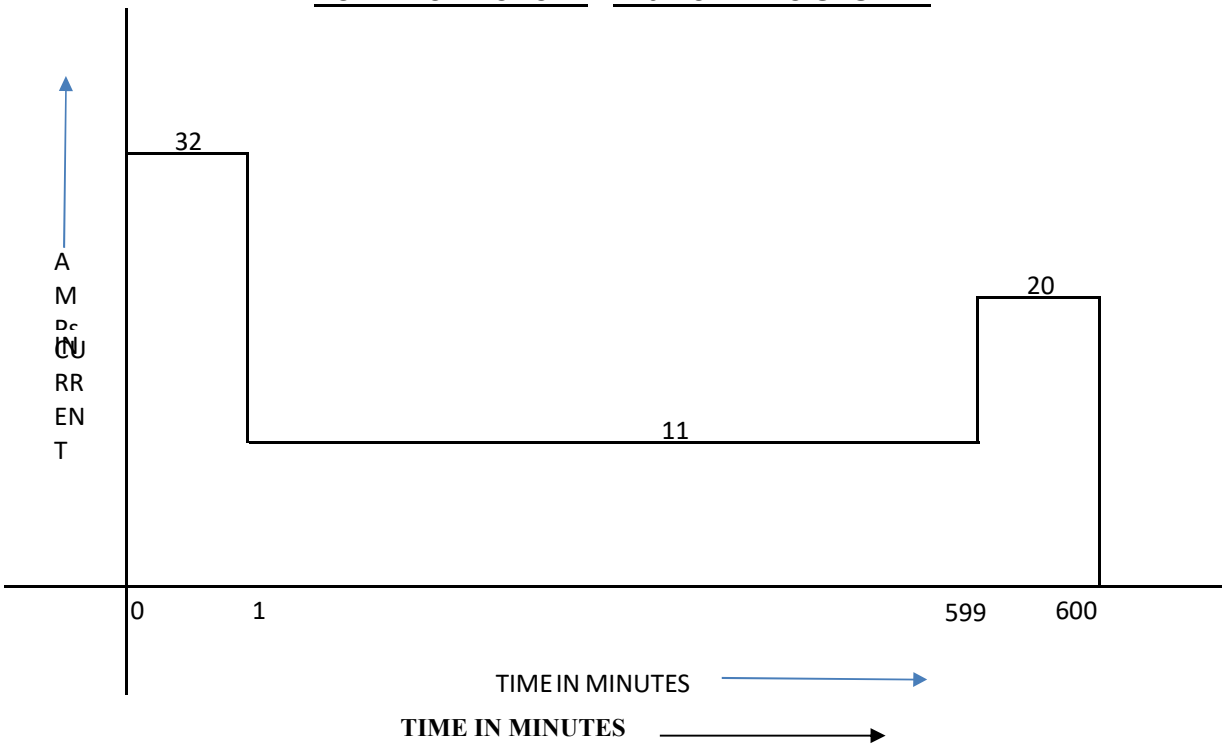
ANNEXURE-III

LOAD DUTY CYCLE - 220V UNIT DC SYSTEM



TIME IN MINUTES

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
AC CONTACTORS	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AC CONTACTORS	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC CONTACTORS	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
AC CONTACTORS	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC CONTACTORS	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
AC MCCB	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AC MCCB	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
AC MCCB	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AC MCCB	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AC MCCB	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AC MCCB	CROMPTON GREAVES	RAIL TRANSPORTATION SYSTEMS,VANDANA BUILDING, 11, TOLSTOY MARG, TOLSTOY MARG, NEW DELHI, DL 110001	011 3041 6300	
AIR CIRCUIT BREAKER	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
AIR CIRCUIT BREAKER	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
AIR CIRCUIT BREAKER	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
AIR CIRCUIT BREAKER	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
AIR CIRCUIT BREAKER	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
AUXILIARY RELAYS	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
AUXILIARY RELAYS	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
AUXILIARY RELAYS	JYOTI LTD.	JYOTI LIMITED, E&CS DIVISION,3/15, BIDC, GORWA,VADODARA - 390 016, E-MAIL ID: ECS@JYOTI.COM	Ph. No.:+91-265-2281214 , Fax No.:+91-265-2281214	
AUXILIARY RELAYS	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287,	
AUXILIARY RELAYS	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
BIMETAL RELAYS	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
BIMETAL RELAYS	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
BIMETAL RELAYS	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
BIMETAL RELAYS	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
CABLE GLANDS	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594	
CABLE GLANDS	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	
CABLE GLANDS	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
CABLE GLANDS	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
CABLE GLANDS	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST).	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/	
CABLE GLANDS	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
CABLE GLANDS	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
CABLE LUGS	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST).	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/	
CABLE LUGS	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	
DC CONTACTORS	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
DC CONTACTORS	BHEL (BHOPAL)	HEAVY ELECTRICAL PLANT		
DC CONTACTORS	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
DC CONTACTORS	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
DC CONTACTORS	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
DC CONTACTORS	TELEMECHANIQUE/ SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	TAKEN OVER BY SCHNEIDER
DC CONTACTORS	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
CONTROL SWITCHES/ SELECTOR SWITCH	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
CONTROL SWITCHES/ SELECTOR SWITCH	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479000	
CONTROL SWITCHES/ SELECTOR SWITCH	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
CONTROL SWITCHES/ SELECTOR SWITCH	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213		

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
CONTROL SWITCHES/ SELECTOR SWITCH	RECOM PVT. LTD.	M/S RECOM PVT. LTD.,16A , 2ND FLOOR A, WING RAJ INDUSTRIAL COMPLEX, MILITARY ROAD , MAROL ANDHERI (EAST),MUMBAI ,MAHARASHTRA STATE : 400059	Mr. Chandrashekar Kamath (MD) : 09820249503	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., 14, CART TRACK ROAD, MADUVANKARAI, CHENNAI - 600 042,	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	LOGICSTAT	B-160, INDUSTRIAL AREA, C BLOCK RD, OKHLA I, OKHLA INDUSTRIAL AREA, NEW DELHI, DL 110020	011 2681 0032	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	UNILEC ENGINEERS PVT. LTD.	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
CONTROL TRANSFORMER/ WINDING HEATING TRANSFORMER	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectrical	FOR CONTROL TRANSFORMER ONLY
LT- CURRENT TRANSFORMER	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LT- CURRENT TRANSFORMER	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- CURRENT TRANSFORMER	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
LT- CURRENT TRANSFORMER	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795	
LT- CURRENT TRANSFORMER	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	
LT- CURRENT TRANSFORMER	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- CURRENT TRANSFORMER	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- CURRENT TRANSFORMER	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMIBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
LT- CURRENT TRANSFORMER	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
LT- CURRENT TRANSFORMER	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectrical	
LT- POTENTIAL TRANSFORMER	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LT- POTENTIAL TRANSFORMER	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
LT- POTENTIAL TRANSFORMER	INDCOIL	PLOT NO. A- 150/ 151, 23RD U ROAD, WAGLE ESTATE, THANE WEST, CST RD, FRIENDS COLONY, HALLOW PUL, KURLA WEST, MUMBAI, MAHARASHTRA 400070	Phone:022 2583 8305	
LT- POTENTIAL TRANSFORMER	KAPPA ELECTRICALS	KAPPA ELECTRICALS, KAPPA CONSOLIDATED PVT. LTD., SOUTHERN ELECTRIKS	PHONE: +91 - 44 - 22454709, 22454516, 22450794, 22450795	
LT- POTENTIAL TRANSFORMER	PRAGATI ELECTRICALS	280/3,II POKHRAN RD	5341779,5427041	

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
LT- POTENTIAL TRANSFORMER	PRECISE ELECTRICALS	47A-49A,CHAKALA ROAD ANDHERI(E),MUMBAI-99 MUMBAI, MAHARASHTRA, INDIA PIN-400 099	022-8323402 / 022-8216433	
LT- POTENTIAL TRANSFORMER	SILKAANS ELECT.MFG.CO.PVT.LTD	PLOT NO: R-247, T.T.C. INDUSTRIAL AREA, M.I.D.C , RABALE, NAVI MUMBAI- 400 701 INDIA	+91-22- 27607787 / 27607927 +91-22- 27607997	
LT- POTENTIAL TRANSFORMER	PRAYOG ELECTRICALS PVT. LTD.	GROUND FLOOR, THAKORE INDUSTRIAL COMPUND, STATION ROAD, VIDYA VIHAR (W), NATHANI ROAD , OPP. AMIBIKA TEMPLE,MUMBAI Mumbai - 400086, Maharashtra, India	91-22-25164288/25133146 Mr. P. U. PATWARDHAN (MANAGING DIRECTOR)	
LT- POTENTIAL TRANSFORMER	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectrical	
DC SWITCH	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
DC SWITCH	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
DC SWITCH	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
HRC FUSES	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
HRC FUSES	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
HRC FUSES	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
HRC FUSES	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
HRC FUSES	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 ;amit.bhadauria@siemens.com	
HRC FUSES	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
HRC FUSES	SPACEAGE SWITCHGEARS LTD.	68 & 13-A INDUSTRIAL DEVELOPMENT COLONY, MEHRAULI ROAD GURGAON, HARYANA-122001	0124-2302711, 4085091	
HRC FUSES	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
HRC FUSES	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
HRC FUSES	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
INTERPOSING RELAY	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
INTERPOSING RELAY	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
INTERPOSING RELAY	JYOTI LTD.	JYOTI LIMITED, E&CS DIVISION,3/15, BIDC, GORWA,VADODARA - 390 016, E-MAIL ID: ECS@JYOTI.COM	Ph. No.:+91-265-2281214 , Fax No.:+91-265-2281214	
INTERPOSING RELAY	OEN INDIA LTD	29/1479, VYTILLA, COCHIN - 682 019 KERALA, INDIA	Phone : +91 484 2301132, 2303709 Fax : +91 484 2302287,	
INTERPOSING RELAY	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
INDICATING LAMPS	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
INDICATING LAMPS	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	6832259,6918834-37	
INDICATING LAMPS	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
INDICATING LAMPS	VAISHNO(HOTLINE SWGR.& CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	
INDICATING LAMPS	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	9818338922	
INDICATING LAMPS	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
INDICATING LAMPS	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
LIGHTING SWITCH , SOCKET & S/F UNIT	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
LIGHTING SWITCH , SOCKET & S/F UNIT	ANCHOR	STEEL HOUSE, B WING, PLOT NO. 24, MAHAL INDUSTRIAL ESTATE, MAHAKALI CAVES ROAD, NEAR PAPER BOX, ANDHERI (E), MUMBAI,	022-30418888.	
LIGHTING SWITCH , SOCKET & S/F UNIT	KAYCEE	KAYCEE INDUSTRIES LTD., C/O-CMS COMPUTERS LTD., 35A, REAR BLDG., KILOKARI, NEW DELH1-110014	Rajiv Sharma-9312004687	
LIGHTING SWITCH , SOCKET & S/F UNIT	L&T	32, SHIVAJI MARG, P.O. BOX- 6223, NEW DELHI-110015	011-41419554/59	
LIGHTING SWITCH , SOCKET & S/F UNIT	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LIGHTING SWITCH , SOCKET & S/F UNIT	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	044-49681447	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	ASIATIC	A-58 NARAINA IND. AREA, PHASE-I , NEW DELHI 110028	011 - 25796330, 25796617	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011 - 25793021	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	EVERGREEN ENGG. CO.	EVERGREEN ENGG COMPANY WORKS-5, PLOT NO. 9,10,11,12, SURVEY NO. 242, CHINCH PADA, VASAI EAST-401208	(0250) 6458250	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	TECKNIC CONTROLS	703, MADHAVA, BANDRA, KURLA COMPLEX, BANDRA EAST, MUMBAI, MAHARASHTRA 400051	022-42532507/00 022-24451648	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	EX-PROTECTA LIGHTING EQUIPMENT	305-306, GIDC ESTATE, VITHAL UDYOGNAGAR - 388121 DIST. ANAND, GUJARAT 388121 INDIA	02692-237823	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	ENPRO ENGG.	NO.995P, DIAMOND PLAZA, 2ND FLOOR, 12TH MAIN ROAD, ANNA NAGAR, CHENNAI-40	044 – 42611526 / 42170338 / 26262716 enproengg@enproengineeri	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	STERLING SWGR CONTROL PVT.LTD.	P.O. BOX NO. 17023, SORAB HOUSE, 2ND FLOOR, 555, S.B. MARG, DADAR, MUMBAI - 400028, MAHARASHTRA, INDIA	91-22-24222297/24222298/24224236	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	ELEXPRO ELECTRICALS PVT/ LTD.	C 1/27 & 37 GIDC KABILPORE NAVSARI-396424	02637-265140, Mr. Jssk kumar	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	VAISHNO(HOTLINE SWGR & CONTROL)	G-19, SECTOR - 11, NOIDA - 201301, UTTAR PRADESH, INDIA	8377805157 9818338922	

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	JASPER ENGNIREES PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	0120-4033520/533	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	KMG ATOZ SYSTEMS	C-49, SECTOR-81-NOIDA-201305	120-4207920, 08527897328	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	UNILEC ENGINEERS PVT. LTD.	BEHRAMPUR INDUSTRIAL AREA, BEGAMPUR KHATOLA ROAD, GURGAON-122001	0124-4030247,248, 4559700, 9911087173	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	BCH	20/4, MATHURA ROAD, FARIDABAD, HARYANA-121006	0129-4293000	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	CANDS	J/202, ANSA INDUSTRIAL ESTATE, SAKI VIHAR ROAD, SAKINAKA, ANDHERI (EAST), MUMBAI-72	022-28570858	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	TECKNIC CONTROLS	703, MADHAVA, BANDRA, KURLA COMPLEX, BANDRA EAST, MUMBAI, MAHARASHTRA 400051	022-42532507/00 022-24451648	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	UNITED ELECTRIC	97 UDYOG VIHAR PHASE-I, GURGAON 122015, HARYANA	124 4002970 72	
LOCAL PUSH BUTTON STATION (NON FLAME PROOF)	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213		
LOCAL PUSH BUTTON STATION (FLAME PROOF)	BALIGA ELECTRICALS	63A,CP RAMASWAMY ROAD, PB NO 6910, CHENNAI-600018	44-24995505,22680990-4	
MCB	MDS SWITCHGEAR LTD	314-317SHAH NAHAR ESTATE	011 - 25793021	
MCB	INDO ASIAN	B-24, PHASE - II , NOIDA - 201305, U.P.	120-3042222	
MCB	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
MCB	S&S POWER SWITCHGEAR LTD,	NEW NO. 67, OLD NO. 19, DR. RANGA ROAD, MYLAPORE, CHENNAI - 600004	044 - 24988056, 044 - 24988057, 044 - 24988058	
PROTECTION - RELAYS (PNUEMATIC)	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
PROTECTION - RELAYS (PNUEMATIC)	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
PROTECTION - RELAYS (PNUEMATIC)	GE-MULTILINE, GE INDIA INDUSTRIAL PVT. LTD.	NO. 90- B, ELECTRONICS CITY, HOSUR ROAD, BENGALURU - 560016, KARNATAKA	(080) 41314617, 9945478935	
PROTECTION - RELAYS (PNUEMATIC)	SCHWEITZER ENGG. LAB (SEL)	406, BHIKAJI CAMA BHAVAN, BHIKAJI CAMA PLACE, BHIKAJI CAMA PLACE, MOHAMMADPUR, RK PURAM, NEW DELHI, DL 110066	011 4152 7899	
PROTECTION - RELAYS (PNUEMATIC)	C&S ELECTRIC LTD.	222, OKHLA IND. ESTATE, PH-III, NEW DELHI-110020	011-3088 7520-29	
PROTECTION - RELAYS (PNUEMATIC)	ALSTOM LTD	A-7, SEC-65, NOIDA	0120-479 0000	
PROTECTION - RELAYS (PNUEMATIC)	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	0129-2567580, 09871799449	
PROTECTION - RELAYS (PNUEMATIC)	AVK-SEG & CONTROLS(I) LTD	C-60,NOIDA PHASE-II	6918834-37	

ANNEXURE-IV

TECHNICAL SPECIFICATION FOR
220V DC BATTERY CHARGER **4 X 270 MW BHADRADRI STPP (FGD)**
PE-TS-440-508-E002 **SUB VENDOR LIST**

ITEM/SERVICE DESCRIPTION	VENDOR NAME	ADDRESS	PHONE	REMARKS
PROTECTION - RELAYS (NUMERICAL)	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	0124-2842000, 9873424331 amit.bhadauria@siemens.com	
PROTECTION - RELAYS (NUMERICAL)	SCHNEIDER ELECTRIC INDIA PVT. LTD.	9TH FLOOR, BLDG. NO. 10, TOWER-C, DLF CYBER CITY, PH-II, GURGAON-122002	0124-3940400	
PROTECTION - RELAYS (NUMERICAL)	GE-MULTILINE, GE INDIA INDUSTRIAL PVT. LTD.	NO. 90- B, ELECTRONICS CITY, HOSUR ROAD, BENGALURU - 560016, KARNATAKA	(080) 41314617, 9945478935	
PROTECTION - RELAYS (NUMERICAL)	SCHWEITZER ENGG. LAB (SEL)	406, BHIKAJI CAMA BHAVAN, BHIKAJI CAMA PLACE, BHIKAJI CAMA PLACE, MOHAMMADPUR, RK PURAM, NEW DELHI, DL 110066	011 4152 7899	
TIMERS - ELECTRONIC	ESSEN DEINKI	FLAT NO. 502, SKYLINE HOUSE 85, NEHRU PLACE NEW DELHI	011-26217060	
TRANSDUCERS	AUTOMATIC ELECTRIC LTD.	ADDRESS : 96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
TRANSDUCERS	SOUTHERN TRANSDUCERS	INTERTECH B-83, FLATTED FACTORY COMPLEX, NEAR MODI MILLS, OKHLA, NEW DELHI-110020	Mr. Gurmohit Singh 011-41020365 / 9891402128	
ENERGY METER (ANALOG)	BHEL (EDN)	MYSORE ROAD,BANGALORE-560026	080-26998500	
ENERGY METER (ANALOG)	SIMCO ENGG. LTD	NO. 126, K ROAD, TIRUCHIRAPPALLI -620001, TAMIL NADU	Mr. Madaswamy Muthu +(91)-(431)-4046223 +(91)-(431)-4046210	
ENERGY METER (ANALOG)	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
ENERGY METER (ANALOG)	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
ENERGY METER (ANALOG)	CONZERVE SYSTEMS PVT. LTD.(SCHNEIDER)	87, 1ST FLOOR INDUSTRIAL DEVELOPMENT COLONY (IDC) MEHRAULI ROAD, UGURGAON 122001 HARYANA, INDIA.	4268899, 9910695701	
AMMETER	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
AMMETER	RISHABH INST.PVT LTD	RISHABH INSTRUMENTS PVT. LTD. F-31, MIDC, SATPUR NASHIK - 422007	marketing@rishabh.co.in 91-253 2202202/203 Fax: 91 253 2351064	
AMMETER	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectrical	
VOLTMETER	AUTOMATIC ELECTRIC LTD.	96 AB LONAVLA INDUSTRIAL ESTATE NANGARGAON, LONAVLA-410401	Phone : +91 2114323665 Fax : +91 2114273482	
VOLTMETER	M/s Newtek Electricals	M-90, M.I.D.C, Waluj, Aurangabad 431136, Maharashtra, India	Tel/Fax: +91 240 2551555 E-mail: mkt.north@newtekelectrical	
THERMOSTAT	AUTOMATION INSTRUMENTATION	-	-	
ISLOLATING SWITCH	ABB/C&S/SCHNEIDER/ L&T/SIEMENS	-	-	
PANEL SPACE HEATER	CONTROL & SWITCHGEAR/EQUIVALENT	-	-	
FIXED TERMINALS	CONNECTWELL/ELEMEX/ESSEN/PHOENIX	-	-	

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER	SPECIFICATION NO. PE-TS-440-508-E002	
		VOLUME II B	
		SECTION C	
	4 X 270 MW BHADRADRI TPS	REVISION 0	DATE:
		SHEET 1 OF 2	

DATASHEET-A

Sr. No.	PARAMETER	UNIT	VALUE
1.0	**Power Supply fault le el details**		
1.1	Rated AC voltage & variation	V, %	415 V, ± 10%, 3Ph- 3 Wire Systems.
1.2	Rated DC voltage & variation	V, %	220 V, 187 V to 242V
1.3	Fault current of 415V system	kA	50 kA for 1 sec.
1.4	Fault current of DC system limited upto (max)	KA	25 KA for 1 sec.
1.5	Type of battery	MIN	200 AH Lead-Acid Plante battery
2.0	**Charger current rating**		
2.1	Float-cum-boost charger	A	50A for Lead-Acid battery
3.0	**Ripple content of charger**		
3.1	RMS	%	
3.2	Peak to peak	%	± 1%
4.0	**Degree of Protection (DOP)**		
4.1	Rectifier transformer cubicle		IP-42
4.2	Control cubicle		IP-42
5.0	**Constructional features**		
5.1	Panel sheet thickness/ material	mm	2.0mm CRCA
5.2	Paint shade		Light grey shade (631 of IS-5) with two coats of Synthetic enamel paint from outside and shade 632 of IS-5 from inside.
5.4	Cable gland plate thickness/ material	mm	3 mm / Sheet steel
5.5	Gasket thickness/ material	mm	3 mm / Rubber
5.6	a) Cable size from charger to DCDB b) Cable size from battery to Fuse Box c) Cable size from Fuse Box to DCDB d) Cable Size For Charger AC Incomer		1CX35 sq.mm(cu)/Pole* 1CX25 sq.mm(cu)/Pole* 1CX25 sq.mm(cu)/Pole* 3Cx50 sq.mm(AL)
6.0	**Type Tests**		

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6.1	Type tests to be conducted for this contract, despite availability of valid & acceptable test certificates	Yes/ No	As per Section –C/Quality plan
7.0	**EARTHING**		
7.1	Grounding terminal size/ no. for each charger		50X6 MM./ 2 nos.
7.2	Grounding terminal size/ no. for each fuse box		50X6 MM./ 2 nos.
7.3	Grounding terminal size/ no. for each discharge resistor		50X6 MM./ 2 nos.
8.0	**Mandatory Spares**		
8.1	Mandatory Spares to be quoted for this contract	Yes/ No	Yes
8.2	If yes, list of mandatory spares		Mentioned in Annexure-IB (BOQ cum Price Schedule
9.0	**E C Spares**		
9.1	E & C Spares to be quoted for this contract	Yes/ No	Yes
9.2	If yes, list of E & C Spares		Mentioned in Annexure-IA (BOQ cum Price Schedule
10.0	**Special tools tackles**		
10.1	Special tools & tackles to be quoted for this contract	Yes/ No	
10.2	If yes, list of Special tools & tackles		Bidder to furnish lists.
11	**Battery Fuse Box**	Fuses as per Load Duty Cycle for both Positive and Negative Pole shall be provided. Also Construction shall be same as Charger Panel and Battery Fuse Box shall be wall mounted type.	
12	**Discharge Resistor Panel**	Discharge Resistor panel shall be suitable for battery size of 200AH with 10 hour discharge resistor. Cooling of discharge resistor shall be air/fan cooled. Construction shall be same as Charger panel. Handle and wheel arrangement shall be provided for easy movement.	

BHEL will pro ide PH- wire power Supply. Further distribution for single Phase shall be created by Bidder.

Min cable si e and Nos. indicated. Nos. may increase during detailed engineering.

	TECHNICAL SPECIFICATION FOR BATTERY CHARGER	SPECIFICATION NO. PE-SS-999-508-E002
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SECTION - D

	TECHNICAL SPECIFICATION FOR BATTERY CHARGER	SPECIFICATION NO. PE-SS-999-508-E002
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1.0 INTRODUCTION

This specification covers the design, manufacture, assembly, testing, packing and despatch of Battery charger (Float/Boost) complete in all respects with all components, fittings and accessories for efficient and trouble-free operation. The charger shall be connected either with Ni-Cd or 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 Under normal conditions, when the AC supply is healthy at the battery charger input terminals, the float charger shall feed the continuous DC loads, while the boost charger shall remain off. Over and above the continuous DC loads the float charger shall also supply the necessary charge to the battery, to keep the later in fully ready condition for being available during AC supply failure at charger terminals. Also some of the impulse loads of duration less than a minute for which the response of the charger is poor, shall be by the associated battery in the DC system. This impulse discharge, shall, however, be continuously replenished by the float charger, unless the discharge is of considerable magnitude, in the event of which the boost charger shall be deployed.

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 be 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.

4.0 BATTERY CHARGERS

4.1 The battery chargers shall be self regulating, natural air cooled, static type, composed of silicon controlled rectifiers (SCRs) 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, DC voltmeter & ammeter, battery DC output ammeter & voltmeter, battery charging

current ammeter, control switches, rectifiers, Auto/ Manual voltage regulators, load limiting device, 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. 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.

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 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.

4.12 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.

4.13 The DC system shall be ungrounded and float with respect to ground potential when healthy. An earth fault relay shall be provided in DCDB for remote annunciation.

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 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. 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. The rectifier transformers & chokes shall have class-F insulation with temperature rise limited to class-B insulation value.

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.

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.

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 mm^2 size with 1.5 accuracy class conforming to IS-1248. The instruments shall be flush mounted type, dust proof, moisture resistant and have easy accessible means for zero adjustment.

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/ ECP. 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.

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. The DC contactors shall be single/double pole air break type and suitable for continuous duty.

5.13 Air break switches

All chargers shall have AC input and DC output switches of air break, single throw, load break and fault make 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 Resistors

One set of variable metallic resistors and shunt suitable for carrying out discharge tests (5 hour discharge rate for Ni-Cd battery and 10 hour discharge rate for Lead Acid battery) on the batteries shall be supplied.

5.16 Battery fuse box

Battery fuse of adequate rating meeting the load duty cycle shall be supplied. Battery fuse box shall have suitable termination arrangement for terminating the cables informed during detailed engineering stage.

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 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 in each panel for incoming and outgoing cables.

5.18 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.

5.19 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.

5.20 All the charger panels shall be provided with an illuminating lamp, a 5 Amp socket and space heaters with thermostat. Toggle switches and fuses 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.

5.21 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.

5.22 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 2.5 mm^2. The control wiring terminating at electronic card shall not be less than 1.0 mm^2. The control terminal shall be suitable for connecting two wires with 2.5 mm^2 stranded copper conductors. All terminals shall be numbered for ease of connections and identification.

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.

5.23 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.

5.24 Cable Lugs

Heavy duty bolt-on termination tinned copper lugs of compression type shall be used in the switchgear 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.

5.25 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.

5.26 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 Visual indication shall be provided to indicate the operating conditions of the charger by the means of indicating lamps/LED or annunciation facia windows as per EEUA-45D, arranged on the top of the charger panels for following faults:

a) AC supply failure
b) Rectifier fuse failure
c) Surge circuit fuse failure
d) Filter fuse failure
e) Load limiter operated
f) Charger trip/over loaded
g) Battery on boost
h) DC system earth fault
i) Battery fuse blown
j) DC system under voltage

Potential free 'NO' contacts of all above conditions shall be provided for following remote alarms in the Unit Control Panel/ DDCMIS:

k) Battery fuse fails
l) Battery on boost
m) Charger over load
n) 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. Indications for charger input supply healthy, charger in FLOAT mode and charger in BOOST mode shall be provided.

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

After fabrication, all surfaces shall be cleaned and pre-treated as per IS:6005. Two coats of lead oxide primer (anti-corrosive) shall be applied after the pre-treatment. Two coats of powder painting with shade no. RAL-7032 or paint shade approved by customer shall be applied for complete panel. Thickness of paint shall be min. 40-50 microns. Protecting pealable compound shall be provided on outside finished surface to protect the painted surface during transportation and site handling.

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 attachment-I 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

10.5 Rectifier transformers shall be subjected to following routine test:

i) Temperature rise test

ii) Insulation Resistance test

iii) High voltage test (power frequency) test

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

i) Complete physical examination

ii) Temperature rise test at full load

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.

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.

10.10 The bidder shall indicate cost of carrying out all the Type tests as specified in the specification. The charges for each of the Type tests shall be given separately in price schedule (Volume III) as optional. These prices will be applicable in case a type test is required to be conducted by purchaser despite availability of satisfactory type test report as per clause 10.2 above.

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.

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

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-IV

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.

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER DATA SHEET C	SPECIFICATION NO. PE-TS-440-508-E002
		VOLUME II B
		SECTION C
		REVISION 0 DATE
		SHEET 1 OF 3

Sr. No.	PARAMETER	UNIT	VALUE
1.0	Manufacturer's Name		
2.0	Design ambient temperature		
3.0	Charger Rating & Type		
4.0	Charger rated output current:		
4.1	Trickle charging mode		
4.2	Boost charging mode		
5.0	Load limiter current setting range (Trickle mode)		
6.0	Automatic voltage regulator (Trickle mode)		
6.1	Type		
6.2	% Stabilization of the output DC voltage		
6.3	Voltage setting range		
6.4	Walk in time of Automatic Voltage Regulator		
6.5	Time taken to stabilize voltage for under shoot & overshoot		
7.0	Manual voltage regulator (Trickle mode)		
7.1	Type		
7.2	Voltage setting range		
8.0	Boost charging		
8.1	Current setting range		
8.2	Voltage limit setting range		
9.0	Rectifier assembly		
9.1	Type of semi-conductor material		
9.2	Rated direct current per cell (Average)		
9.3	SCR Rating Selected		
9.4	Heat sink for SCR		
9.5	Rated direct voltage		
9.6	Rated input voltage		
9.7	Type of connections of rectifier element		
9.8	Standard applicable		
9.9	Ripple content		

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER DATA SHEET C	SPECIFICATION NO. PE-TS-440-508-E002
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Sr. No.	PARAMETER	UNIT	VALUE
10.0	Rectifier transformer		
10.1	Type		
10.2	Rated KVA & % impedance		
10.3	Input line winding connection in vector representation		
10.4	Cell winding connection in vector representation		
10.5	1 min. power frequency withstand voltage (kV)		
10.6	Standard applicable		
11.0	Charger full load Efficiency at nominal input & output voltage & current		
12.0	Power factor at nominal input & output voltage & current		
13.0	Instrument		
13.1	Manufacturer		
13.2	Type		
13.3	AC voltmeter range		
13.4	DC voltmeter range		
13.5	DC Ammeter range		
13.6	Dial size		
13.7	Accuracy class as per IS		
14.0	Contactor		
14.1	Manufacturer		
14.2	Type		
14.3	Rated voltage		
14.4	Rated current		
14.5	No. of power contact		
14.6	No. type and rating of Aux. Contacts		
14.7	Operating coil voltage		
14.8	Drop-out voltage		
15.0	Thermal over load relay		
15.1	Manufacturer		

	TECHNICAL SPECIFICATION FOR 220V DC BATTERY CHARGER DATA SHEET C	SPECIFICATION NO. PE-TS-440-508-E002
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Sr. No.	PARAMETER	UNIT	VALUE
15.2	Tripping current range		
15.3	Whether single phasing protection provided		
15.4	Standard applicable		
16.0	Air - break switches (both DC & AC side)		
16.1	Manufacturer		
16.2	Type		
16.3	Rated voltage		
16.4	Rated current		
16.5	Type & material of contacts		
16.6	Standard applicable		
17.0	Output fuse		
17.1	Manufacturer		
17.2	Type		
17.3	Rupturing capacity (both AC & DC)		
17.4	Standard applicable		
18.0	Painting		
18.1	Paint shade		
18.2	Painting process		
19.0	Degree of Protection (DOP)		
19.1	Rectifier transformer cubicle		
19.2	Control cubicle		
20.0	Earthing busbar size & material		
21.0	Charger dimension: (approx.) [L x W x H]		
22.0	Sheet thickness (mm) / material		
23.0	Cable gland plate thickness		
24.0	Gasket material		
25.0	Charger weight (Kg.)		

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
		CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
		PROJECT			P.O NO.:-	DATE:-
		ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 1 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
1.0	RAW MATERIAL													
1.1	M.S Sheet (CRCA)	1) Grade	MA	Chemical/ Mechanical	100%	-	IS-513	Manufacturer's Drg.	Manufacturer's TC		P	-	-	
		2. Thickness & Finish	MA	Physical	1 Sample/lot	1 Sample/lot	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	V	V	
1.2	Powder Paint	Shade	MA	Visual	1 Sample/lot	-	Shade Card(IS-5)	Approved drg/ doc	-do-		P	-	-	
2.0	MAJOR BOUGHT OUT ITEMS(Note: Make of Bought Items shall be as per Approved List of Makes)													
2.1	Power Switches,MCCB, Timer, Contactor & Relay	1) Type, Rating	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Manufacturer's TC	√	P	V	V	
		2) Mechanical Operation/ Functional check	MA	Visual	100%	-	Manufacturer's std.	Manufacturer's std.	-do-		P	-	-	
2.2	MCB,Push Buttons,HRC fuse, Terminal blocks, control & selector switches, Semiconductor Fuses, Heaters, Thermostat,Lamps, Plug in socket, Exhaust Fans, Heat Sink	1) Type, Rating	MA	Visual	100%	-	Approved drg/ doc	Approved drg/ doc	-do-		P	-	-	
		2) Continuity test	MA	Electrical	100%	-	Manufacturer's std.	Manufacturer's std.	-do-		P	-	-	
2.3	Rectifier Bridge Element	1) Type, Rating	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Manufacturer's TC	√	P	V	V	
2.4	Digital Multi Function Meters	1) Type, Rating	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Manufacturer's TC	√	P	V	V	
		2) Calibration Certificate	MA	Visual	100%	100%	-do-	-do-	-do-	√	V	V	V	
		3) Routine TC	MA	Electrical	100%	100%	-do-	-do-	-do-	√	V	V	V	
2.5	PVC Insulated Electric Cable	1) Type, size	MA	Visual	100%	At Random	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	V	V	All power cables to conform to IS 1554; Control wires to conform to IS 694
		2) I.R Test	MA	Electrical	1 Sample/lot	-	-do-	-do-	-do-		P	-	-	
		3) H.V Test	MA	Electrical	1 Sample/lot	-	-do-	-do-	-do-		P	-	-	
2.6	Transducer	1) Routine TC & Calibration report	MA	Electrical	100%	100%	IS-14570/Approved drg/ doc	IS-14570/Approved drg/ doc	Manufacturer's TC	√	P	V	V	
		1) Type, Rating	MA	Visual	100%	100%	-do-	-do-	-do-	√	P	V	V	

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGGINEERING			QUALITY			Sign & Date		Doc No.			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
		CUSTOMER		QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
		PROJECT		P.O NO.:-	DATE:-
		ITEM:- BATTERY CHARGER(SCR BASED)	SYSTEM:- DC SYSTEM	SECTION:-	SHEET 2 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
2.7	Current Transformer, Voltage Transformer, Dimmerstat Control Transformer	1) Routine Tests	MA	Electrical	100%	10%	IS-2705/ Approved drg/ doc	IS-2705/ Approved drg/ doc	Manufacturer's TC	√	P	V	V	
		2) Type, Rating	MA	Visual	100%	10%	-do-	-do-	-do-	√	P	V	V	
2.8	Busbar	1) Dimensional check	MA	Physical	100%	-	Approved drg/ doc	Approved drg/ doc	Inspection Report		P	-	-	
		2) Conductivity test	MA	Electrical	1 Sample/lot	-	-do-	-do-	-do-		P	-	-	
		3) Surface Finish	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		4) Material Grade	MA	Chemical	1 Sample/lot	-	-do-	-do-	Manufacturer's TC		V	-	-	
2.9	Annunciation facia (if applicable)	All routine test as per EEUA-45D	MA	Electrical	100%	100%	Approved drg/ doc	Approved drg/ doc	Manufacturer's TC	√	P	V	V	
2.10	Visual Indications for charger status using LED/indicating lamps (if annunciation facia is not used)	1) Visual	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	V	V	If Electronic Cards used for indication (Refer Electronic Card Assembly and Location at cl. No. 3.4, for checks)
2.11	Rectifier Transformer	1) Rating	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	V	V	
		2) Dimensional check	MA	Physical	100%	100%	Manufacturer's Drg.	Manufacturer's Drg.	-do-	√	P	V	V	
		a) Overall size	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		b) Mounting Details	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		3) Terminal Board	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		4) Polarity Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		5) I.R Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		6) Routine Tests												
		a)Voltage Ratio Test	MA	Electrical	100%	100%	IEC-60146/ Approved drg/ doc	IEC-60146/ Approved drg/ doc	Manufacturer's TC /Inspection Report	√	P/V	V	V	
		b) DC resistance Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGGINEERING			QUALITY			Sign & Date		Doc No.			
	Sign & Date	Name		Sign & Date	Name				Sign & Date	Name	Seal
Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi	Seal		Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 3 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
		c) No Load Test Measurement of iron losses	MA	Electrical	100%	100%	IEC-60146/ Approved drg/ doc	IEC-60146/ Approved drg/ doc	Manufacturer's TC /Inspection Report	√	P/V	V	V	
		d) Measurement of Tap Voltages	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		e) Measurement of Cu.Losses	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		f) High voltage test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		g) Induced high voltage test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		h) Heat run Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	Insulation Class F with Temp. rise limited to class B insulation value
2.12	Choke	1) Rating	MA	Physical	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	V	V	
		2) Dimensional check	MA	Physical	100%	100%	Manufacturer's Drg.	Manufacturer's Drg.	-do-	√	P	V	V	
		a) Overall size	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		b) Mounting Details	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		3) Terminal Board/ Bakelite plate or busbar	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		4) Terminal rating	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		5) Air gap Measurement	MA	Physical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		6) Contuinity test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	V	V	
		7) Insulation Resistance	MA	Electrical	100%	100%	IEC-60146/ Approved drg/ doc	IEC-60146/ Approved drg/ doc	Manufacturer's TC /Inspection Report	√	P/V	V	V	
		8) High voltage test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		9) DC resistance Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	
		10) Heat run Test	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P/V	V	V	Insulation Class F with Temp. rise limited to class B insulation value

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 4 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
2.13	Printed Circuit Boards	1) Visual Checks	MA	Physical	100%	-	Manufacturer Drg.	Manufacturer Drg.	Manufacturer's TC		P	-	-	
		2) Compliance Report	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
2.14	Insulating Materials (FRP,SMC,DMC,ETC.)	1) Electrical	CR	Electrical	Sample	Sample	Manufacturer Std.	Manufacturer Std.	Manufacturer's TC	√	P	V	V	
		2) Mech Props.	MA	Mechanical	Sample	-	-do-	-do-	-do-		P	-	-	
		3) Tracking Index	MA	Electrical	Sample	-	-do-	-do-	-do-		P	-	-	
2.15	Paints	1) Shelf Life	MA	Visual	100%	-	As per Paints Manufacturer Spec	As per Paints Manufacturer Spec	Manufacturer's TC		V	-	-	
2.16	Gaskets (Syn. Rubber only)	1) Dimension	MA	Measurement	Sample	-	Manufacturer Drg.	Manufacturer Drg.	Inspection Report		P	-	-	
		2) Shore Hardness	MA	Physical	Sample	-	-do-	-do-	-do-		P	-	-	
		3) Ageing	MA	Chemical	Sample	-	IS-3400/BS-2752	IS-3400/BS-2752	Manufacturer's TC		P	-	-	
3.0	**IN PROCESS INSPECTION**													
3.1	Enclosure Fabrication	1) Dimensional checks	MA	Physical	100%	-	Manufacturer Fabrication Drg.	Manufacturer Fabrication Drg.	In-process Insp. Report		P	-	-	
		2) Diagonal (Skewness)	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		3) Straightness	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		4) Welded joints	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		5) Deburring & Finishing of welded joints	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
3.2	Pre-Treatment of Enclosure	1) Degreasing	MA	Physical	100%	-	IS-6005/ Manufacturer Std. practice	IS-6005/ Manufacturer Std. practice	In-process Insp. Report		P	-	-	
		2) Water rinsing	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		3) Derusting	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		4) Water rinsing	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		5) Phosphating	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		6) Water rinsing	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		7) Hot- Chromating	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
		8) Sealing (If used)	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	

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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 5 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
3.3	Powder Coating	1) Shade, Thickness & Finish	MA	Visual	100%	-	IS-6005/ Manufacturer Std. practice	IS-6005/ Manufacturer Std. practice	In-process Insp. Report		P	-	-	
		2) Adhesion check by cross hatch method	MA	Cross Hatch	Random	-	ASTMD-3359/ Manufacturer Std. practice	ASTM D-3359/ Manufacturer Std. practice	-do-		P	-	-	
3.4	Electronic Card Assembly & Location	1) Electronic cards fittings	MA	Visual	100%	100%	Manufacturer Std.	Manufacturer Std.	In-process Insp. Report	√	P	V	V	
		2) Mechanical interlock	MA	Visual	100%	100%	Manufacturer Std.	No wrong insertion of cards possible	-do-	√	P	V	V	
		3) Correctness of electronic components	MA	Visual	100%	-	Manufacturer Drg.	Manufacturer Drg.	-do-		P	-	-	
		4) Jumpers/ track modification	MA	Visual	100%	Random	Manufacturer Drg.	No unplanned jumpers / track modification	-do-	√	P	V	V	
		5) Finish of electronic cards	MA	Visual	100%	-	Manufacturer Drg.	No dry soldering	-do-		P	-	-	
		6) Environmental check on cards to remove cards with infant mortal components	MA	Visual	100%	-	Manufacturer Std.	Manufacturer Std.	-do-		P	-	-	
3.5	Assembly of Components & Modules	1) Transformer & choke	MA	Visual	100%	-	Manufacturer Drg.	Manufacturer Drg.	In-process Insp. Report		P	-	-	
		2) Mounting of components such as switches, rectifiers, stack fuses, meter & contactor	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		3) Minimum clearance between busbar	MA	Physical	100%	-	IS-13947	IS-13947	-do-		P	-	-	
		4) Electronic cards location inside the panels	MA	Visual	100%	100%	Manufacturer Drg.	Temp. rise of the location should not exceed 10°C over ambient during heat run test	-do-	√	P	V	V	
3.6	Wiring	1) Bunching	MA	Visual	100%	-	Manufacturer Drg.	Manufacturer Drg.	In-process Insp. Report		P	-	-	
		2) Marking	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		3) Ferruling	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
		4) Lugs crimping	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	

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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 6 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
		5) Contuinity	MA	Electrical	100%	-	Manufacturer Drg.	Manufacturer Drg.	In-process Insp. Report		P	-	-	
		6) Identification labels	MA	Visual	100%	-	-do-	-do-	-do-		P	-	-	
3.7	Finishing of Equipment	1) Proper pasting of gasket	MA	Visual	100%	-	Manufacturer Drg.	Manufacturer Drg.	In-process Insp. Report		P	-	-	
		2) Earthing busbar	MA	Physical	100%	-	-do-	-do-	-do-		P	-	-	
4.0	**FINAL INSPECTION**													
4.1	**Overall**	1) Dimensional & sheet thickness	MA	Physical	100%	Random	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	W	
		2) Gen arrangement & Bill of Material(BOM)	MA	Visual	100%	100%	-do-	-do-	-do-	√	P	W	W	
		3) Aesthetic,skewness, Straightness,Door alignment, Labels etc.	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		4) Provision of lifting arrangement	MA	Visual	100%	100%	-do-	-do-	-do-	√	P	W	W	
		5) Proper earthing	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		6) Gasketing (Check with 1mm wire)	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		7) Gland plate arrangement	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		8) Mounting arrangement	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		9) Wiring quality	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		10) Paint shade, Adhesion & thickness check	MA	Visual	100%	Random	Approved drg/ doc & Shade Card(IS-5)	Approved drg/ doc & Shade Card(IS-5)	-do-	√	P	W	W	
		11) Door Functioning	MA	Operation	100%	Random	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	W	
		12) Mounting & Proper Fixing of components	MA	Visual	100%	Random	-do-	-do-	-do-	√	P	W	W	
		13 Smooth operation of Switches, Pushbutton etc.	MA	Operation	100%	Random	-do-	-do-	-do-	√	P	W	W	
		14 Alarm & Protection	CR	Elect	100%	Random	-do-	-do-	-do-	√	P	W	W	

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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi	Seal		Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 7 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
4.2	**Electrical Testing**	1) Burn in check at 50°C for 48 hrs in energized condition	MA	Electrical	100%	100%	Approved drg/ doc	The temperature rise inside the cubicle shall not exceed 10°C during the test.	Inspection Report	√	P	V	V	Burn in test to be performed before offering for BHEL/ Customer Inspection
		2) AVR operation test with input voltage variation of +/- 10%, frequency variation and combined voltage-frequency variation.												
		a) No Load	MA	Electrical	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	W	
		b) Half Load	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	W	W	
		c) Full Load	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	W	W	
		3) Ripple test												
		a) No Load	MA	Electrical	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	W	
		b) Half Load	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	W	W	
		c) Full Load	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	W	W	
		4)Logic simulation/ interlocks/ General Operation Test												
		a) Trickle / boost mode selector switch operation	MA	Electrical	100%	100%	Approved drg/ doc	Functional	Inspection Report	√	P	W	W	
		b) Auto/ manual selector switch operation	MA	Electrical	100%	100%	-do-	Functional	-do-	√	P	W	W	
		c) Soft start feature check	MA	Electrical	100%	100%	-do-	Functional	-do-	√	P	W	W	
		d) Uniform step-less trickle mode voltage adjustment in auto / manual operation	MA	Electrical	100%	100%	-do-	Functional	-do-	√	P	W	W	
		e) Boost charge mode current adjustment from 50% to 100 % continuously	MA	Electrical	100%	100%	-do-	Functional	-do-	√	P	W	W	

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi	Seal		Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC NO.:-PE-TS-440-508-E002	DATE:-
	CUSTOMER			QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
	PROJECT			P.O NO.:-	DATE:-
	ITEM:- BATTERY CHARGER(SCR BASED)		SYSTEM:- DC SYSTEM	SECTION:-	SHEET 8 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
		5) Control circuit & charger status indication test	MA	Electrical	100%	100%	Approved drg/ doc	Functional	Inspection Report	√	P	W	W	
		6) Load Limiter Operation	MA	Electrical	100%	100%	-do-	Refer Remarks	-do-	√	P	W	W	Voltage should not drop upto 100% load. Voltage should drop beyond 100% load
		7) Dynamic response test	MA	Electrical	100%	100%	Approved drg/ doc (Also Refer Remarks)	Output Voltgae should stabilise within 2 secs.	-do-	√	P	W	W	Overshoot / undershoot in output voltage of the charger corresponding to sudden change in load from 100% to 20% and from 20% to 100%.
		8) Input AC current measurement test	MA	Electrical	100%	100%	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	W	
		9) Insulation Resistance (I.R) Test	MA	Electrical	100%	100%	IS-13947	IS-13947	-do-	√	P	W	W	
		10) High Voltage (H.V) Test	MA	Electrical	100%	100%	IS-13947	Charger should be able to withsatnd 2.5kV for 1 min.	-do-	√	P	W	W	
		11) Efficiency and power factor measurement	MA	Electrical	100%	100%	IS-4540	Approved drg/ doc	-do-	√	P	W	W	
		12) Degree of protection (DOP) Check for IP 4X	MA	Electrical	100%	100%	IS -2147	Approved drg/ doc	Type Test Report/ Inspection Report	√	P	W	W	
		13) Heat Run Test for 8 Hrs.	MA	Electrical	Sample as per Remarks ($$)	Sample as per Remarks ($$)	Approved drg/ doc	Approved drg/ doc	-do-	√	P	W	W	

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Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC NO.:-PE-TS-440-508-E002	DATE:- 24/11/2021
		CUSTOMER		QP NO.:-PE-QP-999-508-E003, REV.01	DATE:- 14/06/2020
		PROJECT		P.O NO.:-	DATE:-
		ITEM:- BATTERY CHARGER(SCR BASED)	SYSTEM:- DC SYSTEM	SECTION:-	SHEET 9 OF 9

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECK	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	D *	10			11
					M	C/N					**			
											M	C	N	
5	**Battery Fuse/MCCB Box**	1) Dimensional check	MA	Physical	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	W	
		2) Fuse Rating	MA	Visual	100%	100%	-do-	-do-	-do-	√	P	W	W	
		3) Insulation Resistance (I.R) Test	MA	Electrical	100%	100%	IS-13947	IS-13947	-do-	√	P	W	W	
6	**Discharge Resistor**	1) Dimensional check	MA	Physical	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	W	
		2) Resistance rating	MA	Electrical	100%	100%	-do-	-do-	-do-	√	P	W	W	
		3) Insulation Resistance (I.R) Test	MA	Electrical	100%	100%	IS-13947	IS-13947	-do-	√	P	W	W	
7	**Cable Lugs and Glands**	1) Visual	MA	Visual	100%	100%	Approved drg/ doc	Approved drg/ doc	Inspection Report	√	P	W	-	
8	**Packing**	1) Surface Finish & Completeness	MA	Visual	100%	100%	Approved drg/ doc/ As Per Manufacturer Std.	Approved drg/ doc/ As Per Manufacturer Std./ Approved Packing drg/ doc($$)	-do-	√	P	W	-	

NOTES:-

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

LEGENDS :

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

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

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

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

BHEL						BIDDER/SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
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Prepared By		Kanhaiya Kumar	Prepared By		Kunal Gandhi			Reviewed By			
Checked By		Manish Shukla	Checked By		Ritesh K Jaiswal			Checked By			

4x270 MW BHADRADRI TPS (FGD) **'ANNEXURE-I'**

'BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY CHARGER ***'SPECIFICATION NO. PE-TS-440-508-E002***

Sr. No.	Item code	Item Description	Unit	Quantity	Unit price	Total price	Remarks
(A)	**MAIN ITEMS**						
1.0	508-12010-A	FLOAT CUM BOOST CHARGER	NOS	2			50A, 220V DC Float-cum-boost charger
	508-12027-A	PORTABLE SINGLE CELL CHARGER1	NOS	2			200A,220V DC boost charger
	508-12028-A	PORTABLE SINGLE CELL CHARGER2	NOS	1			50A,220V DC boost charger
2.0	508-12001-A	BATTERY FUSE WITH SH STEEL ENCL. SUPP STR	NOS	2			Battery fuse box of adequate rating enclosed (as per load duty cycle) in sheet steel enclosure painted with antiacid/ antialkali paint, along with supporting structure for 220V DC, 200 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 200 AH lead acid plante battery
4.0	508-12006-A	E & C SPARES	SET	1			Refer Annexure-1A
5.0	508-12016-A	MANDATORY SPARES	SET	1			Refer Annexure-1B
6.0	508-12020-A	SUPV.OF ERECTION AND COMMISIONING	SET	1			Refer Annexure-1C

NOTE:- 1) All Cable Gland and Lugs at Charger, fuse box & discharge resistor end are in Bidder's Scope.
2) No separate charges shall be paid for type test to be conducted as specified in section-C and quality plan.

4 X 270 MW BHADRADRI TPS (FGD) ANNEXURE-IA

BOQ CUM UNPRICED PRICE SCHEDULE FOR 220V DC BATTERY CHARGER

Sr. No.	Item code	Item Description	Unit	Quantity	UNIT PRICE	TOTAL PRICE	Remarks
1	**508-12006-A**	**E & C SPARES**	LOT	1			
1.1		**FUSE LINK WITHOUT HOLDER**					
a		AC I/P HRC FUSE LINK	NOS	6			
b		GLASS FUSE	NOS	6			
c		CONTROL HRC FUSE LINK	NOS	6			
d		RECTIFIER FUSE LINK	NOS	6			
e		FILTER CAPACITOR FUSE LINK	NOS	6			
f		DC O/P FUSE LINK	NOS	6			
1.2		**INDICATING LAMP**					
		AC I/P LAMP RED COLOR	NOS	6			
		AC I/P LAMP YELLOW COLOR	NOS	6			
		AC I/P LAMP BLUE COLOR	NOS	6			
		DC O/P LAMP	NOS	6			

4 X 270 MW BHADRADRI TPS (FGD) **ANNEXURE-IB**

BOQ CUM UNPRICED PRICE SCHEDULE FOR 220V DC BATTERY CHARGER

Sr. No.	Item code	Item Description	Unit	Quantity	UNIT PRICE	TOTAL PRICE	REMARKS
1	**508-12016-A**	**MANDATORY SPARES**	LOT	1			
1.1		**ELECTRONIC CARDS (ALL COMPONENTS MOUNTED)**					
1.1.1		Electronic Modules/PCB/Card	SET	2 nos of each type used in the system			
1.1.2		Indicating Lamp	Nos.	10			
1.1.3		Fuse & Fuse links	SETS	2 SET			1 set refers to 100% of total qty for each type and rating of fuses used in the system
1.1.4		SCR	SETS	8 set of each type and rating			
1.1.5		Diode	SETS	8 set of each type and rating			
1.1.6		Pulse Transformer	SET	4			

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.

4 X 270 MW BHADRADRI TPS (FGD) **ANNEXURE-IC**

BOQ CUM PRICE SCHEDULE FOR SUPERVISION OF E&C CHARGES

SL.NO.	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM CHARGES PER VISIT FOR ENGINEER (EXCEPT DAILY CHARGES)	2 VISITS		
2	LUMP SUM DAILY CHARGES FOR ENGINEER	10 DAYS		

NOTES:

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

Annexure-A: Delivery Schedule

For Main supply: Within Six (06) months from date of CAT-1 approval of Primary drawing/documents provided by BHEL's Purchase Dept., subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawing/documents, then same shall be reduced from the given delivery period (of 6 months).

Sl. no.	BHEL Drawing No	Drawing Title	Primary/ Secondary	Drg. Sch. for Vendors
1	PE-V0-XXX-508-E001	TDS FOR BATTERY CHARGER	**Primary**	R-0 within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
2	PE-V0-XXX-508-E002	GA AND INTERNAL LAYOUT DRAWING FOR BATTERY CHARGER	**Primary**	
3	PE-V0-XXX-508-E003	SCHEMATIC/ POWER CIRCUIT DIAGRAM FOR BATTERY CHARGER	**Primary**	
4	PE-V0-XXX-508-E004	BOM WITH MAKE OF COMPONENTS FOR BATTERY CHARGER	**Primary**	
5	PE-V0-XXX-508-E011	SIZING CALCULATION OF TRANSFORMER, RECTIFIER, THYRISTOR, FILTER AND FUSE FOR BATTERY CHARGER	**Primary**	
6	PE-V0-XXX-508-E901	QUALITY PLAN FOR BATTERY CHARGER	**Primary**	
7	PE-V0-XXX-508-E017	LIST OF MANDATORY SPARES FOR BATTERY CHARGER	**Primary (for MS)**	
8	PE-V0-XXX-508-E005	CIRCUIT DIAGRAM AND GA OF BATTERY FUSE BOX	**Primary**	
9	PE-V0-XXX-508-E006	CIRCUIT DIAGRAM AND GA OF BATTERY DISCHARGE PANEL	**Primary**	
10	PE-V0-XXX-508-E018	TYPE TEST CERTIFICATES FOR BATTERY CHARGER	**Secondary**	R-0 within 30 days from PO & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
11	PE-V0-XXX-508-E016	LIST OF O&M SPARES FOR BATTERY CHARGER	**Secondary**	
12	PE-V0-XXX-508-E015	LIST OF E & C SPARES FOR BATTERY CHARGER	**Secondary**	
13	PE-V0-XXX-508-E007	OPERATIONAL WRITE UP FOR BATTERY CHARGER	**Secondary**	
14	PE-V0-XXX-508-E019	O&M MANUAL FOR BATTERY CHARGER	**Secondary**	within 30 days of issuance of MDCC

Mandatory Spares: Supply within four (4) months from manufacturing clearance by BHEL. Separate clearance shall be issued for same.

Schedule for Supervision of E&C: Vendor to depute its service engineer for Supervision of E&C within 15 days from BHEL's intimation (for deputing service engineer) for Supervision of E&C.

Notes:

1. The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.

2. The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof.

3. Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT.

Guidelines for Remote Inspection of PEM BOIs Annexure-B

) OB ECTIVE:

To lay down the procedure for carrying out Remote Inspection of Bought-out Items (BOIs) for PEM suppliers wherever applicable.

2) SCOPE:

It will cover suppliers for packages of PEM BOIs for various project requirements.

Invitation is sent to the suppliers for remote inspection on applications like MS Teams, Webex, etc. by BHEL.

) MINIMUM REQUIREMENTS AT SUPPLIER'S WORKS:

i. Uninterrupted internet services

ii. Good internet bandwidth (Min 100 Mbps)

iii. Good resolution camera (2 nos) – one preferably CCTV (static at one place) and one hand hold (moving)

iv. Smart phone with minimum 8MPi camera front and back both with optical zoom facility suitable for using web applications like Webex, MicroSoft (MS) Teams, etc.

v. Computer and Scanner with good resolution

vi. Digital signatures of supplier's Quality Engineer

vii. Availability of web applications like Webex, MicroSoft (MS) Teams, as required.

viii. All Test certificates, internal test reports, calibration reports, etc. for the items offered for inspection.

ix. Availability of the above to be submitted to BHEL two days in advance before inspection.

x. Dedicated team from supplier side for facilitating inspection requirements.

xi. For ensuring proper visibility, the suggested Portable lighting sources (torch/ electric LED bulb of minimum 15 W) with no glare is to be ensured at offered job, location for remote inspection/testing. This is to be verified before start of the inspection.

xii. The GPS location co-ordinates or any method to locate inspection location shall be captured indicating the location of the Vendor-Premises of remote inspection/testing.

4) MINIMUM REQUIREMENTS AT BHEL and CUSTOMER LOCATION :

i. Uninterrupted internet services

ii. Suitable internet bandwidth

iii. Digital signatures wherever required.

iv. Availability of web applications like Webex, MS Teams, etc. as required.

v. Clearance from customer for conducting remote inspection

) PROCEDURE:

i. Supplier will raise the inspection call in BHEL - CQIR portal.

ii. Supplier shall ensure availability of minimum requirements at supplier's works as mentioned above at point 3.

iii. Before starting the inspection, the supplier shall submit the documents (TCs, internal test reports and calibration certificates as per approved QAP) two days before the date of inspection for review by BHEL and supplier shall coordinate with BHEL and if found satisfactory, inspection shall be considered for remote.

iv. Prior to commencement of remote inspection a pre inspection meeting shall be organised by BHEL inspector with supplier to ascertain the readiness for remote inspection.

6) During inspection, supplier shall share the location on Google maps for verifying the address of the manufacturer. Location may be captured by BHEL as screenshot.

i. Inspection shall be on the basis of approved Quality Plans and associated reference documents mentioned.

ii. For witnessing inspection, supplier shall bring the mobile video camera near to the surface of the equipment or as per requirement of the inspector for clarity in viewing the test/ equipment which shall be the responsibility of supplier. Supplier shall ensure that proper lighting in available during live video streaming.

iii. Before start of the inspection, inspector shall ensure that all instruments shall have valid calibration report. Supplier shall ensure use of digital instruments preferably for inspection to the extent possible.

iv. Details of suppliers's dedicated team handling the remote inspection shall also be incorporated in the CQIR.

v. All details of inspection/ testing referred documents shall be mentioned in the CQIR. Recording of remote inspection shall be maintained by the BHEL inspector and this recording (unedited) shall be maintained at BHEL system for a minimum period of 3 years or till the warranty period whichever is later.

vi. PEM (Engineering) shall accord final technical clearance, in case of any deviation in inspected item noticed during inspection.

vii. Inspection shall be conducted by PEM-Q&BE assigned inspector along with PEM-Engg (if required). CQIR shall be prepared and maintained by PEM-Q&BE.

viii. PG will issue MDCC on the basis of acceptance of inspected items along with accepted packing photographs as per contract provisions.

7) **UNDERTAKING BY VENDOR:** Material inspected through remote inspections is meeting all technical requirements of BHEL. In case of any discrepancy from the above procedure/ material inspected, if found later, vendor will replace the materials without any cost implication to BHEL.

8) Vendor shall provide the signed and stamped of the above guidelines to BHEL as a token of acceptance.

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BHEL	**PRE-QUALIFICATION REQUIRMENTS FOR DC BATTERY CHARGER[FGD PROJECTS]**	PE-PQ-999-508-E008 REVISION NO. 00 DATE 17/08/2020 SHEET NO. 1 OF 1

ITEMS:
DC battery Charger, Battery Fuse Box and Discharge Resistor.

Vendor may be considered for evaluation for one or more of the following type of 220V/110 V DC battery chargers:
Type 1 - Static SCR type full wave fully Controlled, Rating 50A and above
Type 2 - IGBT Technology based, Rating 50A and above
Type 3 - SMPS based, Rating 50A and above

SCOPE: Supply : YES; Erection & Commissioning : NO; Supervision of Erection & Commissioning : YES;

1	Vendor should be designer & manufacturer of the applicable type of Battery charger.
2	Availability of type test certificates conducted at independent Lab or witnessed by third party as per IS/ International standards for the applicable type of Battery charger.
3	In-house capability to carry out all routine and acceptance tests as per IS/ International standards for the applicable type of Battery charger.
4	Option -1: Performance certificates for min. 2 years of trouble free operation at two (2) different installations/sites for the applicable type of battery Charger. Performance certificate should be from end user only. OR Option-2: Repeat order received from 2 different purchasers / end users for the applicable type of battery chargers during last 5 years provided the gap between award of two PO's is minimum 2 years. OR Option-3: 1 no. performance certificate (as per Option-1) and 1 no. repeat order (as per Option-2). OR Option-4 : Successful execution of a major order for BHEL-PEM for the applicable type of battery Charger.
5	Minimum two (2) nos. purchase orders for the applicable type of battery charger shall be submitted which should not be more than five(5) years old from the date of application for registration or date of techno- commercial bid opening (as applicable) for establishing continuity in business.

Notes (General points):

1. Consideration of offer shall be subject to customer's approval of bidders, if applicable.

2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.

3. Any other project specific requirement shall be as per Annexure-I and bidder shall submit relevant supporting documents. Bidder to meet criteria as stated above and as per Annexure- I.
Project Specific PQ requirement are "not Applicable" for BTPS FGD Project.

4. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

5. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

PREPARED BY	REVIEWED BY	APPROVED BY
KANHAIYA KUMAR Digitally signed by KANHAIYA KUMAR DN: cn=KANHAIYA KUMAR, o=BHEL, ou=PEM, email=kanhaiya.kumar@bhel.in, c=IN Date: 2020.08.17 21:19:29 +05'30'	MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN Date: 2020.08.21 16:13:06 +05'30'	DEBASISA RATH Digitally signed by DEBASISA RATH DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=BHEL PS PEM Noida, postalCode=201301, st=UTTAR PRADESH, 2.5.4.20=66a841897ece6235b359ef779ae76b0d329ed709f76a808c1a6d8e42c815ea7fd, cn=DEBASISA RATH Date: 2020.08.24 10:50:50 +05'30'
NAME: KANHAIYA KUMAR DESIGNATION: MANAGER(E)	NAME: MANISH SHUKLA DESIGNATION: SR. DGM(E)	NAME: DEBASISA RATH DESIGNATION: AGM & DH(E)

Manmohan Mahapatra
PRAVEEN DUTTA
HEMA KUSHWAHA

ANNEXURE-D

4x270 MW BHADRADRI TPS (FGD)

BOQ-cum-PRICE SCHEDULE FOR 220V DC BATTERY CHARGER

Sr. No.	Item code	Item Description	Unit	Quantity	HSN CODE	UNIT EX-WORKS PRICE (DULY PACKED) (INR)	TOTAL EX-WORKS PRICE (DULY PACKED) (INR)	Freight rate in %	Freight Amount in INR (as applicable)	Total Ex works + Freight (INR) (as applicable)	GST type	GST rate in %	GST amount in INR	TOTAL F.O.R SITE PRICE (INR)	Remarks
(A)	**MAIN ITEMS**														
1.0	508-12010-A	FLOAT CUM BOOST CHARGER	NOS	2	8504										50A, 220V DC Float-cum-boost charger
	508-12027-A	PORTABLE SINGLE CELL CHARGER1	NOS	2	8504										200A,220V DC boost charger
	508-12028-A	PORTABLE SINGLE CELL CHARGER2	NOS	1	8504										50A,220V DC boost charger
2.0	508-12001-A	BATTERY FUSE WITH SH STEEL ENCL. SUPP STR	NOS	2	8504										Battery fuse box of adequate rating enclosed (as per load duty cycle) in sheet steel enclosure painted with antiacid/ antialkali paint, along with supporting structure for 220V DC, 200 AH lead-acid plante battery
3.0	508-12005-A	DISCHARGE RESISTOR	NOS	1	8504										Discharge resistor with shunt suitable for 10 hour discharge rate for 200 AH lead acid plante battery
4.0	508-12006-A	E & C SPARES	SET	1	8504										Refer Annexure-1A
(B)	**MANDATORY SPARES**														
5.0	508-12016-A	MANDATORY SPARES	SET	1	8504										Refer Annexure-1B
(C)	**Supervision of E&C**														
6.0	508-12020-A	SUPV.OF ERECTION AND COMMISIONING	SET	1	9987										Refer Annexure-1C
	TOTAL														

NOTE:- 1) All Cable Gland and Lugs at Charger, fuse box & discharge resistor end are in Bidder's Scope.
2) No separate charges shall be paid for type test to be conducted as specified in section-C and quality plan.

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ANNEXURE-IA (E & C SPARES)															
Sr. No.	Item code	Item Description	Unit	Quantity	HSN CODE	UNIT EX-WORKS PRICE (DULY PACKED) (INR)	TOTAL EX-WORKS PRICE (DULY PACKED) (INR)	Freight rate in %	Freight Amount in INR	Total Ex works + Freight (INR)	GST type	GST rate in %	GST amount in INR	TOTAL F.O.R SITE PRICE (INR)	Remarks
1	508-12006-A	E & C SPARES (1 Lot)													
1.1		FUSE LINK WITHOUT HOLDER													
a		AC I/P HRC FUSE LINK	NOS	6	8504										
b		GLASS FUSE	NOS	6	8504										
c		CONTROL HRC FUSE LINK	NOS	6	8504										
d		RECTIFIER FUSE LINK	NOS	6	8504										
e		FILTER CAPACITOR FUSE LINK	NOS	6	8504										
f		DC O/P FUSE LINK	NOS	6	8504										
1.2		INDICATING LAMP													
a		AC I/P LAMP RED COLOR	NOS	6	8504										
b		AC I/P LAMP YELLOW COLOR	NOS	6	8504										
c		AC I/P LAMP BLUE COLOR	NOS	6	8504										
d		DC O/P LAMP	NOS	6	8504										
TOTAL															

ANNEXURE-IB (MANDATORY SPARES)

Sr. No.	Item code	Item Description	Unit	Quantity	HSN CODE	TOTAL EX-WORKS PRICE (DULY PACKED) (INR)	Freight rate in %	Freight Amount in INR	Total Ex works + Freight (INR)	GST type	GST rate in %	GST amount in INR	TOTAL F.O.R SITE PRICE (INR)	REMARKS
1	**508-12016-A**	**MANDATORY SPARES** (1 Lot)												
1.1		**ELECTRONIC CARDS (ALL COMPONENTS MOUNTED)**												
1.1.1		Electronic Modules/PCB/Card	SET	2 nos of each type used in the system	8504									
1.1.2		Indicating Lamp	Nos.	10	8504									
1.1.3		Fuse & Fuse links	SETS	2 SET	8504									1 set refers to 100% of total qty for each type and rating of fuses used in the system
1.1.4		SCR	SETS	8 set of each type and rating	8504									
1.1.5		Diode	SETS	8 set of each type and rating	8504									
1.1.6		Pulse Transformer	SET	4	8504									
TOTAL														
	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-IC (SUPV.OF ERECTION AND COMMISIONING)

SL.NO.	DETAILS	QUANTITY	HSN CODE	UNIT PRICE (INR)	TOTAL PRICE (Excl. Tax) (INR)	GST type	GST rate in %	GST amount in INR	TOTAL PRICE (INR)
1	LUMP SUM CHARGES PER VISIT FOR ENGINEER (EXCEPT DAILY CHARGES)	2 VISITS	9987						
2	LUMP SUM DAILY CHARGES FOR ENGINEER	10 DAYS	9987						

NOTES:

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

Annexure-E

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.
iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;
v. Termination of Contract on account of any other reason(s) attributable to the Seller.
vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.
viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager
x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

   i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
   ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
   iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
   iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
   v) Termination of Contract on account of any other reason (s) attributable to Seller.
   vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
   vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
   viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
   ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
   x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 **Risk & Cost Amount against Balance Work:**

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 *** Balance scope of work (in case of termination of contract):**

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 **LD against delay in executed work in case of Termination of Contract:**

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. <u>Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor</u>

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.